



भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

Ref: PSER:SCT:NKP-C1974:7609

Date: 28-06-2019

NOTICE INVITING TENDER

NOTE: INTENDING BIDDER TO PARTICIPATE MAY DOWNLOAD FROM WEB SITES

Sealed offers in two part bid system are invited from reputed & experienced bidders meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-1 through E-Procurement Portal <https://bhel.abcpocure.com> only, for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Issue/ forwarding intimation regarding tender to any bidder shall not construe that the bidder is considered to be qualified. Consideration of their offer is subject to CUSTOMER APPROVAL & compliance of loading criteria as per clause no. 8.0 of NIT etc. specified below. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION
i	TENDER NUMBER	PSER:SCT:NKP-C1974:19
ii	Broad Scope of job	Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.
iii	DETAILS OF TENDER DOCUMENT	
a	Volume-IA	General conditions of contract (Supply)
b	Volume-IB	General conditions of contract (Service)
c	Volume-IC	Special conditions of contract (Supply)
d	Volume-ID	Special conditions of contract (Service)
e	Volume-IE	Forms and Procedures etc.
f	Volume-IF	Technical Conditions of Contract (TCC) (CML, TS & DRGs)
g	Volume-III	Price Schedule (Absolute value) – Rev-00
iv	ISSUE OF TENDER DOCUMENTS	This is an E-tender floated online through our E-Procurement Site https://bhel.abcpocure.com . Start date of the tender: 28-06-2019
v	DUE DATE & TIME OF OFFER SUBMISSION	Date:15-07-2019, Time: 15-00 Hrs. The bidder should respond by submitting their offer online in our e-Procurement platform at https://bhel.abcpocure.com only. Offers are invited in two-parts only. Hard copy bid or bids through email/fax shall not be accepted.
vi	OPENING OF TENDER	Date: 15-07-2019 1 hour after the latest due date and time of Offer submission Notes: (1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next

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		<i>working day at the same time. (2) Bidder may depute representative to witness the opening of tender.</i>	
vii	EMD AMOUNT	Rs. 8510800 /-.	Applicable.
viii	COST OF TENDER	Rs. 10,000/-.	Applicable.
ix	LAST DATE FOR SEEKING CLARIFICATION	Date: 08-06-2019 Along with soft version also, addressing to undersigned & to others as per contact address given below	Applicable.
x	SCHEDULE OF Pre Bid Discussion (PBD)	--	Not Applicable (In case BHEL decides to conduct PBD, date, time & venue of PBD will be intimated suitably thru TCN.)
xi	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)	IEM DETAILS: Refer Clause No 34.0 below.	Applicable.
xii	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com) ; CPP portal & E-Procurement Site https://bhel.abcpocure.com only. Bidders to keep themselves updated with all such information.	Shall be intimated to bidder.

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 & stamped on each page, as part of offer. Rates/Price including discounts/rebates, if any, mentioned anywhere/ in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.

3.0 Unless specifically stated otherwise, bidder shall remit cost of tender (non-refundable) and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Kolkata, issuing the Tender, along with techno-commercial offer.

4.0 Unless specifically stated otherwise, bidder shall have to deposit EMD through Demand Draft/Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Kolkata. For other details please refer General Conditions of Contract.

Bidders may please be noted that "OEMD" provision stands deleted. Hence, bidders who have deposited Rs. 2 Lakh as OEMD are also requested to submit fresh EMD as mentioned in sl no vii under clause no 1.0 of NIT.

5.0 Procedure for Submission of Tenders: The Tenderers must submit their Tenders as detailed below:

DOCUMENTS TO BE UPLOADED & MODALITY OF UPLOADING

Sl no	Description	Remarks
PART-I A	(TECHNO COMMERCIAL BID)	
	CONTAINING THE FOLLOWING:-	

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i.	Covering letter/Offer forwarding letter of Tenderer. (To be attached in relevant Attachment section)	
ii.	Duly filled-in 'No Deviation Certificate' as per prescribed format. (To be attached in relevant Attachment section) Note: a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be attached in relevant attachment section of the e –procurement portal. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexures / schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above shall be attached in relevant attachment section and credential certificates issued by clients shall distinctly bear the name of organization, contact ph no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc pertinent to this NIT. (To be attached in relevant Attachment section)	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	Applicable.
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification/NIT (To be attached in relevant Attachment section)	
vii.	Notice inviting Tender (NIT) (To be attached in relevant Attachment section)	
viii.	Volume – I F: Technical Conditions of Contract (TCC) (To be attached in relevant Attachment section)	
ix.	Volume – I D: Special Conditions of Contract (SCC)-Service (To be attached in relevant Attachment section)	
x.	Volume – I B : General Conditions of Contract (GCC)-Service (To be attached in relevant Attachment section)	
xii.	Volume – I E: Forms & Procedures etc. (To be attached in relevant Attachment section)	
xiii.	Volume–III - (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item. (To be attached in Unpriced Bid Attachment section)	
xiv.	Any other details preferred by bidder with proper indexing. (To be attached in relevant Attachment section)	

PART-I B	EMD/ COST OF TENDER (To be submitted offline within due date of offer submission)	
	CONTAINING THE FOLLOWING:-	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in	

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	this Tender	
	2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	

PART-II	PRICE BID (TO BE ATTACHED IN PRICE BID ATTACHMENT SECTION)	
	CONTAINING THE FOLLOWING:-	
i	Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I	
ii	Volume III – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures) Any other document uploaded in the price bid, apart from above tender format, shall not be taken into cognizance for evaluation of offer.	

SPECIAL NOTE:

- A) Your offer & documents submitted along with offer shall be digitally signed & stamped in each page by your authorised representative. No overwriting/ correction in tender documents by bidders shall be allowed. However, if correction is unavoidable, the same may be signed by authorized signatory.
- B) The credentials/ documents submitted towards compliance of Pre-qualification requirement shall be physically signed by the authorized signatory & stamped before uploading/submission with the offer in the e-procurement portal.
- C) All documents/ annexures submitted with the offer shall be properly attached in the respective sections. BHEL shall not be responsible for any missing documents.

- 6.0 No Deviation with respect to tender clauses and no additional clauses/ suggestions/ in Techno-commercial bid/ Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same.
- 7.0 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).

8.0 Assessment of Capacity of Bidders:

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

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

Total number of Packages in hand = Load (P)

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

- II. **PERFORMANCE**: Here 'Monthly Performance' of the bidder for all the packages (under execution/ executed during the 'Period of Assessment' in all Power Sector Regions of BHEL) SIMILAR to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period

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of Assessment' shall be 6 months preceding and including the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the 3rd Month preceding the month corresponding to 'latest date of bid submission', in the following manner:

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

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

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

- $P_1, P_2, P_3, P_4, P_5, \dots, P_N$ 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. $P_T = P_1 + P_2 + P_3 + P_4 + \dots + P_N$)
- 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. $T_T = T_1 + T_2 + T_3 + T_4 + \dots + T_N$)
- 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 ' = $S_1 + S_2 + S_3 + S_4 + S_5 + \dots + S_N$)
- Overall Performance Rating ' R_{BHEL} ' for the Similar Package/Packages (under execution/ executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL

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

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

- 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.
- Table showing methodology for calculating 'a', 'b' and 'c' above

Sl. No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)

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

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

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

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

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

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

Sl. no.	Overall Performance Rating (R _{BHEL})	Corresponding value of 'L'
1	=60	NA
2	> 60 and ≤ 65	0.4
3	> 65 and ≤ 70	0.35

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4	> 70 and ≤ 75	0.25
5	> 75 and < 80	0.2
6	≥ 80	NA

III. 'Assessment of Capacity of Bidder':

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

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

Note:

- In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number
- For $R_{BHEL} = 60$, $P_{Max} = '1'$
- For $R_{BHEL} \geq 80$, there will be no upper limit on P_{Max}

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if $P \leq P_{Max}$

(Where P is calculated as per clause 'I' above)

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

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

IV. Explanatory note:

- 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.

- Identified Packages (Unit wise)

Table-1

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

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

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

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

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

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

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

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

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

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

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case of any change/discrepancy same shall be informed immediately. Login Details for viewing scores in Contractor Performance Evaluation System shall be provided to the Contractor by SCT Department.

- vii). Performance Evaluation for Activity Month shall be completed in Evaluation Month (i.e. month next to Activity Month) or in rare cases in Post Evaluation Month (i.e. month next to Evaluation Month) after approval from Competent Authority. In case scores are not acceptable, Contractor can submit Review Request to GM Site/ GM Project latest by 25th of Evaluation Month or 3 days after approval of score, whichever is later. However, acceptance/rejection of 'Review Request' solely depends on the discretion of GM Site/GM Project. After acceptance of Review Request, evaluation score shall be reviewed at site and the score after completion of review process shall be acceptable and binding on the contractor.
- viii). Project on Hold due to reasons not attributable to bidder -
 - a. Short hold: Evaluation shall not be applicable for this period, however Loading will be considered.
 - b. Long hold: Short hold for continuous six months and beyond or hold on account of Force Majeure shall be considered as Long Hold. Evaluation as well as Loading shall not be considered for this period.
- ix). Performance evaluation in CL 8 above is applicable to Prime bidder and Consortium partner (or Technical tie up partner) for their respective scope of work.

- 9.0 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.
- 10.0 For any clarification on the tender document, the bidder may seek the same in writing, through e-mail or through E-Procurement Site <https://bhel.abcpocure.com>, 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 any delay. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.
- 11.0 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.
- 12.0 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.
- 13.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
- 14.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), 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 (xi) of 1 above.
- 15.0 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

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satisfying the Pre Qualification Criteria specified in this NIT as per Annexure-1 (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.

- 16.0 In case BHEL decides on a 'Public Opening', the date & time of opening of the PRICE BID shall be intimated to the qualified bidders and in such as case, price bid (Volume-III) uploaded in E-procurement Site <https://bhel.abcpocure.com> will be opened.
- 17.0 Validity of the offer shall be for six months from the latest due date of offer submission (including extension, if any) unless specified otherwise.
- 18.0 BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

However, if reverse auction process is not adopted or is unsuccessful for whatsoever reason, absolute value price bid (Volume-III) uploaded in E-Procurement Site <https://bhel.abcpocure.com> will be opened for deciding the successful bidder. BHEL's decision in this regard will be final & binding on bidder.

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

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L 1 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 L 1 bidder has quoted higher in online seal bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

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

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

In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

- 19.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.
- 20.0 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.
- 21.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.

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- 22.0 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre Qualifying Requirement (PQR) criteria, and in such a case the details to be complied with is enclosed herewith as per Annexure-5 UNLESS SPECIFIED OTHERWISE IN PQR.
- 23.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self certified and stamped/ digitally signed (as applicable) by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.
- 24.0 The bidder may have to produce original document for verification if so decided by BHEL.
- 25.0 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 Website (www.bhel.com).

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

a) 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.

b) Commitment by Bidder/ Supplier/ Contractor:

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

b.ii) The bidder/ supplier/ contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.

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

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

- 26.0 It may please be noted that Guidelines/Rules in respect of Suspension of business dealings (Hold- 12 to 24 Months/ Banning – 3 years etc), Vendor Evaluation formats, quality, safety and HSE guidelines , standard T&P hire charges of BHEL etc may undergo change from time to time and the latest one shall be followed. Latest "Guidelines for Vendor Evaluation" is web based, quality, safety & HSE"; standard T&P hire charges shall be available at site and shall be given to the successful vendors/ subcontractors during execution.
- 27.0 MSE suppliers can avail the intended benefits in respect of the procurements related to the Goods and Services only (Definition of Goods and Services as enumerated by Govt. of India vide Office Memorandum F. No. 21(8)/2011-MA dtd. 09/11/2016 office of AS & DC, MSME) if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or Udyog Aadhar Memorandum (UAM) &

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Acknowledgement or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure – C where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer.

Any Bidder falling under MSME category, shall furnish the following details & submit documentary evidence/Govt. Certificate etc. in support of the same along with their techno-commercial offer: -

Type under MSME	SC/ST owned	Women owned	Others
Micro			
Small			
Medium			

Note: - If the bidder does not furnish the above, offer shall be processed construing that the bidder is not falling under MSME category.

- 28.0 The bidder along with its associates/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website 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.
- 29.0 Annexure-A -Amendment to GCC/SCC shall be read in conjunction with GCC-Volume-IB & SCC-Volume-ID. This Annexure-A (Amendment to GCC/SCC) of NIT shall not be considered as part of the NIT but addendum/corrigendum to the GCC/SCC only.
- 30.0 Annexure-B - Terms & conditions of Reverse Auction is enclosed herewith.
- 31.0 Annexure-D – Specific Clause w.r.t. BOCW Act & Cess Act is enclosed herewith.
- 32.0 Annexure-E- Statewise GST Registration nos. is enclosed herewith.
- 33.0 Duly filled & signed Annexure- CPP-GST/I to be submitted by bidders along with their techno-commercial offer.
- 34.0 Integrity Pact (IP) –

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

SI	IEM	Address	Phone & Email
1.	Mrs. Pravin Tripathi, IA & AS (Retd.)	D-243, Anupam Gardens, Lane IB, Neb Sarai, New Delhi - 110068	pravin.tripathi@gmail.com

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/three part bid). Only those bidders who have entered into

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such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

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

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

Name	Sriparna Mukherjee	Subrata Sen
Dept	SCT Dept, BHEL PSER, Kolkata	SCT Dept, BHEL PSER, Kolkata
Address	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700091	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700091
Phone	033-2339 8228	033-2339 8226
Email	sriparna@bhel.in	subrata.sen@bhel.in
FAX	033-2321 1960	033-2321 1960

- 35.0 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.
- 36.0 Bidders are requested to submit their best price as per latest price schedule of the tender.
- 37.0 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."
- 38.0 It may please be noted that Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid, else bid shall be liable for rejection.

All overwriting/ cutting, etc will be numbered by bid opening officials and announced during bid opening.
- 39.0 Order of Precedence

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

- b. Amendments/Clarifications/Corrigenda/Errata etc issued in respect of the tender documents by BHEL
- c. Notice Inviting Tender (NIT)
- d. Price Bid-Volume-III
- e. Technical Conditions of Contract (TCC) -- Volume-IF
- f. Special Conditions of Contract (SCC) —Volume-ID
- g. General Conditions of Contract (GCC) —Volume-IB
- h. Forms and Procedures —Volume-IE

for BHARAT HEAVY ELECTRICALS LTD

Mgr (SCT)

Agency	Contact details	
BHEL, PSER, Kolkata	Address	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700 091
	Phone no	033-2339 8228 (D)/ 8000
	FAX no	033-23211960
	E-mail	sriparna@bhel.in ; gargi.ray@bhel.in ; subrata.sen@bhel.in

Enclosure

01. Annexure-1: Pre Qualification Criteria.
02. Annexure-2: Format for No deviation Certificate.
03. Annexure-3: Format for seeking clarification.
04. Annexure-4: Check List.
05. Annexure-5: Conditions for consortium/tie up.
06. Annexure –A- Amendment to GCC/SCC.
07. Annexure -B- Terms & conditions of Reverse Auction.
08. Annexure –C- CA certificate Format.
09. Annexure-D – Specific Clause w.r.t. BOCW Act & Cess Act.
10. Annexure-E- Statewise GST Registration nos.
11. Annexure– CPP-GST/I.
12. Integrity Pact Agreement Format (Separate).
13. Other Tender documents as per this NIT.

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ANNEXURE-1PRE QUALIFICATION CRITERIA

JOB	<i>Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.</i>
TENDER NO	PSER:SCT:NKP-C1974:19

SL NO.	CRITERIA
1.0 (a)	BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER OF INR 22.53 CR DURING THE LAST 3 (THREE) YEARS, ENDING ON 31-03-2018 AND HAVING POSITIVE NET WORTH AS ON LATEST AUDITED ACCOUNTS AS SUBMITTED FOR PARA 1(C).
(b)	BIDDER MUST HAVE EARNED PROFIT IN ANY ONE OF THE LAST THREE FINANCIAL YEARS ENDING ON 31-03-2018. AUDITED BALANCE SHEET AND PROFIT & LOSS ACCOUNT OF THE COMPANY FOR LAST 3 (THREE) FINANCIAL YEARS, ENDING ON 31-03-2018 NEED TO BE SUBMITTED IN SUPPORT OF ABOVE.
(c)	IN CASE AUDITED BALANCE SHEET AND PROFIT AND LOSS ACCOUNT HAS NOT BEEN SUBMITTED FOR ALL THREE YEARS INDICATED ABOVE THEN THE APPLICABLE FINANCIAL AUDITED STATEMENTS SUBMITTED BY THE BIDDERS AGAINST THE REQUISITE THREE YEARS WILL BE AVERAGED FOR THREE YEARS.
(d)	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.
2.1	BIDDER SHOULD HAVE EXECUTED PILING OR CIVIL OR STRUCTURE OR 'CIVIL AND STRUCTURAL WORKS' OR RCC CHIMNEY OR RCC COOLING TOWER OR RCC SILO OR MILL BUNKER OR ANY COMBINATION DURING THE LAST 7 (SEVEN) YEARS, ENDING ON THE LATEST DATE OF BID SUBMISSION, VALUE OF WHICH SHOULD NOT BE LESS THAN EITHER OF THE FOLLOWING: A) 1 (SINGLE) WORK OF VALUE NOT LESS THAN Rs. 60.09 CR. OR B) 2 (TWO) WORKS OF VALUE NOT LESS THAN Rs. 37.56 CR EACH OR C) 3 (THREE) WORKS OF VALUE NOT LESS THAN Rs. 30.04 CR EACH RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
2.2	BIDDER SHOULD HAVE 'EXECUTED THE FOLLOWING JOB DURING LAST 7 (SEVEN) YEARS, ENDING ON THE LATEST DUE DATE OF SUBMISSION OF OFFER. AT LEAST 19795 CUM OF RCC WITHIN A COMMON PERIOD OF TWELVE CONSECUTIVE MONTHS IN CUMULATIVE OF TWO RUNNING / COMPLETED CONTRACTS. OR AT LEAST 13196 CUM OF RCC WITHIN A PERIOD OF TWELVE CONSECUTIVE MONTHS IN ONE RUNNING / COMPLETED CONTRACT. RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
3.0	BIDDER SHOULD HAVE VALID PAN. RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
4.0	CONSORTIUM/JV BIDDING IS NOT ALLOWED.
	GENERAL
A	'EXECUTED' MEANS BIDDER SHOULD HAVE ACHIEVED THE CRITERIA SPECIFIED ABOVE EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
B	BIDDER SHOULD FURNISH INFORMATION REGARDING PROJECTS IN HAND, CURRENT LITIGATION, ORDERS REGARDING EXCLUSION/ EXPULSION OR BLACK LISTING.
C	AFTER SATISFACTORY FULFILLMENT OF ALL THE ABOVE CRITERIA, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION AS PER NIT AND ALL OTHER TERMS OF THE TENDER SUBJECT TO CUSTOMER'S APPROVAL
D	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.

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

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated along with all annexures.
2. In case audited Financial statements have not been submitted for all the three years as indicated, 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. NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
4. PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years.
5. 'Additional' Criteria in respect of 'Technical' criteria of PQR for Civil, Electrical, CI, unless otherwise specified:
 - i) 'Similar' work means
 - a. Piling or Civil or Structure or 'Civil and Structural works' or RCC Chimney or RCC Cooling Tower or RCC Silo or Mill Bunker or any combination of these shall be considered similar works for all packages mentioned under 'CIVIL WORKS'
 - b. Electrical or C&I or 'Electrical and C&I' shall be considered similar works for all packages mentioned under 'ELECTRICAL AND C&I WORKS'
6. 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.
7. 'EXECUTED' means the bidder should have achieved the criteria specified in the Technical criteria of PQR even if the Contract has not been completed or closed
8. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR, the word 'EXECUTED' means achievement of milestones as defined below:
 - a. "ACHIEVEMENT OF PHYSICAL QUANTITIES" as per respective 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.
9. Boiler means HRSG or WHRB or any other types of Steam Generator
10. Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass
11. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation.
12. In case the experience/PO/WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR.
13. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine.
14. In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered.
15. 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-

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

Where

P = Updated value of work

R = Value of executed work

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

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

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Y_N = 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).

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

16. PROFIT shall be PBT earned during any one year of last three financial years as mentioned in PQR.
17. For evaluation of PQR, the credentials of the Bidder alone, and not that of the Group Company shall be considered.
18. "Executed" means the bidder should have achieved the criteria specified in the PQR even if the Contract has not been completed or closed.
19. 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.

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ANNEXURE - 2**FORMAT FOR NO DEVIATION CERTIFICATE**
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	<i>Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.</i>	
Ref	1.0	Tender no PSER:SCT:NKP-C1974:19.
	2.0	BHEL's NIT, vide reference no: PSER:SCT:NKP-C1974:7609 Date: 28-06-2019.
	3.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted/uploaded offer/documents in accordance with tender instructions with acceptance of the terms & conditions of the tender by us and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)

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ANNEXURE - 3**FORMAT FOR SEEKING CLARIFICATION**

JOB	<i>Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.</i>
TENDER NO	PSER:SCT:NKP-C1974:19

Sl no	Reference clause of tender document	Existing provision	Bidder's query	BHEL's clarification

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ANNEXURE - 4**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: <u>Please tick (√) whichever applicable:-</u> ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY(BY BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/Not Applicable	YES/NO
8	Copy of PAN Card	Applicable/Not Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable/Not Applicable	YES/NO
10	Integrity Pact	Applicable/Not Applicable	YES/NO
11	Declaration by Authorised Signatory	Applicable/Not Applicable	YES/NO
12	No Deviation Certificate	Applicable/Not Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions	Applicable/Not Applicable	YES/NO
14	Declaration for relation in BHEL	Applicable/Not Applicable	YES/NO
15	Non Disclosure Certificate	Applicable/Not Applicable	YES/NO
16	Bank Account Details for E-Payment	Applicable/Not Applicable	YES/NO
17	Capacity Evaluation of Bidder for current Tender	Applicable/Not Applicable	YES/NO
18	Tie Ups/Consortium Agreement are submitted as per format	Applicable/Not Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable/Not Applicable	YES/NO
20	Analysis of Unit rates	Applicable/Not Applicable	YES/NO
21	Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR (Undertaking to be enclosed if not applicable)	Applicable/Not Applicable	YES/NO

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

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

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ANNEXURE-5CONDITIONS TO BE COMPLIED WITH FOR CONSORTIUM BIDDING (TECHNICAL TIE UP)

- 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. The Prime Bidder and Consortium Partner(s) shall certify to BHEL regarding existence and validity of their consortium agreement on six monthly basis.
- 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.
- 3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR.
- 4 Prime Bidder shall be as specified in the Pre Qualification Requirement, else the bidder who has the major share of work.
- 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 8.0.
- 6 Prime Bidder shall comply with additional 'Technical' criteria of PQR as defined in 'Explanatory Notes for the PQR'
- 7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified
- 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.
- 9 Prime Bidder shall be responsible for the overall execution of the contract
- 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
- 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.
- 12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.
- 13 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.
- 14 The consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.
- 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.

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Annexure - AAmendment to GCC/SCC

1. Introduction of Clause No 1.15.13 in GCC as below:

Clause No 1.15.13: Additional security deposit (SD) has to be submitted by the successful bidder with value as follows:

"If the final price of successful bidder is lesser by 'more than 20%' of BHEL's estimate - 'Additional Security Deposit' will be required to be submitted by the successful bidder with value as follows:

Additional Security Deposit = 30 % of (A-B) limited to a maximum of 10% of the 'Total Price/Contract Value', where,

A = 80% of BHEL estimate

B = The final offered price of successful bidder through RA (In case of RA)

OR

Sealed paper price bid of successful bidder (in case of paper bid)

This 'Additional Security Deposit' shall have the same validity as that of the 'Security Deposit' and shall be revalidated/released in the manner as spelt out for the 'Security Deposit' as per relevant clause of GCC.

The BHEL's estimated value shall be disclosed to the successful bidder (on their request) at appropriate juncture in case 'Additional Security Deposit' is applicable."

2. Clause no. 1.9.1(ii) of GCC shall be read as below:

The EMD may be accepted only in the following forms:

(a) Cash deposit as permissible under the extant Income Tax Act (before tender opening)

(b) Electronic Fund Transfer credited in BHEL account (before tender opening)

(c) Banker's cheque/ Pay order/ Demand draft, in favour of BHEL (along with offer)

(d) 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).

In addition to above, 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 atleast six months. EMD of successful tenderer will be retained as part of Security Deposit.

Clause no. 1.9.1(iv) & (v) of GCC stands deleted.

3. Clause no. 1.10.1 of GCC shall be read as below:

The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.

4. Clause no. 1.10.2 of GCC shall be read as below:

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At least 50% of the required Security Deposit, including the EMD, should be furnished before start of the work. Balance of the Security Deposit can be deposited by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected.

The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of competent authorities.

5. Clause no. 1.10.3 of GCC shall be read as below:

The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in the following forms:

- a) Cash (as permissible under the extant Income Tax Act)
- b) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL
- c) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL
- d) Fixed Deposit Receipt 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)
- e) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

6. Introduction of Clause No. 1.10.8 in GCC as below:

Clause No 1.10.8: SDBG to be furnished by the vendor before start of work. No payment will be released till SDBG is submitted by the vendor.

If requested by the vendor, cash recovery equivalent to SDBG value to be made from bills submitted by the vendor.

Also 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).

In case of delay in extension of SDBG, in case of validity expiry, SDBG shall be invoked. However if the vendor submits a new BG after invocation of the previous BG then, it shall be refunded and recovery for the gap period, i.e. the duration for which BG is not available shall be made as stated above.

7. Clause no. 1.11 of GCC shall be read as below:

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL upon fulfilment of contractual obligations as per terms of the contract.

8. Clause no. 2.8.3, 2.8.4 and 2.8.5 of GCC shall be read as below:

Clause no. 2.8.3: The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations, Notifications, etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act, 1970, Payment of Bonus & Gratuity Act, Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, The Building

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and Other Construction Workers' Welfare Cess Act, 1996 and other Acts, Rules, and Regulations for labour/workers as applicable and as may be enacted by the State Government and Central Govt. during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also comply with provisions of and give all such notices to the local Governing Body, Police and other relevant Authorities as may be required by the Law.

Clause no. 2.8.4: The Contractor shall obtain independent License under the Contract Labour (Regulations and Abolition) Act, 1970 for engaging contract labour as required from the concerned Authorities based on the certificate (Form- V) issued by the Principal Employer/Customer.

Clause no. 2.8.5: The contractor shall pay and bear all taxes, fees, license charges, Cess, duties, deposits, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

9. Clause 2.12 of GCC (Overrun Compensation)

2.12 OVERRUN COMPENSATION (ORC)

2.12.1 ORC during original contract period: No ORC shall be applicable during the original contract period.

2.12.2 ORC during extended period for the reasons solely attributable to contractor: No ORC shall be applicable during the extended period granted for the reasons solely attributable to contractor and work executed during this period shall be paid as per original contract rates.

2.12.3 ORC during extended period for the reasons not attributable to contractor: ORC shall be payable as per following procedure:

2.12.3.1 For initial period of twelve months of extended period, ORC rate applicable over executed value shall be 5%. For every subsequent period of twelve months, ORC rate shall be further increased by 5% over the previous rate. For example, ORC rates applicable for initial period of 12 months and subsequent period of 12 months are given below.

Sl. No.	Extended Period for the reasons attributable to BHEL	ORC rate applicable over executed value
1	First 12 months	5%
2	13th-24th month and so on	10.25% $\{[(1.05 \times 1.05) - 1] \times 100\}$

This process of increasing ORC rate for each subsequent period of 12 months shall continue till applicability of ORC.

2.12.3.2 On completion of original contract period as well as on completion of each subsequent period of twelve months i.e. at the time of change in applicable ORC rate, Delay Analysis shall be carried out and percentage shortfall attributable to both BHEL & Contractor shall be calculated.

2.12.3.3 For the purpose of calculation of ORC, executed value of work in the month shall be divided in Part-1 and Part-2 in proportion of percentage shortfall attributable to BHEL and contractor respectively, based on the last delay analysis as worked out in 2.12.3.2.

ORC shall be payable only on Part-1 and no ORC shall be payable on Part-2.

Value of Part-1 shall be further limited to the value of actual inputs provided by BHEL i.e. "Plan - Shortfall attributable to BHEL" for the month, as per Form-14 for calculation of ORC.

2.12.3.4 Payment of ORC amount shall be further regulated as follows:

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- (i) 50% of the ORC is allocated for deployment of matching resources (with weightages) agreed as per the joint programme drawn vide 2.11.4. ORC Payment against resources shall be calculated in proportion to percentage of resources actually deployed w.r.t. planned resources, as per Form-14.
- (ii) 50% of ORC is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. ORC Payment shall be reduced in proportion to percentage shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month, as per Form-14.

2.12.3.5 The maximum amount of ORC payable for the month shall be limited to Rs. 5,00,000/-.

2.12.3.6 In case, there is no shortfall attributable to contractor for the month and also contractor has deployed the resources as agreed in Form-14 but ORC amount payable for the month worked out as per procedure mentioned in clause 2.12.3.3, 2.12.3.4 and 2.12.3.5, is less than Rs.1,00,000/-, then ORC amount payable for the month shall be Rs.1,00,000/- otherwise ORC amount payable for the month shall remain same.

2.12.3.7 In case execution is on HOLD (Other than Force Majeure), ORC shall be payable as per following:

- i). Contractor has not been permitted by BHEL to de-mobilize
 - a) ORC amount of Rs. 1,00,000/- per month shall be applicable during the period of HOLD provided resources as planned are deployed (not demobilised) during the period of hold.
 - b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.
- ii). Contractor has been permitted to demobilize and to remobilize after lifting of HOLD
 - a) No ORC shall be payable to contractor for the period of HOLD.
 - b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.3.8 In case Force Majeure is invoked:

- (i) No ORC shall be applicable during the period of Force Majeure.
- (ii) Subsequent to revocation of Force Majeure, period of Force Majeure shall be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.4 Applicability of ORC: ORC shall not be applicable for following activities.

- (i) Area cleaning, removal of temporary structures and return of scrap.
- (ii) Punch list points / pending points liquidation pending due to reasons attributable to contractor
- (iii) Submission of "As built Drawing"
- (iv) Material Reconciliation
- (v) Completion of Contract Closure formalities like HR Clearance/ No dues from various dept./ Statutory Authorities etc.

2.12.5 Total Over Run Compensation shall be limited to 10% of the cumulatively executed contract value till the month (excluding Taxes and Duties if payable extra). For this purpose, executed contract value excludes PVC, ORC and Extra/Supplementary Works.

10. Clause 2.14 of GCC (Quantity Variation)

a) Existing Clause 2.14.1 of GCC stands revised as follows:

"The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). The quoted rates for individual items shall remain firm irrespective of any variations in the individual quantities No compensation becomes payable in case the variation of the final executed contract value is within the limit of Minus (-) 15% of awarded contract value"

b) Existing Clause 2.14.2 ii). of GCC stands revised as follows:

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"In case the finally executed contract value increases above the awarded Contract Value due to quantity variation, there will be no upward revision in the rates for the individual items and also contractor is not eligible for any compensation."

11. Clause 2.17 of GCC (Price Variation Compensation) stands revised as follows:

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable (only for works executed during extended period, if any, subject to other conditions as described in this section)

2.17.2 85% component of Contract Value shall be considered for PVC calculations and remaining 15% shall be treated as fixed component. The basis for calculation of price variation in each category, their component, Base Index shall be as under:

SL NO	CATEGORY	BASE INDEX	PERCENTAGE COMPONENT ('K')				
			CIVIL PACKAGES (See Note AB/C)			MECHANICAL PACKAGES	Electrical, C&I Material Management/Handling and other labour oriented packages
			A	B	C		
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	40	25	30	65	80
ii)	HIGH SPEED DIESEL OIL	Name of Commodity: HSD Commodity Code: 1202000005 (See Note E)	5	3	5	5	5
iii)	WELDING ROD	Name of Commodity: MANUFACTURE OF BASIC METALS Commodity Code: 1314000000 (See Note E)				15	
iv)	CEMENT	Name of Commodity: ORDINARY PORTLAND CEMENT Commodity Code: 1313050003 (See Note E)		20	30		
v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity: MILD STEEL: LONG PRODUCTS Commodity Code: 1314040000 (See Note E)		25			
vi)	ALL OTHER MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Commodity Code: 1000000000 (See Note E)	40	12	20		

Note: A) Cement & Steel: Free Issue (BHEL Scope)
 B) Cement & Steel : In Contractor Scope
 C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)
 D) For Composite packages (i.e. Civil+Mechanical+Electrical and/or CI or Civil+Mechanical or Mechanical+Electrical and/or CI), the COMPONENT ('K') for various categories shall be as per respective packages as above.

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E) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website: <http://eaindustry.nic.in/home.asp>). Revisions in the index or commodity will be re adjusted accordingly.

2.17.3 #

2.17.4 Payment/recovery due to variation in index shall be determined on the basis of the following notional formula in respect of the identified COMPONENT ('K') viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS.

$$P = K \times R \times \frac{(X_N - X_0)}{X_0}$$

Where

P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

K = Percentage COMPONENT ('K') applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

R=Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

X_N = Revised Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

X₀ = Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date

2.17.5 Base date shall be the calendar month of the schedule completion date (i.e. Actual start date+ Scheduled Contractual completion period as per Letter of Intent/award and/or work order).

2.17.6 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works.

However, PVC will be payable for items executed under quantity variation of BOQ items under originally awarded contract.

2.17.7 The contractor shall furnish necessary monthly bulletins in support of the requisite indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/recovered on getting the final values.

2.17.9 PVC shall be applicable only, during the extended period of contract (if any) after the scheduled completion period and for the portion of work delayed / backlog for the reasons not attributable to the Contractor.

However total quantum of Price Variation amount payable/recoverable shall be regulated as follows:

- i. For the portion of shortfall / backlog not attributable to contractor, PVC shall be worked out on the basis of indices applicable for the respective month in which work is done. Base index shall be applicable as defined in clause 2.17.5
- ii. In case of Force majeure, PVC shall be regulated as per (a) or (b) below:
 - a) Force majeure is invoked before "base date"/ "revised base date" (as explained below) OR immediately after "base date"/ "revised base date" in continuation (i.e. during the period when PVC is not applicable):
 1. Base date shall be revised: Revised base date =Previous base date+ duration of Force majeure.
No PVC will be applicable for the work done till revised base date.
 2. PVC will be applicable for the work done after "base date"/ "revised base date" as the case may be (during extended period when delay is not attributable to contractor). PVC shall be worked out on the basis of

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indices applicable for the respective month in which work is done with base index as on "base date"/"revised base date" as the case may be.

b) Force majeure is invoked after "base date"/ "revised base date" as the case may be (during extended period when delay is not attributable to contractor) -

1. PVC shall be applicable for the work done after revocation of force majeure.

2. PVC for the work done after revocation of force majeure shall be worked out on the basis of indices applicable for the respective month in which work is done excluding the effect of change in indices during total period of Force majeure(s) invoked after "base date"/ "revised base date" as the case may be. Base index shall be taken as on "base date"/ "revised base date" as the case may be.

iii. The total amount of PVC shall not exceed 15% of the cumulatively executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items and Extra works except extra items due to quantity variation.

12. Clause 2.2 of GCC (Law governing the contract and court jurisdiction) stands revised as follows:

"The contract shall be governed by the Law for the time being in force in the Republic of India. Subject to Clause 2.21.1 or 2.21.2 of this Contract, the Civil Court having original Civil Jurisdiction at Delhi for PSNR, at Kolkata for PSER, at Nagpur for PSWR and at Chennai for PSSR, shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract."

13. Existing Clause 2.21 "ARBITRATION" of GCC has been amended as follows:

2.21 ARBITRATION & CONCILIATION

2.21.1 ARBITRATION:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.

The Arbitrator shall pass a reasoned award.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder as in force from time to time shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Kolkata (the place from where the contract is Issued). The Contract shall be governed by and be construed as per provisions of the laws of India. Subject to this provision 2.21.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.

2.21.1.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

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In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.

2.21.1.3 The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.

2.21.1.4 Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.

2.21.2 CONCILIATION:

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Procedure 2.3 to this GCC. The Procedure 2.3 together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC.

The Contractor hereby agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Procedure 2.3 to this GCC from time to time and confirms that it shall be bound by such amended or modified provisions of the Procedure 2.3 with effect from the date as intimated by BHEL to it.

2.21.3 No Interest payable to Contractor

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

14. Clause no. 2.7.2 and 2.7.3 of Volume-IB-GCC shall be revised as follows:

- 2.7.2.1 To terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases:

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- i). Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
- ii). Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
- iii). Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.
- iv). Termination of Contract on account of any other reason (s) attributable to Contractor.
- v). Assignment, transfer, subletting of Contract without BHEL's written permission.
- vi). Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows: Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,

A= Value of Balance scope of Work (*) as per rates of new contract

B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

* Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount. Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: Incase portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 2.7.9 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of "LD against delay in executed work in case of termination of contract" is given below.

- i). Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
- ii) Let the value of executed work till the time of termination of contract= X

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- iii) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
- iv) Delay in executed work attributable to contractor i.e. $T2 = [1 - (X/Y)] \times T1$
- v) LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.7.2.2 In case Contractor fails to deploy the resources as per requirement, BHEL can deploy own/hired/otherwise arranged resources at the risk and cost of the contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.7.3 Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor

Following sequence shall be applicable for recoveries from contractor:

- a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.
- b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
- c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
 - i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.
 - ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
 - iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

15. Clause 2.24 of GCC (Performance Guarantee for Workmanship)

Term "Special Conditions of Contract" appearing in 3rd line of the current clause 2.24.1, is replaced by "Technical Conditions of Contract"

16. Clause 4.2.1.7 of Special Condition of Contract (SCC)

At the end of Clause 4.2.1.7 (i.e. after the line "Decision of BHEL shall be final and binding on the contractor") following para is to be added

"It is not obligatory on the part of BHEL to provide any tools and tackles or other materials other than those specifically agreed to do so by BHEL. However, depending upon the availability, BHEL /BHEL's Customer handling equipment and other plants may be made available to the contractor on payment of hire charges as fixed, subject to the conditions laid down by BHEL/Customer from time to time. Unless paid in advance, such hire charges, if applicable, shall be recovered from contractor's bill / security deposit or any other due payment in one installment."

17. Clause 9.61 of SCC (NON-COMPLIANCE)

Under NON-COMPLIANCE, at the end of Clause 9.61 (i.e. after the line "Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.") following para is to be added:

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"In case of any financial deduction made by Customer for lapses of safety other than what is provided above or 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"

18. Clause 9.1 & 9.2 to 9.62 of SCC (HSE & OHSAS Obligations)

Cl. no. 9.0	No change
Cl. no. 9.1	HSE (Health, safety & Environment): Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL as per "HSE Plan for Site Operations by Sub-contractors" (Document no. HSEP:14, Rev.00) attached with this tender.
Cl. no. 9.2 to 9.62	Deleted

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Annexure -BTerms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply/service as per tender specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno- commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained for participation in the reverse auction.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form (annexure III) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" which is inclusive of all cost elements in line with terms & conditions of the tender for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure IV) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) will not be allowed to participate in further RA process provided minimum three bidders are left after removal of H1 bidder. In case of tie for H1 bid (identical online sealed bids), 15 minutes' additional time shall be provided and all the participating bidders shall be informed by mail/message on bidding screen to enable bidders submit revised online sealed bids so as to break the tie.

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Annexure -C**Certificate by Chartered Accountant on letter head**

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

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

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
Rs.....Lacs

(Strike off whichever is not applicable)

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

Or

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

Date:

(Signature)

Name-

Membership number-

Seal of Chartered Accountant

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Annexure –D**Specific Clause w.r.t. BOCW Act & Cess Act**

1. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the Building and other Construction Workers' Welfare Cess Act, 1996 and the rules made thereunder.
2. It shall be sole responsibility of the contractor engaging Building Workers in connection with the building or other construction works in the capacity of employer to apply and obtain registration certificate specifying the scope of work under the relevant provisions of the Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 from the appropriate Authorities.
3. It shall be responsibility of the contractor to furnish a copy of such Registration Certificate within a period of one month from the date of commencement of Work.
4. It is responsibility of the contractor to register under the Building and other Construction Workers' Welfare Cess Act, 1996 and deposit the required Cess for the purposes of the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 at such rate as the Central Government may, by notification in the Official Gazette, from time to time specify. However, before registering and deposit of Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, the contractor will seek written prior approval from the Construction Manager.
5. In case where the contractor has been accorded written approval by the Construction Manager and the contractor is required to furnish information in Form I and deposit the Cess under the Building and other Construction Workers' Welfare Cess Act, 1996, fails to do so, BHEL reserves right to impose penalty at the rate of 30% of Cess Amount.
6. 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.
7. 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.
8. 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.
9. It shall 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
10. 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.
11. 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

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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.

12. If 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 withhold a reasonable amount from the payables to discharge any obligations on behalf of Contractors. The reasonable amount shall be decided by the Construction Manager in consultation with Resident Accounts Officer & Head HR and shall be final.
13. 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.

ANNEXURE-E**Statewise GST Registration nos.**

Sl. No.	State / UT	GST Reg. No.
1	Andhra Pradesh	37AAACB4146P7Z8
2	Assam	18AAACB4146P1ZE
3	Bihar	10AAACB4146P1ZU
4	Chandigarh	04AAACB4146P1ZN
5	Chattishgarh	22AAACB4146P1ZP
6	Daman & Diu	25AAACB4146P1ZJ
7	Delhi	07AAACB4146P1ZH
8	Gujarat	24AAACB4146P1ZL
9	Haryana	06AAACB4146P1ZJ
10	HP	02AAACB4146P1ZR
11	Jharkhand	20AAACB4146P5ZP
12	Karnataka	29AAACB4146P1ZB
13	Kerala	32AAACB4146P1ZO
14	Maharashtra	27AAACB4146P1ZF
15	MP	23AAACB4146P1ZN
16	Punjab	03AAACB4146P2ZO
17	Rajasthan	08AAACB4146P1ZF
18	Tamil Nadu	33AAACB4146P2ZL
19	Telangana	36AAACB4146P1ZG
20	Tripura	16AAACB4146P1ZI
21	UP	09AAACB4146P2ZC
22	Uttarakhand	05AAACB4146P1ZL
23	West Bangal	19AAACB4146P1ZC
24	Mizoram	15AAACB4146P1ZK
25	Orissa	21AAACB4146P1ZR
26	Arunachal Pradesh	12AAACB4146P1ZQ

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Annexure- CPP-GST/II**Please arrange to submit this filled-up format along with Tender**

Name of the Company	
Address of Company*	
Company Registration Number*	
Name of Partners / Directors	
ALL THE STATES WHERE BIDDER HAS A PLACE OF BUSINESS*	
ALL ADDRESS OF VENDOR MENTIONING THEIR PIN AS PER THE LATEST GST REGISTRATION*	
GSTN OF ALL THE ABOVE NOTED PLACES OF VENDOR*	
Bidder Type: Indian/ Foreign*	
City*	
State*	
Country*	
Postal Code*	
PAN/TAN Number*	
Company's Establishment Year	
Company's Nature of Business*	
Company's Legal Status* {limited /undertaking/joint venture/partnership/other}	
Company Category* {micro unit as per MSME/small unit as per MSME/medium unit as per MSME/ UAN as per Udyog Aadhaar Memorandum/ Ancillary unit/project affected person of this company/ssi/ other}	
Relevant documents to be submitted as applicable.	
Enter Company's Contact Person Details	
Title(Mr. / Mrs. / Ms. / Dr. / Shri)*	
Contact Name*	
Date Of Birth*	
Correspondence Email*	
(Correspondence Email ID can be same as your Login ID. All the mail correspondence will be sent only to the Correspondence Email ID.)	
Designation	
Phone*	
Fax*	
Mobile*	

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BHEL-IP

AA:SSP:IP:R02 dtd 10.07.2018

INTEGRITY PACT**Between**

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

and

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

Preamble

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

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

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

Section 1- Commitments of the Principal

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

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

BHEL-IP

AA:SSP:IP:R02 dtd 10.07.2018

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

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

Section 3 - Disqualification from tender process and exclusion from future contracts

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

Section 4 - Compensation for Damages

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

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

Section 5 - Previous Transgression

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

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

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

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

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

Section 8 - Independent External Monitor(s)

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

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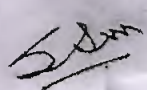
- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants 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 organisation.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

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

Section 10 - Other Provisions

- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.



- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- 10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- 10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

Place-----

Date-----

Witness:_____

(Name & Address) _____

For & On behalf of the Bidder/
Contractor

(Office Seal)

Witness:_____

(Name & Address) _____

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GENERAL CONDITIONS OF CONTRACT
(SERVICE)

FOR

Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)

POWER SECTOR – EASTERN REGION

PLOT NO. – 9 / 1, DJ – BLOCK,

SECTOR – II, KARUNAMOYEE,

SALT LAKE CITY,

KOLKATA – 700091.

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CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

- i) The General Conditions of Contract form part of the Tender specifications. All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages
- ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.
- iii) Integrity pact (IP) shall be applicable for all tenders / contracts if indicated in NIT. This integrity pact shall be issued as part of the Tender documents and shall be returned by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. Only those vendors / bidders who have entered into such an IP with BHEL shall be considered qualified to participate in the bidding. Entering into this pact shall be a preliminary qualification.

1.2. SUBMISSION OF TENDERS

- 1.2.1 The tenderers must submit their tenders to Officer inviting tender as per instructions in the NIT
- 1.2.2 Tenders submitted by post shall be sent by 'REGISTERED POST ACKNOWLEDGEMENT DUE / by COURIER' and shall be posted with due allowance for any postal/courier delays. BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances. Offers received by Fax/Email/Internet shall be considered as per terms of NIT.

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1.2.3 Tenders shall be opened by authorised Officer of BHEL at his office at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorised representatives who may be present

1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids. BHEL's decision in this regard shall be final and binding.

1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour, means of transport and access to Site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. LANGUAGE

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 PRICE DISCREPANCY:

1.4.1 **Conventional (Manual) Price Bid opening :** In the case of price bid opening without resorting to Reverse Auction, if there are differences between the rates given by the tenderer in words and figures or in amount worked out by him, the following procedure for evaluation and award shall be followed:

- i) When there is a difference between the rates in figures and in words, the rates which corresponds to the amounts worked out by the contractor, shall be taken as correct
- ii) When the amount of an item is not worked out by the contractor or it does not correspond with the rate written either in figure or in words, then the rate quoted by the contractor in words shall be taken as correct
- iii) When the rate quoted by the contractor in figures and words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.
- iv) In case of lumpsum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.
- v) In case of omission in quoting any rate for one or more items, the evaluation shall be done considering the highest quoted rate obtained against the respective items by other tenderers for the subject tender. If the tenderer becomes L-1, the notional rates for the omission items shall be the lowest rates quoted for the respective items by the other tenderers against the respective omission items for the subject job and the 'Total quoted price (loaded for omissions)' shall be arrived at. However the overall price remaining the same as quoted originally, the rates for all the items in the 'Total quoted price (loaded for omissions)' shall be reduced item wise in proportion to the ratio of 'Original' total price and the 'Total quoted price (loaded for omissions)'.
- vi) The 'Final Total Amount' shall be arrived at after considering the amounts worked out in line with 'i' to 'iv' above.

1.4.2 **Reverse Auction:** In case of Reverse Auction, the successful bidder shall undertake to execute

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the work as per overall price offered by him during the Reverse Auction process. In case of omission of rates, the procedure shall be as per 'Guidelines for Reverse Auction' enclosed.

1.5. QUALIFICATION OF TENDERERS

- i) Only tenderers who have previous experience in the work of the nature and description detailed in the Notice Inviting Tender and/or tender specification are expected to quote for this work duly detailing their experience along with offer.
- ii) Offers from tenderers who do not have proven and established experience in the field shall not be considered
- iii) .Offers from tenderers who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered.
- iv) Offers from tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India shall not be considered.

1.6. EVALUATION OF BIDS

- i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer
- ii) In case the same qualifying experience is claimed by more than one agency, then the agency who has executed the work as per documentary evidence submitted shall only be qualified. Scope of qualifying work should be totally with the agency who has executed and in case it is only labour+consumables without T&P, then the responsibility of execution is assigned to the first agency and not to the agency who has executed only as labour supply contractor. Further, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job
- iii) In case the qualifying experience is claimed by private organizations based on Work Order and completion certificates from another private organization, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job
- iv) Assessing Bidder Capacity for executing the current tender shall be as per Notice Inviting Tender
- v) Price Bids of shortlisted bidders shall only be opened either through the conventional price bid opening or through electronic Reverse Auction, at the discretion of BHEL
- vi) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unqualified acceptance from the successful bidder
- vii) Bidders are advised to also refer to clause no 2.9.4 regarding evaluation of their performance in ongoing projects for the current tender

1.7. DATA TO BE ENCLOSED

Full information shall be given by the tenderer in respect of the following. Non-submission of this information may lead to rejection of the offer.

- i) **INCOME TAX PERMANENT ACCOUNT NUMBER**
Certified copies of Permanent Account Numbers as allotted by Income Tax Department for the Company/Firm/Individual Partners, etc. shall be furnished along with tender.
- ii) **ORGANIZATION CHART**
The organization chart of the tenderer's organization, including the names, addresses and contact

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information of the Directors/Partners shall be furnished along with the offer.

- iii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor
- iv) IN CASE OF INDIVIDUAL TENDERER:
His / her full name, address and place & nature of business.
- v) IN CASE OF PARTNERSHIP FIRM
The names of all the partners and their addresses, A copy of the partnership deed/instrument of partnership duly certified by the Notary Public shall be enclosed.
- vi) IN CASE OF COMPANIES:
 - a. Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished).
 - b. Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.8 AUTHORISATION AND ATTESTATION

Tenders shall be signed by a person duly authorized/empowered to do so. An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor shall be submitted along with the tenders

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

- i) EMD shall be furnished along with the offer in full as per the amount indicated in the Special Conditions of Contract / NIT
- ii) EMD is to be paid in cash (as permissible under Income Tax Act), Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' and payable at Regional HQ issuing the tender.
- iii) No other form of EMD remittance shall be acceptable to BHEL
- iv) Bidder may opt to deposit "One Time EMD" of Rs. 2.0 lakhs (Rupees Two lakhs only) with BHEL:Power Sector Region HQ issuing the tender, which will enable them to participate in all the future tender enquiries in respect of Erection and Commissioning services issued from the respective office. Interested bidders may clearly send their consent for converting the present EMD into a "One Time EMD" in their offer.
 - Note : The 'One Time EMD' cannot be withdrawn by the tenderers within 3 years from the date of deposit, under any circumstances. The Tenderer who wishes to withdraw after three years will not be allowed to submit 'One Time EMD' again.
- v) Bidders who have already deposited such "One Time EMD" of Rs. 2.00 lakh are exempted from submission of EMD for this tender. However a copy of 'One Time EMD' certificate issued by BHEL Regional HQ issuing the tender shall be enclosed along with the offer.

1.9.2 EMD by the bidder will be forfeited as per Tender Documents if

- i) After opening the tender, the bidder revokes his tender within the validity period or increases his

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earlier quoted rates.

- ii) The bidder does not commence the work within the period as per LOI/Contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

1.9.3 EMD shall not carry any interest.

1.9.4 In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after acceptance of award by successful tenderer.

1.10 SECURITY DEPOSIT

1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work, as per the rates given below:

SN	Contract Value	Security Deposit Amount
1	Up to Rs. 10 lakhs	10% of Contract Value
2	Above Rs. 10 lakhs upto Rs.50 lakhs	1 lakh + 7.5% of the Contract Value exceeding Rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the Contract Value exceeding Rs. 50 lakhs.

1.10.2 The security Deposit should be furnished before start of the work by the contractor.

1.10.3 Security Deposit may be furnished in any one of the following forms

- i) Cash (as permissible under the Income Tax Act)
- ii) Pay Order / Demand Draft in favour of BHEL.
- iii) Local cheques of scheduled banks, subject to realization.
- iv) Securities available from Post Offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).
- v) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats
- vi) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.
- vii) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the Security Deposit should be deposited in any form as prescribed before start of the work and the balance 50% may be recovered from the running bills.
- viii) EMD of the successful bidder can be converted and adjusted against the cash portion of Security Deposit excepting for such bidders who have remitted One Time EMD.

NOTE: Acceptance of Security Deposit against Sl. No. (iv) and (vi) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

1.10.4 The Security Deposit shall not carry any interest.

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1.10.5 In case the value of work exceeds / reduces from the awarded / accepted value, the Security Deposit shall be correspondingly enhanced / reduced as given below:

- i) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.
- ii) There will be no reduction in Security Deposit value in case of variation in contract value upto the lower limit specified in Quantity variation clause. In case of reduction of contract value beyond the lower limit specified in Quantity Variation clause, then the Security Deposit shall be re adjusted in proportion.
- iii) In case of reduction, the reduced Contract value shall be certified by BHEL Construction Manager after ascertaining / freezing of BOQ / Drawings from the Design / Engineering Centre. The reduced Security Deposit value can only be considered after taking into account the adequacy of the securities held by BHEL to meet the liabilities of the contractor for the contract, and the performance of the contract in general. In such cases, the revised value of Security Deposit shall be worked out only after execution of not less than the lower limit of the revised scope of work/contract value as per quantity variation clause, and as certified by Construction Manager. This reduction in value of Security Deposit shall not entitle the contractor to any amendment of Contract and shall be operated at the discretion of BHEL
- iv) Contract value for the purpose of operating the reduced/increased value of Security Deposit due to Quantity Variation, shall be exclusive of Price Variation Clause, Over Run Compensation and Extra works done on manday rates.

1.10.6 The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent/Award + 3 months, and the same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL

1.10.7 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

1.11 RETURN OF SECURITY DEPOSIT

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL.

1.12 BANK GUARANTEES

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

- i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act.
- ii) The Bank Guarantees shall be as per prescribed formats.
- iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period (subject to a minimum period of six months), as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be liable for issue of any reminders regarding expiry of the

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Bank Guarantees.

- iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by the Construction Manager and submitted to the Regional HQ issuing the LOI/LOA.
- v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.
- vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.
- vii) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Subcontracting Department of the respective Region.

1.13 VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of SIX MONTHS from latest due date of offer submission (including extension, if any) . In case BHEL (Bharat Heavy Electricals Ltd) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.14 EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by Bharat Heavy Electricals Limited. The Tenderer shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within a reasonable time after the acceptance of the Letter of Intent/Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by BHEL

1.15 REJECTION OF TENDER AND OTHER CONDITIONS

1.15.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever:-

- a. To reject any or all of the tenders.
- b. To split up the work amongst two or more tenderers as per NIT
- c. To award the work in part if specified in NIT
- d. In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.15.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender

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conditions, specifications etc., are liable to be rejected.

- 1.15.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold/banning /delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule in line with clause no. 9.0 of the 'NIT'. The decision of BHEL will be final in this regard.
- 1.15.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.
- 1.15.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognise such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.
- 1.15.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.
- 1.15.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.
- 1.15.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed of the fact as per specified format, along with the Offer. Failing to do so, BHEL may, at its sole discretion, reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.
- 1.15.9 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The tenderer is solely responsible to BHEL for the work awarded to him.
- 1.15.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders
- 1.15.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-I party, then the awarded price i.e contract value shall be worked out after considering the discount so offered.
- 1.15.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

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CHAPTER-2

2.1 **DEFINITION:** The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

i)	BHEL shall mean Bharat Heavy Electricals Limited (of the respective Power Sector Region inviting the Tender), a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Power Sector Regional Offices or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.
ii)	“EXECUTIVE DIRECTOR” or ‘GROUP GENERAL MANAGER’ or “GENERAL MANAGER (Incharge)” or “GENERAL MANAGER” shall mean the Officer in Administrative charge of the respective Power Sector Region.
iii)	“COMPETENT AUTHORITY” shall mean Executive Director or Group General Manager or General Manager (Incharge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (Incharge) or General Manager of BHEL.
iv)	“ENGINEER” or “ENGINEER IN CHARGE” shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as “Engineer” on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes ‘CONSTRUCTION MANAGER’ or ‘SITE INCHARGE’ as well as Officers at Site or at the Headquarters of the respective Power Sector Regions.
v)	“SITE” shall mean the places or place at which the plants/equipments are to be erected and services are to be performed as per the specification of this Tender.
vi)	“CLIENT OF BHEL” or “CUSTOMER” shall mean the project authorities with whom BHEL has entered into a contract for supply of equipments or provision of services.
vii)	“CONTRACTOR” shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor’s successors, heirs, executors, administrators and permitted assigns.
viii)	“CONTRACT” or “CONTRACT DOCUMENT” shall mean and include the Agreement of Work Order, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.
ix)	“GENERAL CONDITIONS OF CONTRACT” shall mean the ‘Instructions to Tenderers’ and ‘General Conditions of Contract’ pertaining to the work for which above tenders have been called for.

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x)	“TENDER SPECIFICATION” or “TENDER” or “TENDER DOCUMENTS” shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendums, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.
xi)	“LETTER OF INTENT” shall mean the intimation by a Letter/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.
xii)	“COMPLETION TIME” shall mean the period by ‘date/month’ specified in the ‘Letter of Intent/Award’ or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.
xiii)	“PLANT” shall mean and connote the entire assembly of the plant and equipments covered by the contract.
xiv)	“EQUIPMENT” shall mean equipment, machineries, materials, structural, electricals and other components of the plant covered by the contract.
xv)	“TESTS” shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.
xvi)	“APPROVED”, “DIRECTED” or “INSTRUCTED” shall mean approved, directed or instructed by BHEL.
xvii)	“WORK or CONTRACT WORK” shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipments to the entire satisfaction of BHEL.
xviii)	“SINGULAR AND PLURALS ETC” words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.
xix)	“HEADING” – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.
xx)	“MONTH” shall mean calendar month unless otherwise specified in the Tender.

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xxi)	Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty four (24) hours each. A week shall mean continuous period of seven (7) days.
xxii)	"COMMISSIONING" shall mean the synchronisation testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.
xxiii)	"WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.
xxiv)	"TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.
xxv)	'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained
xxvi)	"COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tenderl
xxvii)	"SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor
xxviii)	"TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract
xxix)	"DE MOBILISATION" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor
xxx)	"RE MOBILISATION" shall mean the resumption of work with all resources required for the work after demobilization.
2.2	LAW GOVERNING THE CONTRACT AND COURT JURISDICTION The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Delhi for PSNR, at Kolkata for PSER, at Nagpur for PSWR and at Chennai for PSSR, shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract
2.3	ISSUE OF NOTICE 2.3.1 <u>Service of notice on contractor</u> Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by Registered Post / Speed Post to or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

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2.3.2	<u>Service of notice on BHEL</u> Any notice to be given to BHEL in-charge/Region under the terms of the Contract shall be served by sending the same by post to or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor.
2.4	USE OF LAND No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.
2.5	COMMENCEMENT OF WORK
2.5.1	The contractor shall commence the work as per the time indicated in the Letter of Intent from BHEL and shall proceed with the same with due expedition without delay.
2.5.2	If the contractor fails to start the work within stipulated time as per LOI or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.
2.5.3	All the work shall be carried out under the direction and to the satisfaction of BHEL.
2.6	MEASUREMENT OF WORK AND MODE OF PAYMENT:
2.6.1	All payments due to the contractors shall be made by e mode only, unless otherwise found operationally difficult for reasons to be recorded in writing.
2.6.2	For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.
2.6.3	These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.
2.6.4	Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.
2.6.5	All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.
2.6.6	Measurement shall be restricted to that portion of work for which it is required to ascertain the

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	financial liability of BHEL under this contract.
2.6.7	The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.
2.6.8	The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.
2.6.9	If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.
2.6.10	Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.
2.6.11	Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.
2.7	RIGHTS OF BHEL BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.
2.7.1	To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL's obligation to its customer.
2.7.2	To terminate the contract or get any part of the work done through other agency or deploy BHEL's own/hired/otherwise arranged resources , at the risk and cost of the contractor after due notice <u>of a period of two weeks by BHEL,</u> in the event of:- i) Contractor's continued poor progress ii) Withdrawal from or abandonment of the work before completion of the work iii) Contractor's inability to progress the work for completion as stipulated in the contract iv) Poor quality of work v) Corrupt act of Contractor vi) Insolvency of the Contractor vii) Persistent disregard to the instructions of BHEL viii) Assignment, transfer, sub-letting of contract without BHEL's written permission ix) Non fulfillment of any contractual obligations x) In the opinion of BHEL, the contractor is overloaded and is not in a position to execute the

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job as per required schedule

- 2.7.3 To meet the expenses including BHEL overheads on the differential cost at 5%, over and above the Liquidated damages/penalties arising out of "Risk & Cost" as explained above under SI.No. 2.7.2. BHEL shall recover the amount from any money due from Contractor, or from any money due to the Contractor including Security Deposit, or by forfeiting any T&P or material of the contractor under this contract or any other contract of BHEL or by any other means or any combination thereof
- 2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.
- 2.7.5 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfill any of his obligations. BHEL shall levy overheads of 5% on all such payments along with interest as defined elsewhere in the GCC.
- 2.7.6 While every endeavour will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.
- 2.7.7 In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than two months, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. ORC in such cases shall not be applicable for the period between the period of demobilization and re mobilisation. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.
- 2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract in following cases:
- The balance works (including but not limited to Trial Operation, PG Test, etc) are minor vis a vis the scope of work envisaged as per the contract.
 - There has been no significant work in past 6 months OR no significant work is expected in next 6 months (example in Hydro projects or in projects where work has stopped due to reasons beyond the control of BHEL)
 - The balance works cannot be done within a reasonable period of time as they are dependent on unit shutdown or on other facilities of customer or any other reasons not attributable to the contractor

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of

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work (or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test, etc) as mutually agreed, shall however be reduced from the final contract value.

2.7.9 LIQUIDATED DAMAGES/PENALTY

If the contractor fails to maintain the required progress of work which results in delay in the completion of the work as per the contractual completion period, BHEL shall have the right to impose Liquidated Damage/Penalty at the rate of 0. 5% of the contract value, per week of delay or part thereof subject to a maximum of 10% of the contract value. For this purpose, the period of delay shall be the delay attributable to the Contractor for the completion of work as per contract. Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Manday rate basis, Supplementary/Additional Items and PVC.

2.8 RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

- 2.8.1 As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.
- 2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.
- 2.8.3 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act 1970, Payment of Bonus & Gratuity Act and other Acts, Rules and Regulations for labour as may be enacted by the Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also give to the local Governing Body, Police and other relevant Authorities all such notices as may be required by the Law.
- 2.8.4 The contractor shall obtain independent License under the Contract Labour (Regulations and Abolition Act, 1970)as required from the concerned Authorities based on the certificate (Form-V) issued by the Principal Employer/Customer
- 2.8.5 The contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

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- 2.8.6 While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.
- 2.8.7 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.
- 2.8.8 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.
- 2.8.9 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.
- 2.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.
- 2.8.11 All the properties/equipments/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.
- 2.8.12 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipments/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc, the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor
- 2.8.13 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract
- 2.8.14 Any delay in completion of works/or non achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.
- 2.8.15 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.
- 2.8.16 All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and

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construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract.

The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices.

Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer

- 2.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose, if so called for.
- 2.8.18 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.
- 2.8.19 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.
- 2.8.20 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.
- 2.8.21 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly
- 2.8.22 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.
- 2.8.23 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.
- 2.8.24 The Contractor to note that some of BHEL's T&Ps/MMDs may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is due to

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	carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/ replaced immediately and in case of his failure to do so within a reasonable time, BHEL will reserve the right to recover the loss from the contractor.
2.9	PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION
2.9.1	A detailed plan/programme for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work . The above programme shall be supported by monthwise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed programme. The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.
2.9.2	Monthly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc, and constraints if any, as per prescribed formats. Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.
2.9.3	The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL
2.9.4	Performance of the Contractor shall be assessed as per prescribed formats and shall form the basis for 'Annual/Overall Performance Evaluation' of the Contractor and also for 'Assessment of Capacity of Bidder' for Tenders where the Contractor is a bidder. BHEL reserves the right to revise the evaluation formats during the course of execution of the works
2.10	TIME OF COMPLETION
2.10.1	The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers
2.10.2	The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11
2.11	EXTENSION OF TIME FOR COMPLETION
2.11.1	If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.
2.11.2	Based on the monthly reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.
2.11.3	However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.
2.11.4	A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the

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	contractor as per specified format. Review of the programme and record of shortfall shall be done every month of the 'Time extension' period in the same manner as is done for the regular contract period.
2.11.5	During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program
2.11.6	At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.
2.12	OVERRUN COMPENSATION
2.12.1	Over Run Compensation (ORC) is payable for works done during the extension period, by way of rate revisions for periods beyond original contract period subject to the following terms and conditions.
2.12.2	Rates shall be increased by 10% for the first twelve months of one or more extensions beyond original contract period. For the next twelve months of further extensions if any, rates shall be increased as above by 10% over the previous twelve months, and similarly for each subsequent twelve months extension.
2.12.3	The amount of increase payable per month due to rate revisions is subject to a minimum of Rs 1,00,000/- per month and a maximum of Rs 10,00,000/- per month.
2.12.4	Should there be any 'Time extension' for reasons attributable only to the contractor, then the work shall be executed by the contractor at the rates applicable for the period the work was planned
2.12.5	Payment of ORC shall be regulated as follows: i) Contractor is entitled to Over Run Compensation (ORC) only for the portion of backlog attributable to BHEL. ii) 50% of the compensation as per clause 2.12.3 is allocated for deployment of resources agreed as per the joint programme drawn vide 2.11.4. Payment shall however be based on the actual deployment of resources for the month as certified by BHEL, as per weightages assigned therein iii) 50% of the compensation as per clause 2.12.3, is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. Payment shall be on pro rata basis for actual achieved quantities iv) Total Over Run Compensation shall be limited to 10% of the executed contract value as certified in Final Bill. For this purpose executed contract value excludes PVC, ORC, Supplementary/Additional Items and Extra Works done on Manday rate basis
2.12.6	Contractor shall not be entitled for any Over Run Compensation (ORC) for the portion of backlog attributable to the contractor. Such works shall be executed at the rates applicable for the period the work was planned

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2.13 INTEREST BEARING RECOVERABLE ADVANCES	
2.13.1	Normally no advance is payable to the contractor. However, advance payment in exceptional circumstances shall be interest bearing and secured through a Bank Guarantee and shall be limited to a maximum of 5% of contract value. This 'Interest Bearing Recoverable Advance' shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance.
2.13.2	In exceptional circumstances, with due justification, Competent Authority of BHEL is empowered to approve proposals for payment of additional interim interest bearing advance against Bank Guarantee, for resource augmentation towards expediting work for project implementation.
2.13.3	Bank Guarantee towards 'Interest Bearing Recoverable Advance' shall be atleast 110% of the advance so as to enable recovery of not only principle amount but also the interest portion, if so required.
2.13.4	Contractor shall establish the utilization of advance drawn before the release of next installment.
2.13.5	Payment and recovery of Interest Bearing Recoverable advance shall be at the sole discretion of BHEL and shall not be a subject matter of arbitration.
2.13.6	The rate of interest applicable for the above advances shall be the prime lending rate of State Bank of India prevailing at the time of disbursement of the advance + 2%, and such rate will remain fixed till the total advance amount is recovered
2.13.7	Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 80% of contract value.
2.13.8	Recovery rate per month shall be the sum of: a. Not less than 10% of Running Bill amount b. Simple interest up to the date of RA Bill on the outstanding Principle amount/amounts
2.13.9	Contractor to submit Bank Guarantee as per prescribed formats for each of the advance and shall be valid for at least one year or the recovery duration or the balance contract period which ever is later. In case the recovery of dues does not get completed within the aforesaid BG period, the contractor shall renew the BG or submit fresh BG for the outstanding amount and the remaining recovery period.
2.13.10	BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement
2.14 QUANTITY VARIATION	
2.14.1	The quoted rates shall remain firm irrespective of any variations in the individual quantities. No compensation becomes payable in case the variation of the final executed contract value is within the limits of Plus (+) or Minus (-) 15% of awarded contract value
2.14.2	Compensation due to variation of final executed value in excess of the limits defined in clause

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above, shall be as follows:

- i) In case the finally executed contract value reduces below the lower limit of Contract Value due to quantity variation specified above, the contractor will be eligible for compensation @ 15% of the difference between the lower limit of the contract value and the actual executed value.
- ii) In case the finally executed contract value increases above the upper limit of Contract Value due to quantity variation specified above, there will be no revision in the rates within the contract period.

2.15 EXTRA WORKS

2.15.1 All rectifications/modifications, revamping, and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching, or due to damages in transit, storage and erection/commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.15.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.15.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

2.15.4 BHEL retains the right to award or not to award any of the major repair/rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same

2.15.5 After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/ repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 60/- per man hour.

2.15.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

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2.15.7 Extra Works for Civil Packages shall be regulated as follows

- i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re erecting etc due to no fault of Contractor, shall be in the order of the following:
 - a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
 - b) As per CPWD-DSR-2007 (or latest edition) with applicable escalation derived from All India Consumer price Index for Whole Sale Commodities, OR, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed, whichever is less
 - c) Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.
- ii) PVC and ORC will not applicable be for (i) above.

2.16 SUPPLEMENTARY ITEMS

2.16.1 For NON Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

- i) Based on percentage breakup/rates indicated for similar/nearby items
- ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work

2.16.2 For Civil Works

- i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:
 - a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities
 - b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.15.7
- ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.14
- iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.
- iv) PVC and ORC will not be applicable for (i) above.

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable

2.17.2 85% component of Contract Value shall be permitted to be adjusted for variation in various relevant indices during execution of work. The remaining 15% shall be treated as fixed component

2.17.3 The basis for calculation of price variation in each category, their component, Base Index, shall be as under:

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SL NO.	CATEGORY	BASE INDEX	COMPONENT ('K')				
			CIVIL PACKAGES (See Note A/B/C)			MECHANICAL PACKAGES	LABOUR ORIENTED PACKAGES (See Note D)
			A	B**	C		
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	40	25	30	65	80
ii)	HIGH SPEED DIESEL OIL	Name of Commodity : HSD OIL. Type : INDIVIDUAL COMMODITY (See Note F)	5	3	5	5	5
iii)	WELDING ROD	Name of Commodity : WELDING ROD Type: INDIVIDUAL COMMODITY (See Note F)				15	
iv)	CEMENT	Name of Commodity : GREY CEMENT Type: INDIVIDUAL COMMODITY (See Note F)		20	30		
v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity : a1. IRON & SEMIS Type: GROUP ITEM (See Note F)		25			
vi)	MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Type: GROUP ITEM (See Note F)	40	12	20		

Note: A) Cement & Steel : Free Issue (BHEL Scope)

B) Cement & Steel : In Contractor Scope {**: unless otherwise specified in Special Conditions of Contract (SCC) }

C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)

D) Predominantly 'Labour Oriented' packages including Material Handling & Management, Insulation, Painting, Electrical and CI or a combination thereof, which are separately tendered and awarded

E) For Composite packages (i.e. Civil+Mechanical+Electrical/CI or Civil+Mechanical or Mechanical+Electrical/CI), the components for various categories shall be as per respective packages

F) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website : www.eaindustry.nic.in). Revisions in the index or commodity will be re adjusted accordingly.

2.17.4 Payment/recovery due to variation in index shall be determined on the basis of the following notional formula without any initial absorption, in respect of the identified components viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS

$$P = K \times R \times \frac{(X_N - X_0)}{X_0}$$

Where

P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

K = Percentage component applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

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XN = Revised Index No for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

Xo = Index no for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date.

2.17.5 Base date shall be calendar month of the latest date of submission of Tender.

2.17.6 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works.

2.17.7 The contractor shall furnish necessary monthly bulletins for the necessary indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/recovered on getting the final values.

2.17.9 PVC shall be applicable for the entire original contract period plus the extended period. However the Total Quantum of Price Variation amount payable/recoverable shall be regulated as follows:

- i) For the portion of backlog attributable to the contractor, the PVC will be based on the average of the indices for the period of the original contract period.
- ii) For the period of Force Majeure, the PVC will be limited to the indices applicable at the beginning of the force majeure period.
- iii) For the portion of backlog attributable to BHEL, the PVC will be as per the indices applicable for the respective months
- iv) The total amount of PVC shall not exceed 20% of the cumulatively executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items and Extra works.

2.18 INSURANCE

2.18.1 BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

2.18.2 It is the sole responsibility of the contractor to insure his materials, equipments, workmen, etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

2.18.3 If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

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2.18.4 The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody, matter shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However this will not relieve the contractor of his contractual obligation for the material in his custody.

2.19 STRIKES & LOCKOUT

2.19.1 The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL shall be deducted from the Contractor's bills.

2.19.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

2.20 FORCE MAJEURE

The following shall amount to Force Majeure:-

2.20.1 Acts of God, act of any Government, War, Sabotage, Riots, Civil commotion, Police action, Revolution, Flood, Fire, Cyclones, Earth quake and Epidemic and other similar causes over which the contractor has no control.

2.20.2 If the contractor suffers delay in the due execution of the contractual obligation due to delays caused by force majeure as defined above, the agreed time of completion of the job covered by this contract or the obligations of the contractor shall be extended by a period of time equal to period of delay, provided that on the occurrence of any such contingency, the contractor immediately reports to BHEL in writing the causes of delay and the contractor shall not be eligible for any compensation.

2.21 ARBITRATION & RECONCILIATION

2.21.1 In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL/In charge(Region).

The award of the Arbitrator shall be binding upon the parties to the dispute

Subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory

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modifications or re enactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine

2.21.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable :

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

2.21.3 The cost of arbitration shall be borne equally by the parties.

2.21.4 Work under the contract shall be continued during the arbitration proceedings

2.22 RETENTION AMOUNT

2.22.1 Retention Amount shall be 5% of executed contract value and shall be recovered at the rate of 5% from each Running Bill admitted, including PVC Bills.

2.22.2 Refund of Retention Amount shall be as follows:

- i) 50% of retention amount along with 'Final Bill'
- ii) Balance 50% of retention amount shall be retained towards 'Performance Guarantee for Workmanship' and shall become refundable after expiry of Guarantee period, provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/BHEL Construction Manager, and after deducting all expenses/other amounts due to BHEL under the contract/other contracts entered into by BHEL with them. This portion of the retention amount can be released on commencement of the Guarantee period, on submission of equivalent Bank Guarantee.

2.23 PAYMENTS

Payments to Contractors are made in any one of the following forms

2.23.1 Running Account Bills (RA Bills)

- i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).
- ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents
- iii) Recoveries on account of electricity, water, statutory deductions, etc are made as per terms of contract

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iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor. v) In order to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work	2.23.2 Final Bill Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following. i) 'No Claim Certificate' by contractor ii) Clearance certificates where ever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, etc iii) Indemnity bond as per prescribed format BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL
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 twelve months from the date of commencement of guarantee period as defined in Special Conditions of Contract, 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 BHEL shall release the guarantee money subject to the following i) Contractor has submitted 'Final Bill' ii) Guarantee period as per contract has expired iii) Contractor has furnished 'No Claim Certificate' in specified format iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate' in specified format v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.
2.25 CLOSING OF CONTRACTS The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on	

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	specific request of Contractor.
2.26	REVERSE AUCTION: BHEL reserves the right to go for Reverse Auction for Price Bid Opening by BHEL appointed service provider, instead of opening the submitted sealed price bid in the conventional way. The Business Rules for Reverse Auction shall be as per BHEL guidelines issued from time to time.
2.27	SUSPENSION OF BUSINESS DEALINGS BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.
2.28	OTHER ISSUES
2.28.1	Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.
2.28.2	In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.
2.28.3	Unless otherwise specified in NIT, offers from consortium/JVs shall not be considered.
2.28.4	BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts like providing services for Hot water flushing, Chemical Cleaning, Transportation, etc

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SPECIAL CONDITIONS OF CONTRACT

FOR

Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)

POWER SECTOR – EASTERN REGION

PLOT NO. – 9 / 1, DJ – BLOCK,

SECTOR – II, KARUNAMOYEE,

SALT LAKE CITY,

KOLKATA – 700091.

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SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter - I : General Intent of Specifications

1.0	INTENT OF THE SPECIFICATION
1.1	The intent of this erection specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
1.2	The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship and not conforming to drawings / documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
1.3	It is not the intent of this specification to specify herein all the details of erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
1.4	The omission of specific reference to any fabrication / erection or other method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication / erection shall have to be rectified by the vendor free of cost. Inspection by BHEL/Customer does not relieve vendor of his responsibility of executing quality erection.
1.5	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter - I : General Intent of Specifications

1.6	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.
1.7	Following shall be the minimum responsibility of contractor and have to be provided within finally accepted rates / prices:
1.7.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated MMEs (Monitoring and Measuring Equipment) as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling
1.7.2	Achieving Proper out-turn / Turn-over as per BHEL plan and commitment.
1.7.3	Completion of work as per BHEL Schedule
1.7.4	Good quality and accurate workmanship for proper performance of the equipment
1.7.5	Repair and rectification
1.7.6	Preservation / Re-conservation of all components during storage / erection / commissioning till handing over.

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Chapter - II : General Services to be rendered by the Bidder

2.0	GENERAL SERVICES TO BE RENDERED BY THE BIDDER
2.1	Services for construction, fabrication, equipment erection testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
2.2	Issuing materials from store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant/equipment is officially taken over by the owner / BHEL after complete erection any successful trial run & commissioning.
2.3	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
2.4	Trial run and commissioning of individual equipment / sub-systems to the satisfaction of Owner/BHEL.
2.5	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to be rendered under this specification.
2.6	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
2.7	Supply of all consumables, eg welding electrodes, cleaning agents, diesel oil, lubricant etc as well as materials required for temporary supports, scaffolding etc as necessary for such erection work, unless specified other wise.
2.8	Providing support services for the contractor's erection staff eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under the Contractor's custody etc. as required.
2.9	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, taking approval of all statutory authorities i.e Boiler Inspector, Factory Inspector, Inspector of Explosives etc , as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.
2.10	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.

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Chapter - III : General Technical Requirements (Codes and Standards)

3.0	GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)
3.1	Except where otherwise specified, the plant/equipment shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary, to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.
3.2	Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
3.3	In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements which are more stringent shall govern.
3.4	Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

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Chapter - IV : Obligations of Contractor

4.0	OBLIGATIONS OF CONTRACTOR
4.1	CONSUMABLES & OTHER ITEMS
4.1.1	The contractor shall provide within finally accepted price / rates, all consumables (excepting those indicated in BHEL scope) like welding electrodes (including alloy steel and stainless steel), filler wires, TIG filler wires (over & above as supplied by the unit along with the plant materials, which will be given free of cost to bidder), gases (inert, welding, cutting), soldering material, dye penetrants, radiography films, etc. 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, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as supports, scaffoldings are to be arranged by the contractor. Sealing compounds, gaskets, gland packing, wooden/concrete sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.
4.1.2	All the shims, gaskets and packing, which go finally as part of plant equipment, shall be supplied by BHEL free of cost.
4.1.3	It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
4.1.4	<u>TIG Filler wire for Boiler and Filler wires for Electrodes for P91/T91 piping:</u> These shall be supplied by BHEL free of cost as supplied by BHEL Manufacturing Units as part of regular supply. Required quantity as arrived at by calculation / standards will only be supplied. It would be the contractors' responsibility to account for the consumption of these filler wires. Additional consumption beyond standard / calculated quantity will be at cost recovery basis only unless and otherwise accounted for. Surplus quantity of TIG filler wire, if any, shall be properly stored and returned to BHEL stores.
4.1.5	It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No

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Chapter - IV : Obligations of Contractor

	electrode without a valid test certificate will to be used.
4.1.6	BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.
4.1.7	Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.
4.1.8	In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time. Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the Contractor.
4.1.9	All lubricants and chemicals required for pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client. All services including labour and T&P will be provided by the contractor for handling, filling, emptying, refilling etc. The consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked/tagged and returned to BHEL/ CUSTOMER stores at no extra cost to BHEL. BHEL reserves the right to recover costs for wastage by the contractor.
4.1.10	Transportation of oil drums, from stores, filling of oil for flushing, first filling, subsequent changeover if any, topping/making up till the unit is fully commissioned and handed over to customer is included in scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.
4.1.11	All charges on account of Octroi, terminal or sales tax and other duties on materials obtained from any source for carrying out the works in the scope of the contractor shall be borne by the contractor.
4.2	TOOLS AND PLANTS / MONITORING AND MEASURING EQUIPMENT (MMEs)
4.2.1	T&Ps and MMEs to be provided by Contractor
4.2.1.1	All T&Ps and MMEs excepting those specifically indicated in BHEL scope are to be provided by the Contractor. Contractor has to make his own arrangement at his cost for completing the formalities (including arrangement of Road permits, if any) if required with Sales Tax/VAT authorities, for bringing their materials, plants and

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Chapter - IV : Obligations of Contractor

	equipments at site for the execution of work under this contract.
4.2.1.2	All suitable cranes, lifting and transport equipments for material handling at stores/yard/siding of BHEL/Customer are included in scope. BHEL's cranes will not be available for this purpose unless otherwise specifically permitted as per contract conditions
4.2.1.3	All T&Ps to be deployed by the contractor shall have the approval of BHEL Engineer with regard to brand, quality and specification.
4.2.1.4	Indicative list of Major T&Ps in the scope of Contractor are given in the Technical Conditions of Contract. Bidders to note that these are only indicative and as such all other T&P necessary for timely and satisfactory completion of work in scope shall be mobilized by Contractor
4.2.1.5	Timely deployment of adequate T&Ps is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned programme and to achieve the milestones.
4.2.1.6	Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
4.2.1.7	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor
4.2.1.8	The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.
4.2.1.9	Use of welding generators/ rectifiers only shall be permitted for welding. Use of welding transformers will be subject to specific approval of BHEL engineer.
4.2.1.10	The contractor at his cost shall carry out periodical testing of his construction equipments. Test certificates shall be furnished to BHEL.
4.2.1.11	Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required.

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Chapter - IV : Obligations of Contractor

	Fitness certificate / Test Certificates of T&P shall have to be submitted before it is put in use. Identification for such T&Ps will be done as per BHEL Engineer's advice. BHEL reserves the right to permit only new slings up to 20 mm and lifting tackles up to 3 MT capacities.
4.2.1.12	Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
4.2.1.13	Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MME so that work does not suffer when the particular instrument is sent for calibration. If any MMEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy MMEs and retake the readings at contractor's cost.
4.2.1.14	BHEL shall have lien on all T&P, MMEs and other equipment of the contractor brought to the site for the purpose of erection, testing and commissioning. BHEL shall continue to hold the lien on all such items throughout the period of contract / extended period. The contractor and / or his sub-contractors, without the prior written approval of the Engineer, shall remove no material brought to the site.
4.2.1.15	The month wise T&P deployment plan to execute the work is to be submitted as per relevant format as per the instruction of BHEL. It shall be the contractor's responsibility to deploy the required T&P, for timely and successful completion of the job, to any extent.
4.2.2	Obligations in respect of T&Ps and MMEs provided by BHEL
4.2.2.1	T&P / MMEs being provided by BHEL to sub-contractor free of hire charges shall be shared by other subcontractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.
4.2.2.2	BHEL T&P will be issued in basic assembled condition. Additional loose components / sub-assemblies / attachments as and when necessary, will be

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	issued by BHEL. Assembly of such additional loose components/sub-assemblies/ attachments is in contractor's scope.
4.2.2.3	In case of non-availability of the T&Ps to be provided by BHEL due to breakdown, major overhauls, distribution pattern or any other reason, the contractor shall plan / amend / alter his activities to meet erection / commissioning targets in consultation with BHEL.
4.2.2.4	void
4.2.2.5	The contractor shall engage trained and experienced operators for the operation of BHEL's T&Ps. Their skill / performance will be checked by BHEL Engineer before they are allowed to operate the same. However checking of skills by BHEL does not absolve the contractor of his responsibilities for proper and safe handling of equipment, consistent good performance of operators and regular performance evaluation of operators.
4.2.2.6	The day to day operation and maintenance of BHEL's T&Ps (Other than cranes) shall be carried out by contractor as per manufacturer's / BHEL's maintenance schedule at his cost. The contractor shall arrange, at his own cost, trained operators, fuel and other consumables for their operation. BHEL shall arrange all spares needed for upkeep of major T&Ps provided like Huck Bolting Machine*, DG Set, Induction Machine and Hydraulic Test pumps. The contractor has to arrange for fixing of the spares; supervision in specialized cases will be provided by BHEL. For upkeep of all other T&Ps supplied by BHEL, spares shall be arranged by the Contractor. BHEL supplied T&Ps shall be maintained in good working condition during the entire period of use. T&Ps in defective / damaged condition shall be rectified promptly to the full satisfaction of BHEL engineer. Contractor shall maintain records for maintenance of major T&Ps. These shall be made available for Inspection whenever required. In case of any lapses on the part of the contractor, BHEL at its own discretion shall get the servicing / repair of equipment done at the risk and cost of the contractor along with BHEL overheads. Further, if there are breakdowns / damages due to negligence of the contractor, the complete service / repair charges and cost of all the spares damaged with BHEL overheads shall be recovered from contractor's RA bills. *: for operation and maintenance of ESP Huck bolting machine, BHEL shall provide the basic power rig and hose. Balance toolingsie Guns, chuck jaws etc are to be arranged by contractor.
4.2.2.7	void

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Chapter - IV : Obligations of Contractor

4.2.2.8	Increasing / shortening of the crane boom to suit work requirements shall have to be arranged by the indenting contractor at his cost including restoration to a state as directed by BHEL. All necessary manpower tools, support, consumables, illumination etc. will have to be arranged by contractor at his cost. If required, contractor has to return the crane with original boom.
4.2.2.9	The area and infrastructure development of the area to be carried out by the customer. However in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases backfilling of approaches where ever necessary, consolidation of ground and arrangement of sleepers / sand bag filling etc for safe operation / movement of equipment including cranes / trailers etc shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.
4.2.2.10	In the event of contractor not using and maintaining BHEL T&Ps according to BHEL's instructions. BHEL will have the right to withdraw such item without any notice and no claim in this regard shall be entertained and contractor shall be responsible for delay in execution on this account.
4.2.2.11	The contractor shall furnish regular utilization report of the BHEL T&Ps, as per requirement of BHEL.
4.2.2.12	Any loss / damage to any part of BHEL T&Ps and MMEs shall be to the contractor's account and any expenditure on these accounts by BHEL will be recovered from the contractor's bill in case the contractor fails to make good the loss.
4.2.2.13	It shall be responsibility of the contractor to take delivery of T&Ps and MMEs from stores or place of use by other contractor at project site, transport the same to site and return the same to BHEL store / place as intimated by Engineer in project site in good working conditions after use.
4.2.2.14	The contractor shall return BHEL T&Ps and MMEs issued to him in good working condition as and when desired by BHEL (on completion or reduction of workload). If contractor delays return of T&P and MME, hire charges as applicable shall be levied by BHEL from time, it was requisitioned till the time of actual return. T&Ps and MMEs returned in damaged / unserviceable condition shall be got repaired by BHEL at its own discretion and entire cost of repair with BHEL overheads shall be recovered from the contractor.
4.2.2.15	Replacement cost including BHEL overheads in respect of irreparable / completely damaged / non return of T&Ps and MMEs shall be recovered from the

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Chapter - IV : Obligations of Contractor

	contractor's running / final bills
4.2.2.16	Obligations in respect of Cranes provided by BHEL
a)	BHEL will make available the cranes (as per Technical Conditions of Contract) free of charge to the contractor on sharing basis mainly for the purposes enumerated/indicated therein. BHEL cranes have to be shared with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor.
b)	BHEL Cranes may be initially issued in basic assembled condition. Any alteration/addition like boom reduction / extension, assembly of components/sub-assemblies needed for modulating the capacity/reach/other features of cranes and restoration to the state as directed by BHEL shall be the contractor's responsibility.
c)	In case the BHEL cranes are not covered under AMC of BHEL, then the day-to-day upkeep and running maintenance like filling / topping up of lubricants, changing filters, etc including repair of self starter and dynamo of these cranes shall be the responsibility of the contractor. If on checking it is found that the same is not followed, BHEL will exercise its right to get the job/works done at the risk and cost of contractor. In case BHEL cranes are covered under AMC awarded by BHEL, then the day-to-day upkeep and running maintenance as described above are excluded from scope. However any additional helpers if any required during Preventive/Breakdown Maintenance, Assembly/disassembly shall be provided by contractor at no extra cost. BHEL may also provide cranes through crane hiring agencies in which case the day-to-day upkeep and running maintenance shall be excluded from scope of contractor.
d)	Minor consumables like cotton cloth, cotton waste, etc is to be supplied by Contractor. All spares and lubricants/grease is excluded from scope. Contractor to give the requirements of these items well in advance in case the cranes provided by BHEL are BHEL owned cranes.
e)	Unless otherwise specified, trained operators for BHEL owned cranes shall be provided by the contractor. These operators should possess valid license for heavy vehicle.
f)	BHEL cranes will be withdrawn for regular and capital maintenance as per the respective schedule of maintenance. As far as possible such schedules will be intimated to the contractor in advance and may be adjusted depending on the work

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Chapter - IV : Obligations of Contractor

	requirements at site. However no claim whatsoever will be entertained on account of non-availability of cranes.
g)	Where the services of the cranes provided by BHEL are to be shared by other agencies/ contractors of BHEL, the contractor's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. Working arrangements in this regard will be done at site by BHEL engineer and in any case his decision shall be final and binding.
h)	Major breakdowns will be attended to by BHEL. However, in case of breakdowns or damages due to negligence of the contractor, the complete service/repair charges including cost of spares shall be to the account of the contractor, along with BHEL overheads.
4.2.2.17	Obligations in respect of Construction Lift/Elevators provided by BHEL
a)	The total erection including commissioning, maintenance, statutory clearances shall be included in scope of work. Supervision by the original equipment supplier or their authorized agency shall be arranged for by BHEL, in case found necessary.
b)	All day to day and routine maintenance and checking is to be carried out by the contractor as per the recommendations of the supplier. He should periodically check the brakes and carry out the all works to ensure the safety of all those using the lift/elevator. BHEL shall arrange spares required for upkeep of Construction lift/elevator
c)	The construction lift/elevator should never be overloaded as this can lead to serious accidents. Ensuring all safety aspects in operation of the lift shall be the responsibility of the contractor. Erection of all the required number of landing platforms is included in scope. Landing platforms are to be provided with proper barricades and hand railings.
d)	After completion of contractual scope of work or as per BHEL advice, the temporary elevator/lift shall be dismantled and handed over to BHEL neatly identified/tagged. Temporary structures/platforms etc erected for the elevators/lifts are also to be dismantled and materials to be returned to stores as applicable. The construction and dismantling of the foundations required for the construction/elevator lifts is included in the scope of the contractor.

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**Chapter – V : Responsibilities of Contractor in respect of Labour,
Supervisory Staff, etc.**

5.0	RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.
5.1	Refer relevant clauses of General Conditions of Contract (GCC) also in this regard
5.2	The contractor shall deploy all the necessary skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.
5.3	Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
5.4	It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.
5.5	Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.
5.6	The Contractor in the event of engaging 20 or more workmen, shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the Principal Employer/Customer. In order to issue Form-V by Customer, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc as per the requirement of BHEL/Customer
5.7	Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL/Customer may insist for submission of the account code duly certified by PF Commissioner
5.8	Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.
5.9	BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory

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**Chapter – V : Responsibilities of Contractor in respect of Labour,
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	requirements. Contractor shall enable such facilities to BHEL / Customer.
5.10	Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
5.11	The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
5.12	The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.
5.13	It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.
5.14	The actual deployment will of Labour and Engineer/supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor
5.15	Contractor shall not deploy women labour at night.

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Chapter – VI: Material Handling, Storage & preservation

6.0	MATERIAL HANDLING, STORAGE AND PRESERVATION ETC
6.1	MATERIAL HANDLING AND STORAGE
6.1.1	All the equipments/materials furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. While drawing/lifting material from BHEL / customer stores, the contractor shall ensure that the balance / other materials are stacked back immediately. No claim is admissible on this account
6.1.2	While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the delivery of the same, following the procedure indicated by BHEL, and transport the material safely to pre-assembly yard / erection site in time, according to program.
6.1.3	The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.
6.1.4	The contractor shall identify and deploy necessary Engineers / supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
6.1.5	All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
6.1.6	Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage. Dragging of piping / valves should be avoided. In case of any damage the cost shall be covered from the contractor.
6.1.7	Approach road conditions from the stores / yards to the erection site may not

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	be equipped and ideal for smooth transportation of the equipment. Contractor may have to be adequately prepared to transport the materials under the above circumstances without any extra cost. . The contractor may familiar himself with soil conditions at site.
6.1.8	Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient number of watch / ward personal to avoid any pilferage of material
6.1.9	The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
6.1.10	All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
6.1.11	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractors risk and cost.
6.1.12	The contractor shall be responsible for making suitable indoor storage facilities to store all equipment (drawn by the contractor from BHEL / customer stores), which require indoor storage till the time of their installation. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage, and the contractor shall comply with Engineer's decision.
6.1.13	The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood / containers/ special transporting frames etc are returned to BHEL at a place in project area identified by the Engineer. The contractor will maintain an account for all items received and returned to BHEL. Any shortage in returning such items shall be chargeable to the contractor except allowable wastage for packing wood only.
6.1.14	The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the stores as directed by

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	the concerned BHEL engineer.
6.1.15	The contractor shall ensure that all the packing materials and protective devices installed on equipment during transit and storage are removed before installation.
6.1.16	It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.
6.2	PRESERVATION OF COMPONENTS
6.2.1	After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.
6.2.1.1	Items stored outdoors shall be stacked up at least six inches (6") off the ground. Items should not be stored in a low lying area where water logging is a possibility. Contractor should have sufficient numbers of wooden / concrete / steel sleepers for the job.
6.2.1.2	Motors, valves, electrical equipment, control equipment and instruments, and special or precision items requiring special care, etc shall be stored indoors. Motor windings shall be kept dry by use of external heat or space heaters.
6.2.1.3	Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean and should be regularly monitored.
6.2.1.4	Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.
6.2.2	It shall be the responsibility of the contractor to apply preservatives / touch up paints (primer) on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required paints (primer), thinners, labour, scaffolding materials, cleaning materials like wire brush, emery sheets, etc, cleaning of surface and provide one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. The accepted rate shall include this work also. It is to be noted that such painting may have to be done as and when required till such time the final painting is carried out.
6.2.3	The contractor shall effectively protect the finished work from action of weather

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	and from damage or defacement and shall cover the finished parts then and there for their protection.
6.2.4	Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

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Chapter – VII: Drawings and documents

7.0	DRAWINGS AND DOCUMENTS
7.1	The detailed drawings, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
7.2	Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan, which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.
7.3	The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.
7.4	The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work. The contractors quoted rates shall be inclusive of the above factor
7.5	Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
7.6	Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.

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Chapter – VIII: Inspection and Quality

8.0	INSPECTION AND QUALITY
8.1	Inspection, Quality Assurance, Quality Control
8.1.1	Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.
8.1.2	The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.
8.1.3	A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various equipments etc. High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions. Record of heat treatments performed shall be maintained as prescribed by BHEL
8.1.4	The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately
8.1.5	All the welders shall carry identity cards as per the proforma prescribed by BHEL/Customer/Consultant. Only welders duly authorized by

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	BHEL/customer/consultant shall be engaged on the work.
8.1.6	Contractor shall provide all the Measuring Monitoring Equipments (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.
8.1.7	It is the responsibility of the contractor to prove the accuracy of the testing/measuring/calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
8.1.8	Any re-laying or re-termination of cables/re-erection of instruments/recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.
8.1.9	BHEL, Power Sector Regions (PSNR/PSER/PSWR/PSSR) have already been accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipments). The MMEs shall have test / calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall ie repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
8.1.10	Re-work necessitated on account of use of invalid MMEs shall be entirely to the

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	contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
8.1.11	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter/ finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter/final measurements.
8.1.12	Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.
8.2	Stage Inspection By FES/QA Engineers
8.2.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections free of cost.
8.2.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per Section 13, and provided such modifications have not arisen for reasons attributable to the contractor.
8.3	Statutory Inspection of Work
8.3.1	The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: 1) Inspectorate of Steam Boilers and Smoke Nuisance 2) Electrical Inspector 3) Factory Inspector, Labour Commissioner, PF Commissioner and other authority connected to this project work

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	The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.
8.3.2	Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. contractor also should be aware of the latest IBR regulations and Electricity Act, including the amendments thereof.
8.3.3	Contractor shall comply with 'Qualification Tests for welders engaged in welding of Boilers and Steam Pipes under Construction, Erection and Fabrication at Site in India and in repairing Boilers and steam pipes by welding' in line with Chapter XIII of Indian Boiler Regulations-1950, for testing his welders / men / workers, including all associated fees, procedures, required instruments and equipments and their calibration there of. It shall be contractor's responsibility to obtain approval of Statutory Authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities, at his cost.
8.3.4	The following fees shall be excluded from scope of Contractor: 1. Registration Fee as per Regulation 385 of Chapter IX of Indian Boiler Regulations-1950 2. Fees for inspection of Boiler at the site of Construction as per Regulation 395 A, sl no 4 of Chapter IX of Indian Boiler Regulations-1950 However all other fees like visit fees charged by the Boiler Inspector and other arrangements for his visit or visits till satisfactory completion of work, shall be included in scope of Contractor
8.4	The Quality Management System of BHEL, Power Sector Regions (PSNR/PSER/PSWR/PSSR) have already been certified and accredited under ISO 9002 standards in this regard. The basic philosophy of the Quality Management System is to define the organizational responsibility, work as per

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	documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product/ procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The nonconformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers/vendors of various products/services contributing in the work are also considered as part of the quality management system. .as such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.
8.5	Field Quality Assurance
8.5.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

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Chapter - IX: HSE & OHSAS

9.0	OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME: BHEL, Power Sector Regions (PSNR/ER/WR/SR) are each certified for ISO 9001. Quality of work to customer's satisfaction and fulfillment of system requirements are the essence of ISO 9001 certification. BHEL, PS Regions have HSE certification (ISO 14001 & OHSAS 18001) and therefore Contractor also shall organise/ plan/ perform all their activities to meet with the applicable requirements of these standards.
9.1	HSE (Health, safety & Environment): Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL. HSE requirements in brief, are given below :-
9.1.1	Contractor will nominate one of their qualified and experienced employees as Safety Officer, who will be responsible for all HSE related issues of contractors work area. Safety Officer will have authority to stop any activity, in case he observes that the activity is not being carried out in safe manner. He will conduct surprise inspection as well as periodic inspection/drill (at least once in a month) and submit such reports to BHEL. He will conduct periodic meetings with supervisors of different working groups and explain HSE issues and use of PPEs to them. Reports of such meetings will be submitted to BHEL. Contractor will develop suitable work procedures based upon HSE guidelines and OCPs and implement it. Such work procedures will consist of Area of work, T&P Details, Work Procedure, PPE requirements etc. Please refer Schedule VIII of BOCW Rules for number of safety officers, qualification, duties etc. Contractor should highlight the requirement of safety to staff and labour through daily tool box meeting before start of the days job. Contractor to also submit monthly safety reports as per the format/procedure of BHEL.
9.1.2	The contractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by aregistered medical practitioner. The contractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job
9.1.3	Following personnel protective equipments (PPEs), in adequate numbers, will

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	be made available at site & their regular use by all concerned will be ensured :-
	- HELMET
	- SAFETY GOGGLES & WELDING FACE SHIELDS
	- SAFETY BELTS AND PROTECTIVE NET FOR WORKING AT HEIGHT
	- SAFETY SHOES
	- EAR PLUG
	- ANY OTHER SAFETY EQUIPMENT REQUIRED FOR SAFE COMPLETION OF THE WORK
	Contractor to also submit monthly reports on above as per the format/procedure of BHEL.
9.1.4	Providing appropriate First Aid facilities for prompt treatment of injuries and illness at work place. Arranging training to contractor workmen/ employees for giving first aid.
9.1.5	Arranging ambulance in case of any emergency situation .
9.1.6	Identification of nearest hospital and health check-up of workmen/employees
9.1.7	Providing filtered drinking water at work place in cool container.
9.1.8	Providing Canteen, Rest Room, Washing facilities to the contracted employees as per provisions of Contract Labour Regulation Act 1970 (Chapter V).
9.1.9	Providing appropriate fire fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
9.1.10	Identification of nearest fire station and display contact telephone nos. / person's name around work places for cases of emergencies .
9.1.11	Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
9.1.12	Fulfilling safety requirements at all power tapping points.
9.1.13	Red & White caution tape of proper width(1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavation area etc.
9.1.14	Providing contractors company logo on cloths /uniform/ proper identity cards with photographs, for correct identification of people working at project site .
9.1.15	High/ Low pressure welders to be identified with separate colourclothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
9.1.16	Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place .

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9.1.17	All scaffolding/ platforms should be made from materials of appropriate quality/grade so that these are safe for use. It should be certified/declared safe for use by an experienced contractor person, before any scaffolding/platform is used. Please refer IS:3696 part 1&2 and 4014 part 1 & 2
9.1.18	All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL.. Contractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
9.1.19	Ensure that the regulatory requirement of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
9.1.20	Safety slogan, Safety/ Caution boards , wherever required to be displayed in consultation with BHEL.
9.1.21	Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained. Ensure proper cleanliness of work place, housekeeping and waste management (including proper waste disposal) on daily basis.
9.1.22	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
9.1.23	The contractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.
9.1.24	The Contractor is required to provide proper safety net systems (IS-11057) where ever the hazard of fall from height is present as per instruction of BHEL Engineer. The safety nets shall be fire resistant, duly tested and shall be of ISI Mark and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
9.1.25	All applicable OCPs (Operational control procedures) will be followed by contractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below . In case any other OCP is found to

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	be applicable during the execution of work at site, then contractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to contractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL at the Power Sector Regional HQ, or available in downloadable format in the website, which may be refereed by contractor, if they so desire.
■	OCP for safe handling of chemicals
■	OCP for Electrical safety
■	OCP for energy conservation
■	OCP for safe welding and gas cutting operation
■	OCP for fire safety
■	OCP for safety in use of hand tools
■	OCP for first aid
■	OCP for food safety at canteen
■	OCP for safety in use of cranes
■	OCP for storage and handing of gas cylinders
■	OCP for manual arc welding
■	OCP for safe use of helmets
■	OCP for good house keeping
■	OCP for working at height
■	OCP for safe excavation
■	OCP for safe filling of Hydrogen in cylinder
■	OCP for illumination
■	OCP for handling and erection of heavy metals
■	OCP for safe acid cleaning
■	OCP for safe alkali boil out
■	OCP for safe oil flushing
■	OCP for steam blowing
■	OCP for safe working in confined area
■	OCP for safe operation of passenger lift, material hoists & cages
■	OCP for Vehicle maintenance
■	OCP for safe radiography
■	OCP for waste disposal
■	OCP for working at night
■	OCP for blasting
■	OCP for DG Set
■	OCP for handling & storage of mineral wool

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	■ OCP for drilling, reaming and grinding(machining) etc.
	■ OCP for hydraulic test
	■ OCP for spray insulation
	■ OCP for trial run of rotary equipment
	■ OCP for stress relieving
	■ OCP for material preservation
	■ OCP for cable laying/tray work
	■ OCP for electrical maintenance
	■ OCP for transformer charging
	■ OCP for safe handling of battery system
	■ OCP for computer operation
	■ OCP for storage in open yard
	■ OCP for sanitary maintenance
	■ OCP for batching
	■ OCP for piling rig operation
	■ OCP for gas distribution test
	■ OCP for cleaning of hotwell / deaerator
	■ OCP for electro-resistance heating
	■ OCP for compressor operation
	■ OCP for O&M of control of AC plant & system
	■ OCP for air compressor
	■ OCP for passivation
	■ OCP for Safe EDTA Cleaning
	■ OCP for Safe Chemical cleaning of Pre boiler system
	■ OCP for Safe Boiler Light up
	■ OCP for Safe Rolling and Synchronisation
	■ OCP for Safe Loading of Unit
9.2	SAFETY AND CLEANLINESS : The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per discretion of BHEL or its authorised officials (Site Construction Manager) to prevent loss of human lives, injuries, to personnel engaged and damage to property. Before commencing the work, the contractor shall submit a "Safety Plan" to the above authorised BHEL official and obtain approval on the same. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, materials and environment during execution of the work. This will also include an organization structure, role and responsibilities of the concerned key

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	personnel, the safety practices that will be followed, PPEs deployed, plan for handling critical activities and emergencies.
9.3	If the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor.
9.4	During the course of construction, alternation or repairs, scrap with protruding nail, sharp edge etc and all other debris shall be kept clean from working areas, passage, ways and stairs in and around site.
9.5	Combustible scrap and debris shall be removed at regular intervals during the course of execution. Safe means shall be provided to facilitate such removal. The combustible scrap should be stored in safe place away from the plant materials to avoid fire accidents. The area shall be chosen in consultation with the Engineer and to be cordoned off.
9.6	Rigging equipment for materials handling shall be inspected prior to use in each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
9.7	Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the original work area so as not to present a hazard to employees.
9.8	Contractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the contractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
9.9	Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the contractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The contractor shall be responsible for obtaining

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	the same.
9.10	Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
9.11	When cylinders are transported by powered vehicle they shall be secured in a vertical position.
9.12	All workmen of the contractor working on construction area shall wear safety shoes, hand gloves, safety helmets and safety belt as applicable. The contractor shall provide to its workforce and ensure the use of following personnel protective equipment as found necessary and as directed by BHEL.
9.12.1	Safety Helmets conforming to IS-2925 : 1984
9.12.2	Safety Belts conforming to IS-3521:1983
9.12.3	Safety Shoes conforming to IS-1989 : 1978
9.12.4	Eye and face protection devices conforming to IS – 1179:1967, IS 5983:1980, IS 8521 Part 1:1977, IS 8521 Part 2: 1994.
9.12.5	Hand and body protection devices conforming to IS 4770:1991 and IS- 6994 : Part 1: 1973, IS – 8619 : 1977
9.12.6	Ear protection IS-9167:1979
9.12.7	Respiratory Protective Devices as per IS-9473:2002, i4746:1999 and 14166:1994
9.13	The contractor shall insure his workmen against all accidents and the policy shall be presented to BHEL Engineer on demand. Other wise, BHEL will arrange the same and the expenditure towards this will be debited to the contractor. In case of a fatal or disabling injury accident to any person at construction site due to lapses by the contractor, the victim and/or his/her dependants shall be compensated by the contractor as per statutory requirements. However, if considered necessary BHEL shall have the right to impose appropriate financial penalty on contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependence before imposing any such penalty. Appropriate enquiry shall be held by BHEL giving opportunity to the contractor for presenting his case. Above safety conditions are not exhaustive but gives an idea for the contractor and contractor shall adhere to all safety precaution given by the

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	Engineer at site.
9.14	The contractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations during night hours at the work spot as well as at the pre-assembly area.
9.15	The contractor shall be responsible for provision of all the safety notices and safety equipment as enjoined on him by the application of relevant statutory regulation / provisions and/or as called upon by BHEL from time to time. He shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instruction that may endanger safety of men, equipment and material.
9.16	The contractor shall provide temporary fencing wherever required as a safety measure against accident and damage to properties. Suitable caution notices shall be displayed where access to any part is found to be unsafe and hazardous.
9.17	Contractor shall ensure safety of all the workmen, material and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by BHEL without exception.
9.18	It will be the responsibility of the contractor to ensure safe lifting of the equipment, taking due precaution to avoid any accident and damage to other equipment and personnel. All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the contractor by engaging only the COMPETENT PERSONS as per law. Defective equipment or uncertified shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.
9.19	The contractor shall provide necessary first aid facilities as per schedule III. In addition, ambulance facilities, OHC and CMO as per schedule IV, V, X and XI of BOCW Rules as applicable for all his employees, representatives and workmen at site and BHEL shall have no obligation in this regard. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time. The contractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.
9.20	Training

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9.20.1	The contractor shall arrange induction safety training for all employees before assigning work. In addition, awareness programme, mock drill at regular intervals and daily tool box meetings shall be arranged. Monthly report of the above to be given to BHEL safety Officer as per prescribed BHEL formats
9.20.2	All the contractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Contractor should nominate his supervisor to coordinate and implement the safety measures.
9.21	Contractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed. Non-compliance of the above requirement under fire protection shall in no way relieve the contractor of any of his responsibility and liabilities to fire accident occurring either to his materials or equipment or those of others. Emergency contacts nos must be displayed at prominent locations
9.22	The contractor shall at his cost, remove from vicinity of work at least once each day all combustible waste, scrap, painting materials, rubbish, unused or other materials and deposit them in places specified by BHEL to keep the work site clear and tidy. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
9.23	The contractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
9.24	All portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
9.25	In case of any delay in completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from

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	the payments due to the contractor, after notifying the contractor suitably.
9.26	Valve protection caps shall be kept in place and secured.
9.27	The contractor shall be responsible for the safe storage and handling of his radio-active sources as per BARC rules and regulations.
9.28	Tarpaulin being inflammable should not be used (instead, only non infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.
9.29	If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
9.30	If the contractor succeeds in carrying out its job in time with out any fatal or disabling injury accident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the contractor suitably for the performance.
9.31	The contractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
9.32	The contractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the contractor. All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations. Area wise Electrical safety inspection is to be carried out on monthly basis as per "Electrical Safety Inspection checklist" and the report is to be submitted to BHEL safety officer
9.33	The contractor shall arrange adequate number of persons specifically for clearing any debris and for house keeping of the erection area including restacking of components in the erection areas. Housekeeping to be carried out

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	as per BHEL's checklist and report is to be submitted to BHEL safety officer
9.34	In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover the cost of such damages from the contractor after holding an appropriate enquiry.
9.35	The contractor shall submit report of all accidents, fires and property damage etc to the Engineer immediately after such occurrence, but in any case not later than 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. In addition periodic reports on safety shall also be submitted by the contractor to BHEL from time to time as prescribed by the Engineer. Compiled monthly reports of all kinds of accidents, fires and property damage to be submitted to BHEL safety officer as per prescribed formats
9.36	Before commencing the work, the contractor shall appoint/nominate a responsible person to supervise implementation of all safety measures and liaison with his counterpart of BHEL.
9.37	Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ horizontal and 1 vertical.
9.38	Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the out side and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from savor, from swaying, from the building or structure.
9.39	Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above.

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9.40	Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.
9.41	Wherever there are open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.
9.42	Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least $\frac{1}{4}$ " for each additional foot of length.
9.43	A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.
9.44	All personnel of the Contactor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal worker shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
9.45	Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
9.46	All trenches, four feet or more in depth, shall at all times be supplied with at least one ladder for each 30 m in length or fraction thereof. The ladder shall be extended from bottom of the trench to at least 90 cm above the surface of the ground. Sides of the trenches which are 1.50 m or more in depth shall be stepped back to give suitable slope or securely held by timer bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
9.47.1	The contractor shall take permission of BHEL prior to risky jobs such as working at height, hot work, liftig activities, etc through permits. No job should be started without permits.
9.47.2	The Contactor shall take all measures at the sites of the work to protect all persons from accidents and shall be bound to bear the expenses of defense of

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	every suit, action or other proceeding at law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the Contractor be paid to compromise any claim by any such person should such claim proceeding be filed against BHEL, the Contractor hereby agrees to indemnify BHEL against the same.
9.48	Before any demolition work is commenced and also during the process of the work the following shall be ensured:
9.48.1	All roads and open areas adjacent to the work site shall either be closed or suitably protected.
9.48.2	No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
9.48.3	All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.
9.49	All necessary personnel safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed in the Site and maintained in a condition suitable for immediate use and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.
9.49.1	Workers employed on mixing asphalted materials, cement and lime mortars shall be provided with protective foot wear and protective goggles.
9.49.2	Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
9.49.3	Those engaged in welding works shall be provided with welder's protective eyesight lids.
9.49.4	Stone breakers shall be provided with protective goggles and protective clothing and seated sufficient to safe intervals.
9.49.5	Where workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided

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Chapter - IX: HSE & OHSAS

	with warning signals or boards to prevent accident to the public.
9.49.6	The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken.
9.49.6.1	No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
9.49.6.2	Suitably face masks should be supplied for use by the workers where paints are applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
9.49.6.3	Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
9.50	When the work is being done near any place where there is risk of drowning all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
9.51	Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards. Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers employed on electrical installations which are already energized, insulting mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.
9.52	All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near the places of work.
9.53	The contractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable inspection Agency for performing Inspection. If any test equipment is found not complying with proper safety

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Chapter - IX: HSE & OHSAS

	requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.
9.54	The Contractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the contractor shall adhere to such instructions. BHEL may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.
9.55	All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.
9.56	.All gas cylinders shall be stored in upright position. Suitable trolley shall be used. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced. No of cylinders shall not exceed the specified quantity as per OCP
9.57	These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent, place at work spot. The persons responsible for compliance of the safety code shall be named therein by the Contractor
9.58	To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangement made by the contract shall be open to inspection by the Engineer of the Engineer's Representative.
9.59	Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the contractor. Such cleanings has to be done by contractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by contractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost alongwith BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the contractor.
9.60	Notwithstanding the above clauses there is nothing to exit the Contractor from the operations of any other Act or Rule in force in area of work in this respect. Provided always that all safety measures apart from those specifically provided in this agreement which are brought to the notice of the Contractor from time to time by the Engineer shall be complied by the Contractor. Provided further that

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Chapter - IX: HSE & OHSAS

	all consequences, damages, or losses arising by reason of any safety code shall be met with by the Contractor.																																																																
9.61	<u>NON COMPLIANCE:-</u> NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER <u>for every instance of violation noticed:</u> <table border="1"> <thead> <tr> <th>SN</th><th>Violation of Safety Norms</th><th>Fine (in Rs)</th></tr> </thead> <tbody> <tr><td>01</td><td>Not Wearing Safety Helmet</td><td>50/- *</td></tr> <tr><td>02.</td><td>Not wearing Safety Belt or not anchoring life line</td><td>100/-*</td></tr> <tr><td>03</td><td>Not wearing safety shoe</td><td>100/-*</td></tr> <tr><td>04</td><td>Not keeping gas cylinders vertically</td><td>100/-</td></tr> <tr><td>05</td><td>Not using flash back arrestors</td><td>50/-</td></tr> <tr><td>06</td><td>Not wearing gloves</td><td>50/- *</td></tr> <tr><td>07.</td><td>Grinding Without Goggles</td><td>50/- *</td></tr> <tr><td>08.</td><td>Not using 24 V Supply For Internal Work</td><td>500/-</td></tr> <tr><td>09.</td><td>Electrical Plugs Not used for hand Machine</td><td>100/-</td></tr> <tr><td>10.</td><td>Not Sliding property</td><td>200/-</td></tr> <tr><td>11.</td><td>Using Damaged Sling</td><td>200/-</td></tr> <tr><td>12.</td><td>Lifting Cylinders Without Cage</td><td>500/-</td></tr> <tr><td>13.</td><td>Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.</td><td>200/-</td></tr> <tr><td>14.</td><td>Not Removing Small Scrap From Platforms</td><td>200/-</td></tr> <tr><td>15.</td><td>Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting</td><td>200/-</td></tr> <tr><td>16.</td><td>Not Maintaining Electric Winches Which are Operated Dangerously</td><td>500/-</td></tr> <tr><td>17.</td><td>Improper Earthing Of Electrical T&P</td><td>500/-</td></tr> <tr><td>18</td><td>No or improper barricading</td><td>500/-</td></tr> <tr><td>19.</td><td>Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)</td><td>1000/-</td></tr> <tr><td>20.</td><td>Accident Resulting in Partial Loss in Earning Capacity</td><td>25,000/- per victim</td></tr> </tbody> </table>		SN	Violation of Safety Norms	Fine (in Rs)	01	Not Wearing Safety Helmet	50/- *	02.	Not wearing Safety Belt or not anchoring life line	100/-*	03	Not wearing safety shoe	100/-*	04	Not keeping gas cylinders vertically	100/-	05	Not using flash back arrestors	50/-	06	Not wearing gloves	50/- *	07.	Grinding Without Goggles	50/- *	08.	Not using 24 V Supply For Internal Work	500/-	09.	Electrical Plugs Not used for hand Machine	100/-	10.	Not Sliding property	200/-	11.	Using Damaged Sling	200/-	12.	Lifting Cylinders Without Cage	500/-	13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-	14.	Not Removing Small Scrap From Platforms	200/-	15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-	16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-	17.	Improper Earthing Of Electrical T&P	500/-	18	No or improper barricading	500/-	19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-	20.	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
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Bharat Heavy Electricals Limited

Power Sector – Eastern Region, Kolkata

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	<table><tr><td>21.</td><td>Fatal Accident/Accidents Resulting in total loss in Earning Capacity</td><td>1,00,000/- per victim #</td></tr></table>	21.	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/- per victim #
21.	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/- per victim #		
	Legend:-*: per head, #: or as deducted by Customer whichever is higher Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilized for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.			
9.61	<u>CITATION:-</u>If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job			
9.62	<u>MEMORANDUM OF UNDERSTANDING</u> After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below: <u>Memorandum of Understanding</u> ➤ BHEL, Power Sector _____ Region is committed to Health, Safety and Environment Policy (EHS Policy). ➤ M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____ ➤ M/s _____ shall ensure that safe work practices not limited to the above are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance. ➤ BHEL will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed/reported within fifteen days. Signed by authorized representative of M/s -----			

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Chapter - IX: HSE & OHSAS

	Name : Place & Date:

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Chapter-X: RA Bill Payments

10.0	RA Bill Payments
10.1	The contractor shall submit his monthly RA bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month.
10.2	Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract
10.3	Release of payment in each running bill including PVC Bills where ever applicable will be restricted to 95% of the value of work admitted as per stages of progressive pro rata payments.
10.4	The 5% thus remaining shall be treated as 'Retention Amount' and shall be released as per terms specified in the General Conditions of Contract.
10.5	The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc and other dues in the meanwhile. In case of Civil works, 60% of RA Bills complete and correct in all respects and certified by BHEL Engineer, shall be paid within 15 days of receipt. Balance payment shall be within 30 days.
10.6	BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats: Note: BHEL may also choose to release payment by other alternative modes as applicable
10.7	Paying Authority shall be the Construction Manager of the Site. Any change in the paying Authority shall be intimated to the Contactor accordingly.

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Chapter-XI : Performance Monitoring

11.0	Performance Monitoring
11.1	Performance of the contractor is monitored through various reports/reviews and shall be jointly evaluated every month for unit wise identified packages as per prescribed formats. Based on the net weighted scores obtained, Contractors shall be rated 'Good' or 'Satisfactory' or 'Unsatisfactory'
11.2	In case of any dispute on performance rating and the contractor refuses to sign on the performance rating given by BHEL package Incharge, the same shall be reviewed by BHEL site Incharge/Construction Manager and his decision shall be final.
11.3	Release of RA Bills will be contingent upon joint evaluation of performance
11.4	Performance of the contractor will be taken into consideration for assessing the capacity of the bidder to execute future jobs under tender, as detailed in the Notice Inviting Tender. Risk of non evaluation or non availability of the Monthly performance evaluation reports is to be borne by the Bidder.
11.5	In case of 'Unsatisfactory performance' for a continuous period of three or more months for a package or packages, BHEL has the right to get the balance works executed at the risk and cost of the contractor.
11.6	In case of 'Unsatisfactory performance' in a financial year, BHEL reserves the right to put on hold such Contractors for a period of six months for similar package or similar packages

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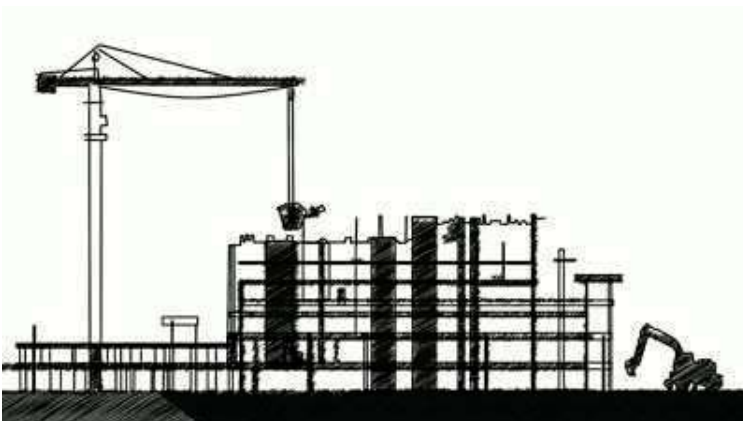
Chapter-XII: Suspension of Business Dealings

12.0	Suspension of Business dealings
12.1	BHEL reserves the right to take action against contractors who fail to perform or indulge in malpractices, by suspending business dealings with them.
12.2	Suspension could be in the form of 'Hold', 'De-listing' or 'Banning' a contractor.
12.3	A bidder may be put on HOLD for a period of 6 months, for future tenders for specific works on the basis of one or more of the following reasons: a) Bidder does not honour his own offer or any of its conditions within the validity period. b) Bidder fails to respond against three consecutive enquires of BHEL. c) After placement of order, Bidder fails to execute a contract. d) Bidder fails to settle sundry debt account, for which he is legitimately liable, within one year of its occurrence. e) Bidder's performance rating falls below 60% in specific category (more fully described in chapter 'Performance Monitoring') f) Bidder works are under strike/ lockout for a long period.
12.4	A Bidder may be de-listed from the list of registered Bidders of the region for a period of 1 year on the basis of one or more of the following reasons:- a) Bidder tampers with tendering procedure affecting ordering process or commits any misconduct which is contrary to business ethics. b) Bidder has substituted, damaged, failed to return, short returned or unauthorizedly disposed off materials/ documents/ drawings/ tools etc of BHEL. c) Bidder no longer has the technical staff, equipment, financial resources etc. required to execute the orders/ contracts.
12.5	A Bidder can be banned from doing any business with all Units of BHEL for a period of 3 years on the basis of one or more of the following reasons: a) Bidder is found to be responsible for submitting fake/ false/ forged documents, certificates, or information prejudicial to BHEL's interest. b) In spite of warnings, the Bidder persistently violates or circumvents the provisions of labour laws/ regulations/ rules and other statutory requirements. c) Bidder is found to be involved in cartel formation

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Chapter-XII: Suspension of Business Dealings

	d) The Bidder has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage etc which are contrary to business ethics. e) The Bidder is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings. f) The Bidder is declared bankrupt, insolvent, has wound up or been dissolved; i.e ceases to exist for all practical purposes. g) Bidder is found to have obtained Official Company information/ documentation by questionable means. h) Communication is received from the administrative Ministry of BHEL to ban the Bidder from business dealings.
12.6	Contracts already entered with a contractor before the date of issue of order of 'HOLD' or 'DE-LISTING' shall not be affected.
12.7	All existing contracts with a 'BANNED' contractor shall normally be short closed
12.8	Once the order for suspension is passed, existing offers/new offers of the contractor shall not be entertained
12.9	The above guidelines are not exhaustive but enunciate broad principles governing action against contractors



HEALTH, SAFETY and ENVIRONMENT PLAN

For

SITE OPERATIONS

By

SUB-CONTRACTORS

POWER SECTOR- EASTERN REGION

 PS-ER	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SUB-CONTRACTORS (GENERAL)	Doc. No.: HSEP:14-ER
		Rev.: 00
		Date: 25.04.19
		Page 2 of 162

DOCUMENT ISSUE SHEET

	PREPARED BY	APPROVED BY
NAME	Saswajeet Rout	
DESIGNATION		
SIGNATURE		Pradip Ghosh Digitally signed by Pradip Ghosh DN: cn=Pradip Ghosh, o=BHEL, ou=HSE-PSER, email=pradipg@bhelpser.co.in, c=IN Date: 2019.06.15 13:02:14 +05'30'
ISSUED BY:		
ISSUED TO:		
COPY NO:		
DATE OF ISSUE:		

THIS PLAN SUPERSEDES THE STANDARD HSE PLAN

 PS-ER	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SUB-CONTRACTORS (GENERAL)	Doc. No.: HSEP:14-ER
		Rev.: 00
		Date: 25.04.19
		Page 3 of 162

HSE PLAN FOR SITE OPERATIONS BY BHEL'S SUBCONTRACTORS AT A GLANCE

BEFORE START	SIGNING OF MOU	
	Agree to comply to HSE requirement- Statutory and BHEL's	Agree to accept BHEL's decision on release of 1.5% (as specified in the contract) of Gross bill Amount or part thereof or otherwise (non-release), based on our HSE performance as evaluated by BHEL during the execution period
	HSE ORGANISATION	
PLAN	Manpower 1 (one) safety officer for every 300 workers or part thereof 1(one) safety-supervisor for every 150 workers 1(one) safety-steward/ supervisor for every 50 workers As per Cl. 7.1	HSE Roles and responsibilities - All employees as per 7.2.1 - Site In-charge & Package In-charges- As per clause 7.2.2 - Safety officer- As per clause 7.2.3
	HSE Planning for Man, Machinery / Equipment/ Tools & Tackles	
PROVIDE	HSE INFRASTRUCTURE	
	- PPEs - Drinking Water - Washing Facilities - Latrines and Urinals - Provision of shelter for rest - Medical facilities	- Canteen facilities - Labor Colony - Emergency Vehicle - Pest Control - Scrapyard - Illumination - Crèches (if required)
TRAIN	HSE TRAINING , AWARENESS & PROMOTION	
	Training - Induction training - Height work and other critical areas - Tool Box talk & Pep Talk - Job Specific Training	Awareness & Promotion - Posters & Signage - Emergency Contact/Information Display - Banner - Competition & Awards
COMMUNICATE	HSE COMMUNICATION	
	Incident Reporting - Accident- Fatal, Major & Minor - Property damage - Near Miss Safety Performance Reporting	Event Reporting - Celebrations - Training - Medical camp - Motivational Activities



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EXECUTE SAFELY

SAFETY DURING WORK EXECUTION

PERMIT TO WORK

Height work (above 2 meters), Hot Work, Heavy Lifting, Confined Space, Radiography, Excavation (More than 1.22 meters), Lockout / Tag out

OPERATIONAL CONTROL

• Welding, Gas Cutting Grinding • Rigging, Signaling • Cylinder- Storage & Movement • Demolition work • T&Ps • Chemical Handling • Electrical works • Painting	• Fire • Scaffolding • Height work • Working Platform • Excavation / Civil Work • Ladder • Lifting • Hoisting appliance • Hard Barricading

HOUSE KEEPING

WASTE MANGEMENT

TRAFFIC MANAGEMENT

ENVIRONMENTAL CONTROL

EMERGENCY PREPAREDNESS AND RESPONSE PLANNING

CHECKS

HSE AUDITS & INSPECTION

• Daily Checks • Inspection of Height work • Inspection of PPEs • Inspection of T & Ps	• Inspection of Cranes & Winches • Inspection of Welding and Gas cutting • Inspection of elevators etc.

HSE PERFORMANCE EVALUATION PARAMETERS

NON CONFORMANCE

PENALTY for NON CONFORMANCE

Refer Clause 16 Incremental
penalty

For repeated violation by the same person, the penalty would be double of the previous penalty

For repeated fatal incident in the same contract / package, incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to the previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

COMPENSATION TO ACCIDENT VICTIMS

Refer Clause 17

Employee Compensation Act, 1922

Other Acts and Guidelines relevant to employee compensation



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ORGANIZATION OF THIS DOCUMENT

- **GENERAL SECTION**
- **SECTION A:**
MAIN REQUIREMENTS APPLICABLE IN FULL
- **SECTION B:**
SPECIAL REQUIREMENTS
- **ANNEXES**



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GENERAL

1. PURPOSE

- 1.0** The purpose of this HSE Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during installation and servicing of industrial projects and power plants.
- 1.1** This document shall be followed by BHEL's Sub-Contractors at all installation and servicing sites. In case BHEL has contractual HSE obligations towards customer, this document will be followed in conjunction with (BHEL's) customer specific requirements, ensuring that applicable systems, controls and checks of both are implemented in letter and spirit.
- 1.2** In case the customer has any specific requirement, the same is to be fulfilled but may not include financial inclusion.
- 1.3** This document shall be followed unless otherwise mentioned in TCC (technical condition of contract) or elsewhere in NIT or contract documents. This supersedes all HSE clauses in GCC.
- 1.4** Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy relevant statutory guidelines must be followed.

2. SCOPE

The document is applicable on all activities and assets including managerial, supervisory, professional, technical, clerical and other workers including contract laborers; and equipment operating under the control of BHEL's Subcontractors at all installation / servicing activities of BHEL Power Sector as per the relevant contractual obligations.

3. OBJECTIVES

The HSE Plan reflects that BHEL places high priority upon the Occupational Health, Safety and Environment at workplaces. The Sub-contractor shall:

Health & Safety

- Prevent injury and ill health of all persons at site ('Persons' refers to all personnel including managerial, supervisory, professional, technical, clerical and other workers including contract laborers)

Environment

- Prevent pollution to environment and ensure protection of environment taking into account interested party concern and conservation of resources and reduction of wastage

Legal Requirements

- Comply at all times with the relevant statutory and contractual HSE requirements.

Planning & Resources

- Ensure that all work planning takes into account all persons that may be affected by the work.
- Ensure timely provision of resources to facilitate effective implementation of HSE requirements.

Competency, Training & Awareness

- Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.

Maintenance of Equipment

- Ensure fitness testing of all T&Ps. Lifting appliances like cranes, chain pulley blocks etc. are certified by competent authority.

Safety during Operations

- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- Establish effective communication on HSE matters with all relevant parties involved in the Project works.

HSE Improvement

- Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause
- Ensure timely implementation of correction, corrective action.
- Ensure continual improvement in HSE performance



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GOALS AND TARGETS

- ❖ To achieve “Zero Incident at Site” (LTI)
- ❖ 100% compliance of all legal/statutory requirements related to HSE.
- ❖ 100% Health, Safety and Environmental Induction training attendance for all workers.
- ❖ 100% High Risk activities to be carried out only after approved Method Statement, HIRA / Aspect-Impact / JSA / OCP and Permit to Work are implemented.
- ❖ 100% PPEs compliance in high and medium risk activities.
- ❖ 100% monitoring of all Work Areas
- ❖ 100% detection of non-conformities in work area and 100% closure within specified time
- ❖ 100% incident (near miss, minor, major, other) reporting, recording and reviewing for corrective actions.
- ❖ Regular Safety Reviews to assess HSE program compliance and 100% closure of any recognized gaps to continually improve safety management and incident prevention.

4. REFERENCES

1. ALL CONTRACTUAL HSE REQUIREMENTS INCLUDING THIS DOCUMENT
2. ALL APPLICABLE ACTS, RULES & REGULATIONS
3. BHEL POWER SECTOR HSE MANAGEMENT SYSTEM
 - I. HSE PROCEDURES (13.1.1)
 - II. WORK PERMITS (See Clause 13.1.2)
 - III. OPERATIONAL CONTROL PROCEDURES (See Clause 13.1.3)
 - IV. FORMATS (See Clause 21)
4. BHEL CORPORATE STANDARD PPE GUIDELINES
5. RELEVANT INDIAN STANDARDS FOR SAFETY (See Annexure 02)

(Note: Wherever, the date or revision number of a document is not mentioned, latest revision is implied)

5. *BHEL HEALTH, SAFETY & ENVIRONMENT POLICY:*

In BHEL, Health, Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with, community and environment. BHEL believes in zero tolerance for unsafe work/non-conformance to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulations and BHEL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/substitution/reduction/control.
- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, contractors and suppliers on HSE issues.
- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- Communicating this policy within BHEL and making it available to interested parties.



Atul Sobti
Chairman & Managing Director

6. TERMS AND DEFINITIONS

6.0 INCIDENT

Work- related or natural event(s) in which an injury or ill health (regardless of severity) or fatality, damage to property/environment occurred, or could have occurred.

6.1 NEAR MISS

An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as “Near-Miss incident”.

6.2 MAN-HOURS WORKED

The total number of employee hours worked by all employees including subcontractors working in the premises.

It includes managerial, supervisory, professional, technical, clerical and other workers including contract laborers.

Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the period covered by the number of hours worked per day. The total number of workday for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

6.3 FIRST AID CASES (FAC)

First aid cases include:

1. Visit to a physician or a licensed health care professional solely for observation or counselling
2. Conduct of diagnostic procedures like X rays, blood test including the prescription medications used solely for diagnostic purposes (e.g. eye drops to dilate eyes)
3. Using a non-prescription medicine at non-prescription strength (for medication available in both prescription and non-prescription form as recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for record keeping purposes);
4. Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment);
5. Cleaning, flushing or soaking wounds on the surface of the skin;
6. Using wound coverings such as bandages, Band-Aids TM, gauze pads, etc.; or using butterfly bandages or Steri-Strips TM (other wound closing devices such as sutures, staples, etc., are considered medical treatment);
7. Using hot or cold therapy;
8. Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for record-keeping purposes);

9. Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).
 10. Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister;
 11. Using eye patches;
 12. Removing foreign bodies from the eye using only irrigation or a cotton swab;
 13. Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
 14. Using finger guards;
 15. Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes); or
 16. Drinking fluids for relief of heat stress.
- No other treatments are considered first aid.

6.4 MEDICAL TREATMENT CASES (MTC)

An incident involved with an injury or illness that needs medical attention beyond First-aid as per 6.3 above.

6.5 Dangerous Occurrence is defined as:

- (1) Collapse or failure of lifting appliances or hoist or conveyors or other similar equipment/machine;
- (2) Collapse or failure of a crane, derrick, winch, hoist or other appliance used in raising or lowering persons or goods or any part thereof, or the overturning of a crane;
- (3) Explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant, resulting in the complete suspension of ordinary work;
- (4) Electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire, causing structural damage involving its stoppage or disuse;
- (5) Explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (including air) or any liquid or solid resulting from the compression of gas;
- (6) Collapse in whole or part from any cause whatsoever of any roof, wall, floor, Structure or foundation forming part of the construction site in which persons are employed;
- (7) Total or partial collapse of any overburden, face, tip or embankment on the Construction site;
- (8) The overturning of, or collision with any object by any bulldozer, dumper, excavator, grader, lorry or shovel loader, or any mobile machine used for the handling of any substance on the construction site.

6.6 **Fire:** Except Dangerous occurrence, any incident involving fire.

6.7 **Property Damage:** Except Dangerous Occurrences and Fire, any incident of property (materials, building, equipment etc) getting damaged.

6.8 TYPE OF INCIDENT / ACCIDENT & THEIR REPORTING:

The categories of Incident / accident are as follows:

Non-Reportable Cases or NON-LTI: (Including First-aid cases as per 6.3 and MTC as per 6.4)

Minor: In this case the injured person resumes duty within 48 hours of incident.



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Reportable Cases (LTI or Loss Time Injury Cases):

Major: In this case the injured person is disable for 48 hours or more and is not able to perform his duty. (as per IS 3786). It includes fatality.

All incidents must be reported orally immediately and in writing within 24 hours of time of incident. However, in case of fatality, it shall be reported to the statutory authority within prescribed timeline through proper channel. Internal reporting shall be done within 6 hours of time of the incident

6.9 TOTAL REPORTABLE FREQUENCY RATE

Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

$$\frac{\text{Number of Reportable LTI}}{\text{Total Man Hours Worked}} \times 1,000,000$$

6.10 SEVERITY RATE

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:

$$\frac{\text{Days lost due to LTI}}{\text{Total Man Hours Worked}} \times 1,000,000$$

6.11 FREQUENCY SEVERITY INDEX (FSI)

$$\text{Frequency Severity Index, FSI} = \sqrt{\text{FR} \times \text{SR} / 1000}$$

6.12 INCIDENCE RATE

Incidence Rate is the Number of LTI per one thousand manpower deployed. Mathematically, the formula reads as:

$$\frac{\text{Number of LTI} \times 1000}{\text{Average number of manpower deployed}}$$

6.13 JOB SAFETY ANALYSIS

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.

6.14 SAFETY WALK

It's a walk (conducted periodically) by an official through a portion or whole of a site as an HSE officer, noting down HSE observations, speaking to concerned workmen and supervisor on observation, recording and reporting to in charges of agencies, getting the same rectified with personal follow up - to send out a strong message on Management's commitment to safety.

6.15 HEAVY & COMPLEX LIFTING

A heavy and complex lifting activity includes:

1. Lifting above 50 Tons
 2. Tandem Lifting using multiple cranes
 3. Total load exceeding 75% of capacity of crane
 4. Lift of unusual difficulty or geometry or rigging
 5. Lift over operating units
 6. Any other lift as decided by site HSE / Erection
- In any case, Job Safety Analysis to be carried out for any lift above 5 Tons.

6.16 SAFETY COMMITTEE

As per the BOCW, Safety Committee shall be constituted if there are more than five hundred or more construction workers are employed at any site. As per the Factories Act, 1948 it is for 250 workers. It shall be represented by equal number of representatives of employer and construction workers.

6.17 NIGHT WORK

Work conducted after sunset when only a fraction of total manpower is available

Section-A

Main Requirements

(Applicable in Full)



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7. HSE ORGANISATION

7.1 DEPLOYMENT

7.1.1 Minimum Number (Availability per contract / package per Working Shift)

7.1.1.1 HSE Officer	7.1.1.2 HSE Supervisor	7.1.1.3 HSE Steward / Observer
1 per 300 workers or part thereof as a minimum or as mandated by applicable legal requirements, whichever more stringent	1 per 150 workers or part thereof	1 per 50 workers or part thereof

7.1.1.4 The safety officers shall be engaged directly by the sub-contractor, whereas safety supervisors and safety stewards may be from the agencies engaged by the sub-contractor.

7.1.1.5 Deployment Plan:

- 7.1.1.5.1 These shall be minimum one HSE officer along with HSE supervisor and HSE steward in the aforesaid ratio for every shift for each unit of Boiler/ESP/Power House & TG/ Chimney/ Whole of Cooling Tower.
- 7.1.1.5.2 For Civil works and other BOP items, deployment shall be broadly as specified in the above table. But BHEL shall finally approve the deployment based on nature and volume of jobs, Risks and hazards associated etc.
- 7.1.1.5.3 The deployment plan of Safety manpower at various locations shall be submitted to BHEL for approval by subcontractor

BHEL reserves the right to demand more safety personnel than what is stipulated here and change the deployment pattern

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7.1.2 QUALIFICATION & EXPERIENCE

All Degrees/ Diplomas shall be recognized by State Council for Technical Education & Vocational Training (SCTE & VT) / All India Council for Technical Education (AICTE) / University

7.1.2.1 HSE Officer	7.1.2.2 HSE Supervisor	7.1.2.3 HSE Steward / Observer
A. i. Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, or Recognized diploma in any branch of Engg. or Tech with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than five years. ii. Recognized degree or diploma in Industrial safety iii. (Preferably) have adequate knowledge of the language spoken by majority of the workers at the construction site. Alternatively: B. Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (from any Indian institutes recognized by AICTE or State Council of Tech. Education of any Indian State) with practical experience of working in a building, plant or other construction works (as Safety Officer, in line with Indian Factories Act, 1958) for a period of not less than five years.	As a minimum, (s)he shall possess: A recognized graduation Degree in Science (with Physics & Chemistry) or a recognized diploma in Engg. or Tech. with: a. Minimum Two years of practical experience in construction work environment and b. Should possess requisite skills to deal with construction safety & fire related day-to-day issues.	As a minimum, (s)he shall possess: 1. Class XII pass certificate and 2. Trained in fire-fighting as well as in safety / occupational health related subjects, with: a. Minimum two year of practical experience in construction work environment and b. Should have adequate knowledge of the local language spoken by majority of the workers at the construction site.

7.1.3 HSE IN-CHARGE

In case there are more than one HSE Officers with any subcontractor, one of them, who is senior most by experience (in HSE discipline), may be designated as HSE In-Charge. Duties & responsibilities of such person shall be commensurate with that of relevant statute and primarily to coordinate with top management of Client and subcontractors.



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7.1.4 AVAILABILITY AND PENALTY FOR NON-DEPLOYMENT:

Subcontractor shall ensure physical availability of safety personnel at the place of specific work location including where Height Work Permit is required/granted. No work shall be started in any area until above safety personnel & concerned Site Engineer of subcontractor are physically deployed at site.

The Subcontractor shall prepare an organization chart identifying the areas of operations, responsibilities and reporting structure of all safety personnel and submit the same to BHEL.

The subcontractor shall deploy sufficient safety officers, supervisors and safety-stewards, as per numbers & qualifications mandated in this Section since mobilization of first batch of manpower and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty at following rates:

Non-deployment of HSE Officer	–	Rs 50000 per man-month
Non-deployment of HSE Supervisor	–	Rs 30000 per man-month
Non-deployment of HSE Steward	–	Rs 20000 per man-month

Penalty shall be collected for the period of non-availability of safety personnel after allowing a grace period of 15 days for finding a replacement.

7.1.5 QUALIFICATION OF CRANE & WINCH OPERATORS, DRIVERS etc.:

The Crane and Winch Operators, Drivers, Riggers and other professionals deployed shall be qualified and experienced, and have valid license for the class of vehicle / machinery as applicable. The subcontractor shall certify competence of these persons in writing as and when they join.

Crane/Winch operator should have certificate on subject course or owner experience certificate in letterhead.

7.1.6 In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act, 1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above clarifications, the same shall be followed.

7.1.7 **BILLING:** Deployment of Safety manpower as per this clause **shall be** a billable item.

7.1.8 The Subcontractor shall verify & authenticate credentials of the HSE personnel detailed in this Section and furnish Bio-Data/Resume / Curriculum Vitae of the safety personnel as above for BHEL / Owner's approval, at least 1 month before the mobilization. The Subcontractor, whenever required, shall arrange submission of original testimonials / certificates of their Safety personnel, to BHEL / Owner (for verification/scrutiny, etc.)

7.1.9 Prior approval of CVs by BHEL for Safety Officer and Safety Supervisor is mandatory, however BHEL has right to check suitability of Safety Stewards as well.



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7.2 HSE RESPONSIBILITIES

The subcontractors shall communicate the HSE responsibilities as indicated in this section to relevant employees in written Form and ensure awareness of the same

7.2.1 ALL EMPLOYEES

1. To be aware of, get involved in and ensure implementation of all HSE related Systems and Procedures including but not limited to:
 - a) BHEL HSE Management System including HSE Procedures and OCPs
 - b) Work Permit System
 - c) Emergency Preparedness Response Plans
 - d) Contractual HSE requirements
 - e) Legal Requirements
 - f) Penalty System
 - g) Training requirements
2. To ensure that the persons engaged in respective area follow the safety rules like using appropriate PPEs.
3. To keep track of repetitive minor or major incident observation/ report and submit to BHEL.
4. To prepare HIRA / JSA as required and submit to BHEL for verification.
5. To record all incidents including near miss and report to BHEL.
6. To adopt safe working practices at all times and act as role model for Safety
7. To take immediate corrective action actions in case any non-conformity is observed on product / process / system with respect to Occupational Health, Safety and Environment.
8. In case any particular activity / work has extremely high consequential risk or high environmental impact, same shall be brought to the notice of BHEL Package In-charge before starting the work.
9. To interfere/ stop work as & when identified unsafe.
10. To maintain & promote improved level of house-keeping all the time at site.
11. To support/co-operate with audit team members as & when safety audits are carried out.
12. To involve in investigation, if any incident occurs in his work area.
13. To participate in safety promotional programmes.
14. To attend the safety committee meeting, if member/ invitee
15. To ensure that only fit T&Ps and qualified persons are engaged for all activities.
16. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
17. Shall ensure that materials are not thrown from height. Cautions to be exercised to



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prevent fall of material from height.

18. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent authorities.

7.2.2 SITE IN –CHARGE & PACKAGE IN-CHARGES OF SUBCONTRACTOR

1. All requirements as per 7.2.1
2. **Shall ensure fulfillment of HSE requirements of BHEL contract as given in this document.**
3. Shall engage qualified safety manpower as per this document at all times.
4. Shall adhere to the rules and regulations mentioned in this document, practice very strictly in his area of work in consultation with his concerned engineer and the safety coordinator.
5. Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
6. Shall ensure that all the workers are engaged after undergoing induction training.
7. Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job. Shall ensure that no working men /women carry excessive weight more than stipulated in Factory Rule Regulation R57.
8. Shall ensure that provisions stipulated in contract Labor Regulation Act 1970, Chapter V C.9, canteen, rest rooms/washing facilities to contracted employees at site.
9. Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
10. Shall conduct Safety Walks and safety inspections, and act as a role model for Safety.
11. Shall ensure that Horseplay is strictly forbidden.
12. Shall ensure that adequate illumination is arranged during night work.
13. Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
14. Shall ensure display of adequate signage/posters on HSE.
15. Shall ensure that mobile phone is not used by workers while working.
16. Shall ensure conductance of HSE audit, mock drill, medical camps, induction training and training on HSE at site.
17. Shall ensure full co-operation during Client/External /Customer HSE audits.
18. Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
19. Shall ensure adequate valid fire extinguishers are provided at the work site.
20. Shall ensure availability of sufficient number of toilets /restrooms and adequate drinking water at work site and labor colony.
21. Shall ensure adequate emergency preparedness
22. Site In-charge also involve in the induction training so as to share knowledge of some incident and guide the worker to perform work safely.
23. Shall ensure power source for hand lamps shall be maximum of 24 v.
24. Shall ensure temporary fencing should be done for open edges if Hand – railings and Toe-



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guards are not available.

25. Shall be responsible for the periodic testing of T&Ps (winches / crane /hydra/tools/equipment so on.) and Pressure Vessels as per applicable codes and submit report to BHEL

26. Shall be member of site HSE committee and attend all meetings of the committee

7.2.3 HSE OFFICER OF SUBCONTRACTOR

1. All requirements as per 7.2.1
2. Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
3. Facilitate HIRA and Aspect/Impact Study in the area and ensure control measures.
4. Highlight the requirements of safety through Tool-box / other meetings.
5. Help concerned HOS to prepare Job Specific instructions for critical jobs.
6. Maintain record and conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
7. Advice & co-ordinate for implementation of HSE permit systems, OCPs & MPs.
8. Convene HSE meeting & minute the proceeding for circulation & follow-up action.
9. Plan procurement of PPE & Safety devices and inspect their healthiness.
10. Report to BHEL on all matters pertaining to status of safety and promotional programmes at site level.
11. Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
12. Facilitate administration of First Aid
13. Facilitate screening of workmen and safety induction.
14. Conduct fire Drill and facilitate emergency preparedness
15. Design campaigns, competitions & other special programs to promote safety in the workplace.
16. Notify non-conformance to safety norms observed during site visits / site inspections.
17. Recommend to Site In-charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
18. To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.

7.2.4 HSE SUPERVISOR OF SUBCONTRACTOR

1. All requirements as per 7.2.1
2. To assist Safety officer

7.2.5 HSE STEWARD / OBSERVER OF SUBCONTRACTOR

1. All requirements as per 7.2.1
2. To monitor allotted area for Safety violations, take required action and inform the concerned Safety Supervisor / Officer



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3. To assist Safety Officer and Safety Supervisor

7.2.6 HSE DOCUMENTS, SYSTEMS & PROCEDURES:

BHEL shall provide the subcontractor soft copies of all applicable HSE Procedures, Work Permits, Operational Control Procedures, Formats and any other instructions required for the implementation of HSE Management System before commencing operations at site. Subcontractor shall ensure the availability of the same.

7.2.7 IMPORTANT SITE EHS RULES RESULTING IN POSSIBLE EXPULSION FROM SITE

- ❖ Pre-employment Medical fitness is compulsory for all workers.
- ❖ EHS induction is mandatory for all new workers, supervisor and engineers, subcontractor managers etc.
- ❖ No visitors are allowed for site visit without safety induction.
- ❖ **Mandatory PPEs are**
 - ✓ Safety helmet,
 - ✓ Hard toe safety shoes,
 - ✓ Safety glasses
 - ✓ Reflective vest
 - ✓ Full/half sleeve (at least 4-inch-long) shirt
 - ✓ Full length pant/trousers for male and preferably Salwar Kameez for female
- ❖ **Zero Tolerance Safety Rules**
 - Violation of Fall protection / not anchoring & wearing safety harness above 6 feet,
 - Work without PTW
 - Child labor at site
- ❖ Restricted Use of cell phone in the working zone, operating vehicle/crane and at height. Encourage the people not to bring mobile phones inside the project premises.
- ❖ All vehicle being used at site to be in good condition in all respect.
- ❖ All electrical installations should have individual 30 mA ELCBs
- ❖ **Fighting:** Fighting anywhere on the Project site, including in parking areas, is strictly forbidden; violators will be barred from site and possibly subjected to legal action by local authorities.
- ❖ **Horseplay:** Running, pushing, practical jokes, and other horseplay are forbidden on the project site, including in parking areas.
- ❖ **Gambling:** Gambling on the Project site is not permitted
- ❖ **Alcohol & Drugs:** Intoxication or possession of alcohol or illegal drugs is strictly forbidden.
- ❖ **Weapons:** Possession of weapons on the Project site is strictly prohibited
- ❖ **Asbestos Material:** No asbestos material is allowed to use in Project Site
- ❖ **Hair:** Anyone working on site property with scalp hair longer than the top of his/her shoulders must tie-up and restrains the hair within the hard hat or coveralls, shirt or jacket collar.
- ❖ **Jewelry:** Loose necklaces, dangling earrings and bracelets shall not be worn when working on the Project site.



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- ❖ **Contact Lens:** While the site does not prohibit the wearing of contact lens, BHEL Project does not recommend their use.
- ❖ **Use of Empty Drums:** Use of empty drums to climb up and work is banned. Proper stool/ ladder/ stage required to be used if intended to work at height.
- ❖ Projects must comply in full with all applicable EHS local and national legislation. In circumstances where there is a conflict between local or national legislation and client requirements, the higher (more protective) requirement must prevail.
- ❖ All persons working on suspended scaffolds/cradles/gondolas must wear and use appropriate fall prevention equipment so as to protect them effectively at all times when they are at risk from any failure of any part of the scaffold/cradle/gondola, including its suspension system
- ❖ **Construction Trucks/Vehicles**
 - ✓ Vehicles must be equipped with proper seat belts for driver and passengers. All persons riding in vehicles must be advised of the requirement that seat belts are to be used whenever the vehicles are being operated.
 - ✓ The subcontractor is responsible for assuring the overall safe condition of vehicles assigned to its projects.
 - ✓ The speed limit on the project site is a maximum of 20 Km/hr.
 - ✓ Any person found operating or driving in a reckless or careless manner without regard for the safety of other employees or the general public will be immediately removed for the equipment they were operating and permanently prohibited from operating or driving any equipment on the project.
 - ✓ Any mobile equipment found to be unsafe or defective must be immediately removed from service and sent for repair or replacement. The subcontractor must ensure that the proper repairs have been made prior to putting the equipment back into service.
- ❖ **Construction Material Handling Heavy Equipment**
 - ✓ No equipment may be modified without equipment manufacturer's authorization.
 - ✓ Rollover Protective Structures must be provided for all equipment as required.
 - ✓ Seat belts must be provided and used by operators of all equipment that has a Rollover Protective Structure.
 - ✓ All bi-directional equipment must be equipped with an operable horn that must be used as needed when the machinery is moving in either direction.
 - ✓ All bi-directional equipment must also have an operable alarm in addition to the horn.
 - ✓ All equipment must be provided with a multi-purpose (class A, B, and C) fire extinguisher mounted in an easily accessible location.
 - ✓ Braking systems, controls, safety devices must be maintained in effective operating condition.
 - ✓ The operator must inspect the equipment at the beginning of the shift and test for acceptable



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- ✓ operation as per the equipment's manufacturer's instructions. Inspections must be documented and filed.
- ✓ Only qualified personnel must be allowed to operate equipment. Qualification must be documented and filed.

In case any worker violates any of the EHS rules identified by BHEL as above, following punitive action shall be taken:

First Offence	Second Offence	Third Offence	Fourth Offence
Oral warning	Gate Pass Punched	Gate pass punched (second)	Gate Pass Punched(third) and person sent out of the gate Photo of concerned worker to be displayed on Notice boards and prominent locations.

BHEL has the right to send out such person even earlier than fourth offence after considering the severity of the offence and/or the persons track record related to following general/EHS rules.

BHEL reserves right to expel even concerned supervisor or engineer as well in case of repeat of such cases of indiscipline.

Note:

The appellate authority in this case shall be the BHEL Site In-charge whose decision shall be final on the matter and binding on all parties.

8. PLANNING FOR HSE

A. Identifying Hazards / Risks & Aspects / Impacts and implementing control measures

- Subcontractor shall identify all OHS Hazards and Risks applicable to all activities in scope as per HSEP01: HSE Procedure for OHS Hazards and Risks, and plan & implement the required control measures.
- Subcontractor shall identify all Environmental Aspects and Impacts applicable to all activities in scope as per HSEP02: HSE Procedure for Environmental Aspects and Impacts, and plan & implement the control measures.

B. Register of Regulations:

Subcontractor shall prepare a register of applicable rules and regulations in the scope as per



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HSEP03: HSE Procedure for Register of Regulations and plan to ensure compliance.

The detailed plans and registers in A and B to be submitted to BHEL for review and approval within 60 days of start of work at site.

Note: The plans above are dynamic and shall be periodically reviewed as per BHEL requirement.

8.1 MOBILISATION OF MACHINERY / EQUIPMENT / TOOLS

1. Subcontractor shall furnish to BHEL, the Test Certificates issued by the jurisdictional competent persons of machinery, equipment and other T&Ps to be deployed at site, before deployment. BHEL reserves the right to disallow the same if found non-conforming to HSE / legal requirements
2. As a further measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and comply with legislative and owner requirement, inspection shall be arranged by in-house expert / competent authority (preferable) for acceptance. **(Report Format: HSEP:14-F15)**
3. **The equipment considered for this purpose shall include all those in the T&P list in the tender document. Conventional Hydra crane with carriage in front shall not be permitted. Other models like FX or TRX series of Escorts or equivalent shall be permitted.**
4. In the course of work, the subcontractor shall notify the BHEL Engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard.
5. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions.
6. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
7. Following items should be only ISO certified and not more than 2 yr. of purchase
 - i. Chain pulley block
 - ii. Wire rope slings
 - iii. Grinding machine and wheel and buffing wheel
 - iv. Gas cutting equipment
8. Following equipment should not be more than 5 Yr. old
 1. Welding machine
 2. Vibrator Machine
 3. Concrete cutter
 4. DB/Electrical panel
9. **Office Infrastructure** - subcontractor shall arrange a computer / Laptop with Network



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connection, chair and table for HSE Staff to facilitate HSE reporting and recordkeeping.

8.2 MOBILISATION OF MANPOWER

1. As a measure to ensure that manpower being mobilized to the construction site is fit and competent for safe working, screening arrangement shall be made by the sub-contractor to ensure fulfillment of contractual as well as legislative requirement by:
 - i. Ensuring the required qualification/ training/ certification/ license and experience for the job as per Section 7 of this document & applicable legal requirements
 - ii. **Medical Checkup:** Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed. (Record: Format No. HSEP14:F02). For height workers, height phobia test to be carried out as qualification criteria.
 - iii. **Induction Training:** Induction training of all workers to be ensured as per clause 9.1 and HSEP04: *HSE Procedure for Training & Awareness* (Record: Format No. HSEP14:F03)

Only on successfully meeting above criteria, permanent gate passes to be issued.

2. The subcontractor shall strictly adhere to the maximum daily working hours and other requirements as per applicable laws and shall not engage any employee below 18 years of age.
3. The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.
4. Ensure that the regulatory requirements of excessive weight limit (to carry / lift / move weights beyond prescribed limits) for male and female workers are complied with.
5. System for Issue of Gate Passes to authorized personnel only shall be ensured at site
6. The subcontractor shall keep accurate and updated records of all manpower preferably in soft form
7. The subcontractor shall ensure appropriate infrastructure for workers as per Clause 8.4.

8.3 PROVISION OF PPEs

1. Adequate numbers of Personnel Protective Equipment (PPEs), will be made available at site & their effectiveness and regular use by all will be ensured
2. The PPEs shall conform to the relevant standards as listed in Annexure 02, and bear ISI mark.
3. The following matrix recommends usage of minimum PPEs against the respective job. For details, the respective OCPs to be referred.



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Sl. No	Type of work	Suggested PPEs
1	Work at height	Double lanyard full body harness with rope grab (as applicable), retractable Fall arrestor (specific cases), Safety nets (single / double)
2	Concrete and asphalt mixing	Nose mask, hand glove, apron, gum boot, goggles
3	Welders/ Grinders/ Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders, safety goggles
4	Stone/ concrete breakers	Ear muffs, safety goggles, hand gloves
5	Electrical Work	Rubber hand glove, Electrical Resistance shoes, Arc-flash resistant suit.
6	Insulation Work	Respiratory mask, Hand gloves, safety goggles
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves, safety goggles
8	Painting	Plastic gloves, Respirators (particularly for Spray painting)
9	Radiography	As per BARC guidelines
10	General	Helmets, Safety Shoes Reflective vests, ear plugs, nose masks, safety goggles

4. The exact PPEs required for a particular task shall be chosen to ensure there are multiple lines of defense against accident or injury. All applicable safety precautions for a job shall be ensured notwithstanding the duration or perceived importance of the task.
5. Additionally, the BHEL safety officer may demand additional PPEs based on specific requirement
6. The applicability of PPEs shall be as per the concept of Hierarchy of controls, i.e.:
Elimination->Substitution->Engineering Controls->Administrative Controls-PPEs
7. Relying solely on PPEs without other applicable controls to be strictly avoided.
8. The issuing agency shall maintain register for issue and receipt of PPEs (Format No. HSEP: 14-F06A). All the PPEs shall be checked for quality before issue and the shall be periodically re-checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be replaced.
9. The body harnesses shall be serial numbered.
10. All worker should wear reflecting Jacket during both shift Day/Night.
11. Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public
12. Besides the PPEs mentioned above, the persons shall use helmet, safety shoe and reflective vest at all times. The visitors shall use Helmet and any other PPEs as



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deemed appropriate for the area of work.

13. Following color scheme for Helmets to be maintained:

- a. Workmen: Yellow
- b. Safety staff: Green or white with green band
- c. Electrician: Red
- d. Others including visitors: White

14. The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front along with the person's gate pass no. & blood group. An awarded worker shall have reflective logo

8.4 ARRANGEMENT OF INFRASTRUCTURE

The subcontractor is responsible for ensuring and maintaining the required HSE infrastructure at site as described in this Section

8.4.1 DRINKING WATER

1. Drinking Water Storage Tanks shall be provided and maintained at suitable places at different elevations / locations to ensure easy accessibility. The tank/container shall be kept on a platform at an elevation of at least 2 feet and should be covered:



2. **Construction and Quantity:** The design of Drinking Water Storage Tank (DWST) shall be submitted to BHEL for approval prior to initiating construction. Provision of 5 liter water daily for each worker to be maintained.
3. **Labelling:** DWST should be labeled as "Drinking Water". Date of last cleaning, next due date shall be indicated on the container besides Date of source testing as per IS 10500.
4. Cleaning of the DWST shall be ensured at least once in a week. Mild cleaning detergents as used for cleaning vessels shall be applied and scrubbers (3M or equivalent) shall be used for removing scales and deposits on the inside surface. The tank shall be thoroughly cleaned with potable water only before it is refilled.
5. Suitability of the water source should be tested as per IS10500.
6. For all tanks containing water unsuitable for drinking, prominent "Do Not Drink" signage shall be pasted in English, Hindi and local language.
7. In Hot Work and other critical areas, drinking water shall be made available near the activity
8. Provision of supplying drinking water to height workers and those working in difficult to reach



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areas shall be made available through dedicated personnel.

- 8.4.2 **PROVISION OF LATRINES AND URINALS AT SITE** (Ref: Interstate Migrant Workmen (Regulation & Employment and Act, 1979) read with The Inter-State Migrant Workmen (Regulation of employment and conditions of service) central rules, 1980 (PI refer rule no. 42)

LATRINES

1. Latrines shall be provided in every establishment on the following scale, namely: -
 - a. Where females are employed, there shall be at least one latrine for every 25 females;
 - b. Where males are employed, there shall be at least one latrine for every 25 males:

Provided that where the number of males or females exceeds 190, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 30 thereafter
2. Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.
3. Where workers of both sexes are employed there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers '**For Men Only**', or '**For Women Only**', as the case may be.
4. The notice shall also bear the figure of a man or of a woman, as the case may be.

URINALS

5. There shall be at least one urinal for male workers up to fifty and one for female up to fifty employed at a time:
6. Provided that where the number of male or female workmen, as the case may be, exceeds 500 it shall be sufficient if there is one urinal for every fifty females up to the first 500 and one for every 100 or part thereof thereafter.
7. The urinals shall be designed and located so as to ensure privacy.
8. In case a structure encompasses multiple floors, urinals shall be provided suitably for quick access
9. The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment.
10. The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
11. Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the public health authorities.
12. Water shall be provided by the means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

8.4.3 WASHING FACILITIES

1. In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
2. Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic



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condition and dully illuminated for night use.

3. Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

8.4.4 PROVISION OF REST SHELTER FOR WOKERS

Proper Sheds & Shelters big enough to accommodate all possible workers shall be provided for workers to rest during break. Taking rest at height, in activity area and other hazardous locations shall not be allowed.

The drawing of such sheds shall be submitted to BHEL for approval before construction.

8.4.5 MEDICAL FACILITIES

Refer Section B for applicability of requirements pertaining to Clause 8.4.5.1

8.4.5.1 MEDICAL CUM FIRST-AID CENTER

- a) A medical center shall be setup at site with basic facilities for handling medical emergencies. The medical center shall be developed independently by BHEL/an agency as specified in the contract and run jointly by all agencies on proportionate sharing basis as stipulated in the contract.
- b) A qualified medical professional, not less than MBBS, shall be deployed at medical center as stipulated in the contract.(Part-time or full time as decided at the site).
- c) There shall be a full-time trained first aider and a nurse. Depending upon the working hours at the site, First-aider shall be deployed accordingly.
- d) The center shall have all articles as per Schedule IV of BOCW(Central) Rules'1998. In addition,, one Stokes basket stretcher shall be available.
- e) An ambulance shall be deployed for every 1000 persons along with trained driver and accessories as per schedule V of Central BOCW Rules'1998. Depending upon the working hours at the site, First-aider shall be deployed accordingly.
- f) The center shall be adequately equipped for Resuscitation, Immobilisation, Dressing, dealing with poisoning cases including snake and insect-bites and sufficient stock of emergency medicines as prescribed by the qualified medical professional as per point (b)

8.4.5.2 IMPORTANT

- g) If there is no specific mention of responsibility of deployment or setting up of any of the above facilities and operating expenses thereof, BHEL site management shall have the liberty to give this responsibility to any of the contractors on cost sharing basis.
- h) Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste –Management and Handling Rules, 1998)
- i) Every injury shall be treated, recorded and reported.
- j) All First Aid injuries shall be recorded as per Format No. HSEP:14-F17
- k) List of qualified first aiders and their contact numbers to be displayed at conspicuous places.



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8.4.5.3 FIRST AID

A. In addition to 8.4.5.1 &2, The subcontractor with Boiler&ESP, TG, Civil shall:

1. Provide necessary first aid facilities for every work place.
2. Ensure availability of qualified First-aiders throughout the working hours.
3. Every injury shall be treated, recorded and reported.
4. Refresher course on first aid shall be conducted as necessary.
5. List of qualified first aiders and their contact numbers to be displayed at conspicuous places.
6. All First Aid injuries shall be recorded as per Format No. HSEP:14-F17

B. FIRST AID BOX

1. The first aid box shall be maintained by first aider who shall always be readily available during the working hours of the work place.
2. **Details of First Aid Box:**
 - a) Details of contents of first aid box is given in **Annexure 03**. A slip of contents shall be pasted on the First Aid Box with following details:

Name, Quantity, Expiry Date, Checked by...

- b) First Aider's name and contact no to be displayed on the box.
 - c) The first aid box shall be distinctly marked with a Green Cross on white background.
 - d) The box shall be properly secured with lock & key to avoid misuse
7. The first aid boxes should be placed at various locations so as to make them available within easy reach of hazardous activities and at the quickest possible time.
8. The subcontractor shall ensure that the Supervisors and Engineers are adequately trained for attending to any emergency.
9. Monthly inspection of First Aid Box to be conducted by the subcontractor as per Format no. HSEP:14-F01

8.4.5.4 HEALTH CHECK UP

The persons engaged at the site shall undergo health checkup as per the **Format no. HSEP:14-F02** before induction. The persons engaged in the following works shall additionally undergo regular health checkup using same Format at least once in a year:

Height workers	Drivers/crane operators/riggers	Confined space workers
Shot/sand blaster	Welding and NDE personnel	Any person referred by BHEL

8.4.5.4.1 HEIGHT PHOBIA TEST

1. The persons engaged in working at heights (above 2 meters) to be assessed for Height Phobia and associated conditions.
2. Such workers are to be allowed only on successful completion of this test, otherwise they shall be allocated ground based jobs. IDs / Height passes shall be issued to such workers.

8.4.6 PROVISION OF CANTEEN FACILITY



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Minimum or better facilities to be ensured as per BOCW (Rule 244) / Factories Act, specially taking care of the following:

1. Canteen facilities shall be provided for the workmen of the subcontractor inside the project site.
2. Proper cleaning and hygienic condition shall be maintained.
3. Proper care should be taken to prevent biological contamination.
4. Adequate drinking water should be available at canteen.
5. Fire extinguisher shall be provided inside canteen.
6. Regular health check-up and medication to the canteen workers shall be ensured.
7. Canteen waste to be disposed of in compliance with law
8. Domestic LPG cylinder shall not be used
9. Canteen should be periodically inspected using standard checklist finalized along with BHEL

8.4.7 PROVISION OF ACCOMMODATION / LABOR COLONY

1. The subcontractor shall provide to every workman (within fifteen days of the commencement of the employment of migrant workmen):
 - a) In case he is accompanied by any other member of his family, a suitable barrack so as to accommodate one room having at least a floor area of 10 square meters, a verandah and adequate additional covered space for cooking food as well as one common sanitary latrine, one common bathroom for every three such quarters; and
 - b) In case he is unaccompanied by any other member of his family, a suitable barrack so as to accommodate not more than ten such migrant workmen, having at least a floor area of not less than 6.5 square meters for each such migrant workman making use of the barrack, a verandah and adequate additional covered space for cooking food as well as one common sanitary latrine and one common bathroom for every ten such migrant workmen
2. Every quarter and the barrack shall be so constructed as to afford adequate ventilation, protection against heat, wind, rain and shall have smooth, hard and impervious floor surface.
3. The quarters or the barracks, as the case may be, shall be at a convenient distance from the establishment and shall have adequate supply of wholesome drinking water.
4. The area in which the quarters and/or barracks are located as well as the latrines and bathrooms provided therein shall be kept in a clean and sanitary condition at all times.
5. Regular housekeeping of the labor colony shall be ensured.
6. Availability of Bathing/ washing bay to be ensured



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7. Room ventilation and safe electrification to be ensured
8. MSDS of LPG shall be put up prominently and shall be included in the induction training also.
9. The labor colony shall be secure so that only authorized persons have access to it.
10. Availability of local market to be ensured by the Sub-contractor
11. A "Suggestion Register" shall be made available at the labor colony for workers. The feedback shall be reviewed on weekly basis and acted upon.
12. Labor colony shall be inspected fortnightly by Subcontractor Safety Officer & HR executive, and report submitted to BHEL as per Format No. HSEP:4-F16
13. **Facility of Crèches** – to be provided wherein more than fifty female workers are deployed
14. Provisions of Clause 8.4.1, 8.4.2 and 8.4.3 shall be applicable on labor colony as well

8.4.8 PROVISION OF EMERGENCY VEHICLE

Dedicated emergency vehicle shall be made available at workplace by subcontractor for evacuation of victim from site.

However, Ambulance shall be used exclusively for transporting victim to hospital

8.4.9 PEST CONTROL

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labor colony and stores by the subcontractor.

8.4.10 SCRAPYARD

1. Scrapyard shall be developed by subcontractor to store metal scrap, wooden scrap, waste, hazardous waste.
2. Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

8.4.11 ILLUMINATION

1. The subcontractor shall provide adequate lighting facilities e.g. flood lighting, hand lamps, area lights etc. to ensure adequate lighting at all work places & their approaches including passage ways as per IS: 3646 (Part-II) at all times. Indicative recommended values are given below:

S. No.	Location	Lux Level
A.	Construction Site	
1	Outdoor areas like store yards, entrance and exit roads	20
2	Platforms	50
3	Entrances, corridors and stairs	100
4	General illumination of work area	150
5	Rough work like fabrication, assembly of major items	150



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6	Medium work like assembly of small machined parts	300
7	Fine work like precision assembly, precision measurements etc.	700
8	Sheet metal works	200
9	Electrical and instrument labs	450
B.	Office	
1	Outdoor area like entrance and exit roads	20
2	Entrance halls	150
3	Corridors and lift cars	70
4	Lift landing	150
5	Stairs	100
6	Office rooms, conference rooms, library reading tables	300
7	Drawing table	450
8	Manual telephone exchange	200

In case any area is not mentioned above, the applicable illumination for the same shall be specified by BHEL based on applicable standards and international norms

1. Level of illumination shall be checked periodically using a calibrated lux meter and recorded for each work area on minimum weekly basis as per Format No. HSEP:14-F21
2. Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
3. Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
4. Emergency lighting provision for night work shall be made to minimize danger in case of main supply failure.

9. HSE TRAINING & AWARENESS

9.1 HSE INDUCTION TRAINING

1. All persons entering into project site shall be given HSE induction training before being assigned to work, which shall be imparted through audio-visual medium and shall be of minimum 2-hour duration.
2. Any single trainee batch size should not exceed 40.
3. Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
 - i. They must arrive fully dressed in safety wear & gear to attend the induction.
 - ii. Any one failing to conform to this safety wear& gear requirement shall not qualify to attend.
4. In-house induction training subjects shall include but not limited to:



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- i. Briefing of the Project details and importance of employee for the project and for the nation.
 - ii. Safety related cardinal rules, objectives and targets.
 - iii. Site HSE rules.
 - iv. Site HSE hazards and aspects.
 - v. First aid facility.
 - vi. Emergency Contact No. and procedures
 - vii. Details of Fire prevention and emergency response systems & procedures at site.
 - viii. Requirement of incident / near miss reporting by all.
 - ix. Accident case studies
 - x. Rules to be followed in the labor colony (if applicable)
5. Evaluation to be carried out after training and induction training to be repeated in case of failure of participant in evaluation
6. On completing subcontractor's in-house HSE induction, each employee shall sign an induction training form (format no. HSEP: 14-F03) to declare that he had understood the content and shall abide to follow and comply with safe work practices. They may only then be qualified to be issued with a personal I.D. card, for access to the work site (provided Health Checkup is over).

9.2 HSE TOOLBOX TALK

1. HSE Tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups daily prior to the start of work. The agenda shall consist of the following:
 - i. Visual checkup of workers regarding health, any signs of fatigue, intoxication etc.
 - ii. Details of the job being intended for immediate execution.
 - iii. The relevant hazards and risks involved in executing the job and their control measures.
 - iv. Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
 - v. Recent non-compliances observed.
 - vi. Appreciation of good work and warning for any unsafe acts done by any person.
 - vii. Any doubt clearing session at the end
2. Record of Tool box talk shall be maintained as per Format no. HSEP:14-F04

9.3 TRAINING ON HEIGHT WORK

Due to the large percentage of fall from height in incidents, training of minimum 2-hour duration on height work shall be imparted to all height workers by in- house / external faculty for every batch of new inductees. The training shall include following topics:

1. Inspection of work area, access and egress w.r.t height hazards
2. Use of PPEs; use of fall arrester, retractable fall arrester, life line, safety nets etc.
3. Safe climbing through monkey ladders.
4. Inspection of PPEs.
5. Medical fitness requirements.
6. Mock drill on rescue at height.
7. Dos & Don'ts during height work.



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8. Accident case studies

In case, above is organized by BHEL, proportionate cost shall be borne by subcontractors

9.4 HSE TRAINING DURING PROJECT EXECUTION

1. HSE training shall be arranged by subcontractor as per the need of the project execution and recommendation of BHEL.
2. The topics of the HSE training shall be as follows but not limited to:
 - i. Hazards identification and risk analysis & Identification of Environmental Aspects / Impacts
 - ii. Work Permit System
 - iii. Learning from past incidents
 - iv. First aid, Firefighting & Fire-warden training
 - v. EMS and OHSMS
 - vi. T & Ps fitness and operation
 - vii. Electrical & Chemical safety
 - viii. Welding, NDE & Radiological safety
 - ix. Material handling.
3. Safety awareness and on-the-job training programmes shall be carried out at site for all workers periodically. Periodicity to be decided by BHEL but shall be minimum once in six months
4. Penalty Training – In case of any incident, the involved person, group or agency shall undergo a penalty HSE training for a minimum period of 2 hrs or as decided by BHEL.
5. In case it is not possible to provide training to all workers at once, same shall be imparted in Batch-wise manner so as to cover all workers with specified periodicity.
6. An up-to-date record to be maintained with attendance of participants and trainers preferably in soft copy as per Format No. HSEP:14-F03.
7. Every employee of agency should be provided at least 2 hr. safety training in every month.

In case, above is organized by BHEL, proportionate cost shall be borne by subcontractors

10. HSE PROMOTION: SIGNAGE, POSTERS, COMPETITION, AWARDS ETC

10.1 DISPLAY OF HSE POSTERS AND BANNERS

Site shall arrange appropriate posters, banners, slogans in local/Hindi/English languages at work place.

10.2 DISPLAY OF HSE SIGNAGE

Appropriate HSE signage shall be displayed at the work area to enhance awareness of HSE workmen and passersby about the work going on and do's and don'ts to be followed.

10.3 COMPETITIONS ON HSE, AWARDS & REWARDS



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1. Subcontractor shall arrange competitions (slogan, poster, essay etc.) on HSE for workers and employees from time to time (Safety day, World Environment Day etc. minimum one such function each month) and winners will be suitably awarded during the functions.
2. Subcontractor shall identify workers following good HSE practices and reward them from time to time as encouragement to follow good HSE practices.
3. Alternatively, if a common monthly function is organized at site, subcontractor shall participate in the same so that a minimum frequency of one such function per month is maintained.

10.4 HSE AWARENESS PROGRAMMES

Subcontractor shall arrange HSE awareness programmes periodically on different topics including medical awareness for all personnel working at site from time to time including officials involved in execution.

11. HSE COMMUNICATION AND PARTICIPATION

11.1 MONTHLY HSE REPORTING

1. HSE activities shall be reported to BHEL monthly as per Format no. HSEP: 14-F05. The reporting medium can be hard/soft as per BHEL requirement.
2. The period of reporting shall be 25th of the preceding month to 24th of the present month and report shall be submitted by the end of the calendar month or as conveyed by BHEL.
3. BHEL can modify the reporting requirements as per requirement

11.2 HSE EVENT REPORTING

1. Important HSE events like HSE Training, Mock / Fire/Rescue Drills, Medical camp etc. organized by subcontractor shall be reported to BHEL in detail with photographs
2. Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported likewise.

11.3 HSE INCIDENT REPORTING

All incidents (near misses, property damage, first-aid cases, minor, major and fatal incidents) shall be reported to BHEL as they happen through SMS and Hard/Soft copy as per Format No. HSEP: 14-F22

11.4 HSE SUGGESTIONS

All workers and employees to be encouraged to provide suggestions for improvement in



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Health, Safety & Environment at site. The suggestions to be recorded in a "Suggestions Register". Suggestions to be reviewed and those having potential of significant beneficial effects are to be implemented, and recognition / award to be given to the individual.

11.5 CLIENT COMMUNICATON

All HSE related communication from BHEL, customer / external statutory and regulatory agencies to be handled on priority. The relevant issues to be resolved in expeditious manner

11.6 RECORDS OF COMMUNICATON

Records of all communication and their responses as detailed above shall be maintained by subcontractor in hard / soft copy and produced when required.

12. INCIDENT REPORTING, INVESTIGATION & CORRECTIVE ACTION

1. A conducive environment for reporting of near misses and other incidents shall be developed at site through system of rewards etc.
2. Priority to be given to ensure medical treatment of the victim. Victim to be given immediate First Aid and transported to Medical Facility in a well-equipped Ambulance
3. All incidents, as they happen, shall be reported to BHEL immediately over phone/SMS/Whatsapp/mail and then in Format No. HSEP:14-F22 within 24 hrs. of occurrence. Immediate SMS shall be sent to concerned Package In-charge with following Details:

- a. Project & Customer Name:
- b. Subcontractor Name & Scope:
- c. Incident Area:
- d. Number of Injured / Fatalities:
- e. Date & Time of Accident:
- f. Incident Description in few lines:

No incident shall be hidden

4. Records of all incidents shall be maintained in hard / soft copy as per Format No. HSEP:14-F23.
5. For all incidents:
 - a. The incident area, equipment / tools involved, documents & records etc. shall be maintained as-it-is pending investigation
 - b. Root Cause Analysis (RCA) to be conducted and corresponding Corrective / Preventive Action (CAPA) ensured
 - c. Responsibility shall be assigned and action to be taken against the erring individual
 - d. In case presence of manufacturer of the equipment involved is required, subcontractor will arrange the same



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- e. All expenses pertaining to the RCA / CAPA shall be borne by the subcontractor
6. RCA and CAPA reports of all near misses and minor injuries shall be identified and report submitted to BHEL within 7 days of occurrence.
7. For incidents, where worker does not resume duty within 48 hours of occurrence, Joint investigation along with BHEL shall be conducted within 7 days, and CAPA ensured.
8. Corrective action shall be immediately implemented at the work place. Work shall be put on hold in the area till corrective actions are verified by BHEL
9. All incidents, their Root Cause Analyses and Corrective actions shall be recorded, and analyzed so as to identify weak areas and actions to be taken to reduce the incident trend.

13. SAFETY DURING WORK EXECUTION

13.1 HSE SYSTEMS AND PROCEDURES

BHEL Power Sector HSE Management System (HSEMS) shall be referred for controlling hazards, aspects, and carrying out HSE activities at site. Subcontractor shall get familiar with and follow the HSEMS documents provided by BHEL which include the follows:

13.1.1 HSE PROCEDURES:

All HSE Procedures defined in HSEMS, as referred in various sub-clauses of this Section as given in Annexure 01

13.1.2 PERMIT TO WORK (PTW) SYSTEM

1. The following activities shall be carried out by the subcontractor strictly after obtaining Permit to Work (PTW) from BHEL
 - i. General Work Permit (**Format No. HSEP14-FP01**)
 - ii. Height working (**Format No. HSEP14-FP02**)
 - iii. Hot working (**Format No. HSEP14-FP03**)
 - iv. Confined space Work (**Format No. HSEP14-FP04**)
 - v. Excavation more than 2-meter depth (**Format No. HSEP14-FP05**)
 - vi. Radiography / Radiation Work (**Format No. HSEP14-FP06**)
 - vii. Heavy / Complex / Critical Lifting Activity (**Format No. HSEP14-FP07**)
 - viii. Night / Holiday Work (**Format No. HSEP14-FP08**)
 - ix. Material Loading / Unloading Permit (**Format No. HSEP14-FP09**)
 - x. Grating / Safety Net / Safety Facility Removal Permit (**Format No. HSEP14-FP10**)
 - xi. Live Electrical Maintenance etc. - Lockout / Tag (**Format No. HSEP14-FP07**)



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2. The above list is not exhaustive. BHEL reserves right to introduce additional Permits or modify requirements for usage of existing Permits. The conditions for using the Permit are specified in the Format (General Requirements).
3. Where customer is having separate Work Permit System the same shall be followed in conjunction to ensure all activities and checks are covered in all systems.
4. Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work along with Job Hazard Analysis.
5. All Permit signatories shall physically visit the work area and check that all the safety control measures necessary for the activity are in place. Only then the permit shall be issued.
 - a. Signatory shall physically visit the area of work and ensure all required safeguards before signing the Permit
 - b. Signatory shall periodically visit the area to confirm the availability of required safeguards throughout the currency of the permit
 - c. In case any Permit requirement is not available, work will be stopped till it is made available
6. Permit holder shall implement and maintain all control measures during the period of permit. The permit will be closed after completion of the work and submitted to BHEL.

13.1.3 Operational Control Procedures

1. All applicable OCPs (Operational Control Procedures) as identified from outcomes of HIRA, Aspect / Impact studies and BHEL inputs will be followed by subcontractor. This will be done as part of normal scope of work.
2. Illustrative list of such OCPs is given in Table 13.1 and same will be made available to subcontractor by BHEL during work execution at site.
3. In case any other OCPs are required or existing ones need to be modified in order to control the risks / impacts associated with any activity during the execution of work subcontractor shall prepare / update and follow the same with information to BHEL.

Table 13.1 - LIST of Reference OCPs

No.	Topic	No.	Topic	No.	Topic
0	General Safety	20	Oil flushing	40	Gas distribution test
1	Handling of chemicals	21	Alkali boil out	41	Cleaning of Hotwell / Deaerator
2	Electrical safety	22	Steam blowing	42	Electrical maintenance
3	Energy conservation	23	Working in confined area	43	O&M of control of AC plant & system
4	Welding and gas cutting operation	24	Operation of passenger lift, material hoists & cages	44	Material preservation
5	Fire safety	25	Vehicle/ Crane maintenance	45	Electro-resistance heating
6	Use of hand tools	26	Radiography	46	Blasting
7	First aid	27	Waste disposal	47	Transformer charging



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8	Food safety at canteen	28	Handling & storage of mineral wool	48	Handling of battery system
9	Use of cranes	29	Working at night	49	DG set
10	Storage and handling of gas cylinders	30	Computer operation	50	Sanitary maintenance
11	Manual arc welding	31	Storage in open yard	51	Piling rig operation
12	Use of helmets	32	Drilling, reaming and grinding(machining)	52	Passivation
13	Good house keeping	33	Stress relieving	53	EDTA Cleaning
14	Safe excavation	34	Hydraulic test	54	Chemical cleaning of Pre boiler system
15	Working at height	35	Trial run of rotary equipment	55	Boiler Light up
16	Filling of hydrogen in cylinder	36	Batching	56	Rolling and Synchronization
17	Illumination	37	Cable laying/tray work	57	Loading of Unit
18	Handling and erection of heavy metals	38	Spray insulation	58	Air compressor
19	Acid cleaning	39	Compressor operation	59	Hydra Operation

13.2 ACTIVITY SPECIFIC REQUIREMENTS FOR SAFETY:

All Work shall be commenced only after taking the respective Work Permits (as applicable) and precautions as per relevant codes, systems and OCPs in order to ensure safe conditions throughout the duration of work. Additionally, activity specific safeguards as per this section shall be followed.

13.2.1 WORK AT HEIGHT:

1. All work at height above 2 meter above ground level without complete platforms, handrails and other related fall protection shall require a work permit in the prescribed form. This shall require approval by the competent authority. The HSE officer of sub-contractors shall follow the checklist religiously by physically verifying the condition of the work area before recommending for approval.
2. Prior to the start of work at elevation, the HSE Officer involved with the work must meet the work supervisor to review the scope of work, and must review all the possible fall hazards and effective safety responses. The evaluation / analysis must be documented and kept on file and on site by the HSE Officer.
3. Whenever a fall hazard or other exposure exists for working at heights more than 2.0m/6ft, the nature and scope of work will be evaluated for conditions and environmental factors before selecting the appropriate fall protection system (active, passive or a combination of measures, as appropriate).



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4. All Engineering and Administrative Controls including barricading, safe platform, Safety Nets etc. shall be made available at work location. Under no circumstances, there shall be total reliance on PPEs only

5. Safety Nets

- a. Contractor shall maintain sufficient stock of Safety Nets for deployment
- b. Safety Nets as per IS: 11057:1984 should be used extensively for prevention / arrest men and materials falling from height.
- c. The safety nets shall be fire resistant, duly tested and shall be of ISI marked.
- d. Safety Nets shall be deployed below all platforms where height work is envisaged. Duration of work, delay shall be no excuses for non-installation of Safety Net
6. Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
7. Monkey Ladder shall be fitted with cages. Rope ladder should be discouraged.
8. In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
9. In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
10. For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure along with separate fall arrestor.
11. The procedures for the safety response to identified fall hazards developed and rescue plans must be reviewed with all individuals exposed to the hazards.
12. The HSE Officer must establish an inspection process of fall protection systems. Some equipment requires documented inspections by its manufacture on a regular schedule. Such equipment must have evidence of the inspection and re-certification process on it. This information must be reviewed before the equipment is actually used. Individuals must visually inspect the fall protection equipment before each use. Failure to complete this inspection process could result in serious injury or death.
13. Immediately remove from service any fall protection equipment that is identified as defective, damaged, or has been subjected to an impact. Damaged fall protective equipment must be destroyed to prevent re-use and not be discarded into trash containers, as the worn or damaged equipment could be unintentionally re-used.
14. Aerial lifting devices, excluding scissor lifts require the use of full body harnesses and lanyards in any elevated position.



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13.2.1.1 Personnel fall protection system must include:

a. Safety Harness

All height workers must use Safety harness with double lanyards. The primary lanyard is never unhooked until the secondary lanyard is secure. The design of the working platform should be such that **under no circumstances, worker should have both lanyards unhooked while at height.**

b. Lanyard

- i. The type of work and the environment conditions determine lanyard and lifeline selection. If welding, chemical cleaning that may damage lanyards, connectors or lifelines, sandblasting, etc., either protect the components or use more appropriate type of system.
- ii. Lanyards and lifelines must incorporate, or be used with, an appropriate deceleration (shock absorbing) device. Deceleration devices include rope grabs, rip-stitch lanyards, specially woven lanyards, tearing, or deforming lanyards, automatic self-retracting lifelines and lanyards which dissipate or limit the energy imposed on the employee during fall arrest.
- iii. Once in use, the system's effectiveness is to be monitored. In some cases, a program for cleaning and maintaining the system may be necessary. Lanyard and lifelines must use locking snap hooks only and under no circumstances must two lanyard snap hooks be connected.

c. Lifeline

All lifelines in general are to be made of min 8mm dia steel rope (plastic coated) and tied to columns with 3 clamps at each end. Wherever columns are not available to tie the lifelines, the vertical posts as per the design below are to be provided after carrying out drop load test initially. A load of 240kg to be dropped off the mid-point of lifeline in this test.

d. Lifeline Post

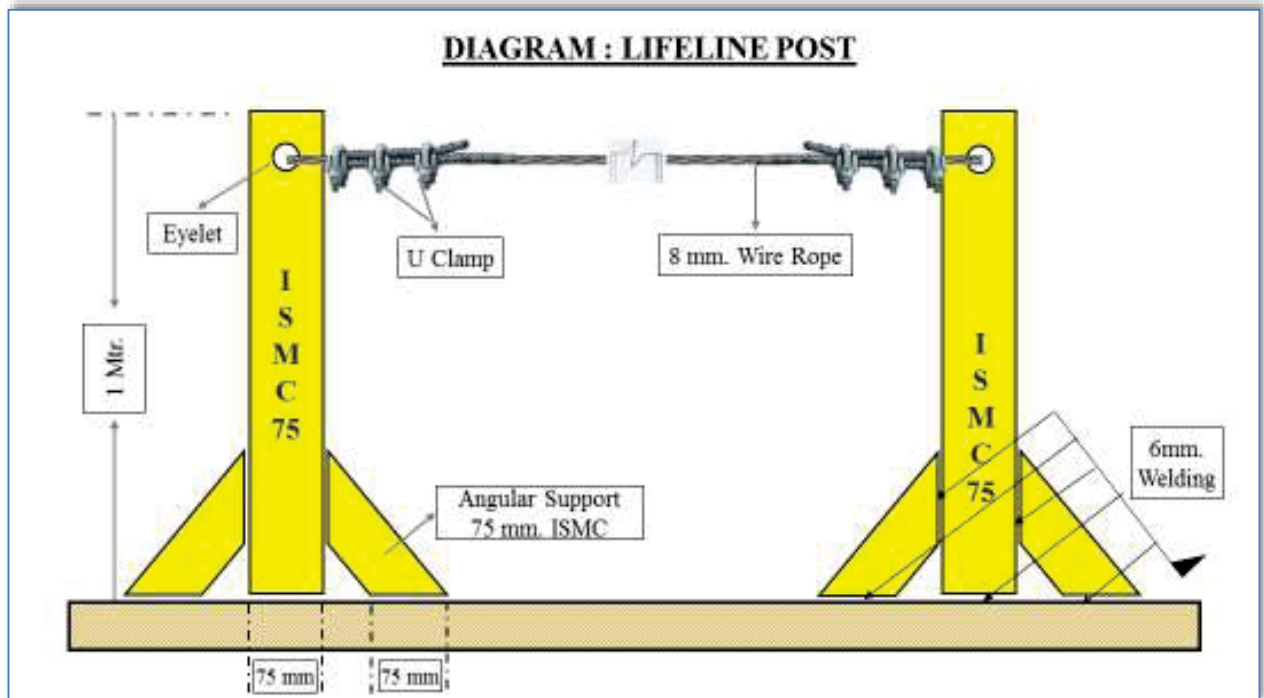


Fig. 13.2.1.1 Lifeline Post

- i. The support at vertical post shall be fixed at end-to-end. The maximum length of one end to another end shall be 18 meters
- ii. If the length of a lifeline is more than 18 meters, then intermediate vertical post(s) are to be used. Such intermediate post(s) will act as supports and the lifeline rope should simply pass through the eyelets (holes) of such supports without being anchored
- iii. The lifeline need not be wrapped / clamped to any intermediate post
- iv. Such intermediate posts must be used at an interval of every 18 meters
- v. The post(s) in which the original lifeline is to be installed should be capable of sustaining a tensile stress of 2268 Kgs
- vi. In a horizontal lifeline installation, maximum allowable sagging is 500-600 mm
- vii. For a single spun lifeline, no more than 2 persons are allowed to work; for more than two workers, another lifeline should be installed
- viii. Horizontal lifeline should be so installed that it does not impede safe movement of workers
- ix. All the installation work must be carried out by competent person with adequate knowledge

13.2.1.2 Working Platform

1. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width, which shall not be less than 750 mm and be suitably fenced.

2. Precautions against the fall of Materials, Persons and Collapse of Structures



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- i. Every opening in the floor or a building or in a working platform shall be suitably barricaded to prevent the fall of persons by providing suitable fencing or railing whose minimum height shall be 90 cm.
- ii. Adequate precautions should be taken such as the provision of fencing, or barriers to protect any person who might be injured by the fall of materials, or tools or equipment being raised or lowered. Cradle may be used for lifting materials - however this shall be made of MS angles and flats only and duly certified by the HSE officer. Operators may also use designed containers for lifting small tools.
- iii. Guardrails (including scaffolding) erected over/adjacent working areas must have the guardrails screened (opening < 0.5), to prevent material from falling outside the platform/decking.
- iv. Guardrails must be able to withstand a 200-pound force exerted in any one direction.
- v. Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- vi. All openings through which workers are liable to fall should be kept effectively covered or fenced and indicated in the most appropriate manner.
- vii. Guardrails and toe-board/barricades and sound platform conforming to IS: 4912-1978 and other Indian laws and regulations as depicted below should be provided.

Guardrail system

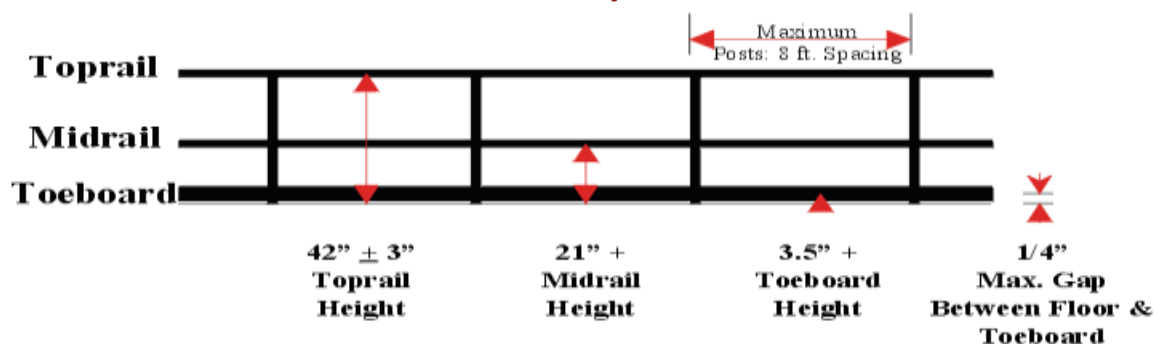


Fig. 13.2.1.2 Guard Rail System

- viii. Guardrails shall be provided to protect workers from falling from elevated work places. The rails are generally made of MS pipes of suitable dia. Rebar shall not be used for any handrails, ladder or cover purpose. Wherever the guard-rails and toe-boards cannot be provided:
 - a. adequate safety nets or safety sheets shall be erected and maintained; or
 - b. adequate safety harnesses shall be provided and used and / or
 - c. adequate fall arrestor shall be provided and used.

As mentioned under PPE clause, all these PPEs shall be defect free and regularly inspected for any defect. The full body safety harness shall have double lanyard only with max 1.8m length.

- ix. The monkey ladders shall have sufficient fall arrestors. Adequate lifelines of 8mm steel wire



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rope shall be provided across the work area.

- x. The HSE officer shall recommend appropriate PPEs after analyzing hazards and risks involved.

13.2.1.3 Scaffolding

All scaffolds shall be conformant to the relevant standards including IS 3696 and IS 4014 as applicable. A sketch of the scaffolds proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use.

General

1. The scaffolding work must be carried out by a competent person, who shall train the scaffold users on safety aspects
2. All scaffolds shall be erected / dismantled by scaffolding crew under direct supervision of competent scaffolding supervisors.
3. All scaffolds shall be capable of supporting 4 times maximum intended load and erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement. Bamboo scaffolding is not permitted for use on site.
4. Each employee on the scaffold shall use an approved safety harness attached to an independent lifeline. The lifeline is to be securely attached to substantial members of the structure (not the scaffold itself) or to securely rigged lines, which shall safely suspend a worker in event of a fall.
5. Guard rails and toe boards shall be installed on all open sides and ends of platforms more than (2) meters above ground or floor
6. Scaffold planks must be at least 5 cm x 25 cm (2" x 10") full thickness lumber scaffold grade or better.
7. Scaffold planks shall not span distances greater than 2.5 meters (8 feet).
8. Scaffold planks shall extend over end supports not less than 6 inches nor more than 12 inches and be secured to the scaffold. Scaffolding and accessories with defective parts shall be immediately repaired or replaced.
9. All scaffolding must be a minimum of two planks wide. No one may work from a single plank.
10. Scaffold planks must be inspected before use. Planks that have been damaged must be removed from the site.
11. Access ladders must be provided for each scaffold. Climbing the end frames is prohibited unless the design incorporates an approved ladder.
12. Adequate mudsills or other rigid footing capable of withstanding the maximum intended load must be provided.
13. Scaffolds more the 6 meters (20 feet) in height must be tied to the building or structure at intervals which do not exceed 4 meters (13 feet) vertically and 6 meters (20 feet) horizontally.
14. Do not overload scaffolds. Material should be brought up as needed. Scaffolding must not be loaded in excess of its rated capacity.
15. Barrels, boxes, kegs, blocks or similar unstable object must never be used as work platforms or to support scaffold.
16. Where persons must work under or pass under a scaffold then a 18 gauge wire mesh screen must be installed between the toe board and guard rail.
17. Employees exposed to overhead hazards while working on a scaffold will be protected by 5 cm (2") thick planks.
18. Wooden/bamboo ladders shall not be allowed at any cost. Ladder's rungs shall be fitted /welded properly. Before every use the rungs should be checked for safe use.



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19. Wooden scaffolds shall not be used in areas where fire / fire products are expected
20. Ropes made of jute / Plastic and other fire prone material shall not be used to tie up scaffolding components together
21. The platform should have permanent hand rail and mid rail with Toe board without fail.
22. All platforms are to be tightly planked for the full width of the scaffold, except as may be necessary for entrance openings. Platforms shall be secured in place.
23. On suspension scaffolds designed for a working load of 500 pounds, no more than two workers are permitted to work on the scaffold simultaneously. On suspension scaffolds with a working load of 750 pounds, no more than three workers are permitted on the scaffold simultaneously.

24. Requirements for different types of Scaffolds:

A. Suspended Scaffold

- i. Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- ii. Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

B. Rolling Scaffolds

- i. The height of rolling scaffolds shall not exceed three times the minimum base dimension.
- ii. The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).
- iii. Adequate help must be provided when moving a rolling scaffold.
- iv. Secure or remove all loose materials, equipment and tools before moving a rolling scaffold.
- v. No one is permitted to ride a rolling scaffold when it is being moved. Castor brakes must be locked-on when the scaffold is not being moved.

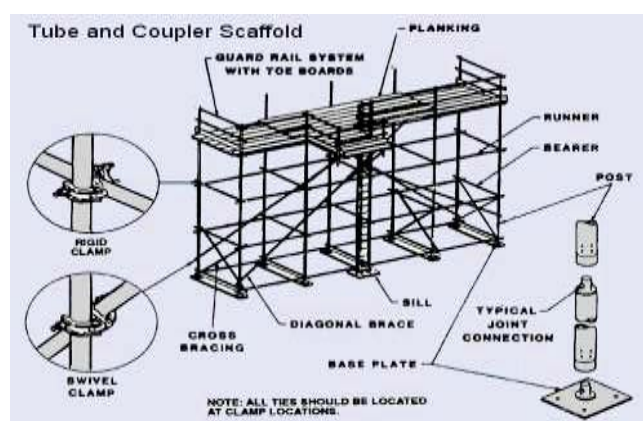
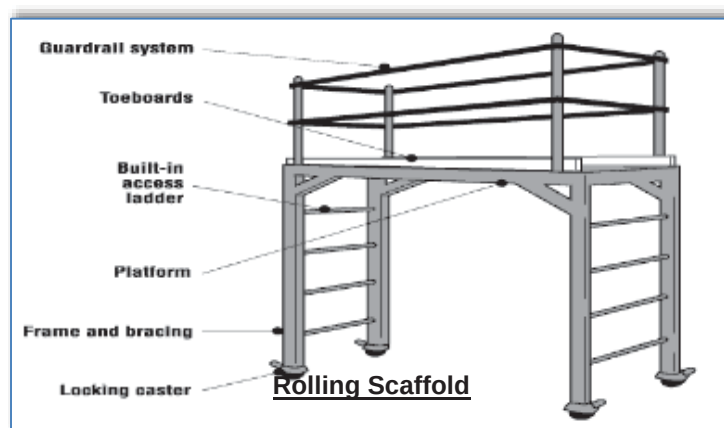


Fig. 13.2.1.3 Types of Scaffolds

25. Scaffold Tagging

Scaffolds being erected, modified or dismantled must be tagged as suitable for use. The scaffolds can only be accessed by those involved with the process.

GREEN scaffold tag- shall be fixed when scaffold is complete and safe for use, signed and dated by



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the scaffolding competent person daily.

RED scaffold tag – to be fixed if scaffold is in some way defective and cannot be used or is still under erection.

Examples of scaffold tags:



Fig. 13.2.1.4 Scaffold Tagging

13.2.1.4 Ladder Safety

A sketch of the ladders proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use

Safe Use of Ladders:

1. Fall protection is required when working on a ladder above 2 meters and when climbing above nearby guardrails.
2. Ladders must be inspected prior to use and by a competent person quarterly, with documentation.
3. Use portable ladders for height up to 4 M only
4. Provide fixed ladders for height above 4 M
5. Place the ladder at an angle of 75 degrees (approx.) from the horizontal (1:4)
6. Extend ladder at least 1 M above the top landing
7. Secure top and bottom of the ladder firmly to prevent displacement- anti skid lining at the bottom
8. Ensure that the width of the ladder is not less than 300 mm and distance between rungs is not more than 300 mm
9. Provide landings of minimum size 600 x 600 mm at intervals not more than 6 M for fixed ladders. Check the ladders daily for any defects
10. Ensure that the areas around base and top of the ladder are clear. Getting on and off the ladder is more hazardous than using it. Use a mudsill if the ladder is to rest on soft, loose or rough soil
11. Do not use ladders of conducting material near power lines, and only use ladders near power line or other energize system with exposed parts if they are confirmed locked-out and de-



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energized.

12. Stand no higher than the fourth rung from the top for carrying out any job standing on a ladder.
13. Never reach out from a ladder to perform work where your belt buckle protrudes past the ladder rung.
14. Always face the ladder while climbing up or down
15. Maintain three-point contact while climbing up or down a ladder i.e. two hands and one foot or two feet and one hand on the ladder at all the times.
16. Avoid climbing up or down a ladder while carrying anything in hands. Lift tools, equipment and materials with a rope.
17. Work from portable and extension ladders near guardrail where fall expose exists over the guardrail regardless of height, and above 2.0 mtr. heights from the working/walking surface will require the use of personal fall arrest equipment

13.2.2 EXCAVATION & CIVIL WORKS

All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

13.2.2.1 Excavation

The following safety measures are to be ensured before and during excavation:

1. All Excavation activities more than with depth of 1.22 meter or more shall require and Excavation Work Permit
2. Check for underground utilities like electrical / telephone cables, sewage, water lines and proper care has to be exercised to protect and prevent damage to it
3. Proper and adequate slope is maintained while excavating
4. Adequate shoring or sheeting is done wherever require to prevent soil sliding
5. Safe access through ladder or steps for exit & entry to excavation
6. No material /excavated soil is kept within one meter from the edge
7. Safe way is planned and provided for movement of HEM /transport equipment near excavation
8. Safety helmet and shoes/gum boots are provided and worn by the workmen at excavation works
9. Dewatering arrangement is made where water seepage is prevailed.
10. Stop blocks are provided to avoid vehicles reversing into the excavated trenches
11. Danger signs /Caution boards are displayed at work spot
12. Barricading is provided at excavated pits



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Soil Type	Height/Depth ratio	Slope Angle
Stable Rock	Vertical	90 deg.
Type A	$\frac{3}{4} : 1$	53 deg.
Type B	1 : 1	45 deg.
Type C	$1\frac{1}{2} : 1$	34 deg.

Determining Soil Type		
Type	Description	Examples
A	Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot or greater.	Clay, silty clay, sandy clay, clay loam and in some cases; silty clay loam and sandy clay loam.
B	Cohesive soils with unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.	Angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases silty clay loam and sandy clay loam.
C	Cohesive soils with unconfined compressive strength greater than 0.5 tsf or less.	Granular soils such as gravel, sand and loamy sand; submerged soil or soil from which water is freely seeping; submerged rock that is not stable.

Fig. 13.2.2.1 Excavation Reference

13.2.2.2 Piling

Ensure the following precautionary measures before starting piling works:

1. Inspection of piling equipment by responsible person for its condition before initiating piling operation.
2. Checklist and OCP for piling to be prepared using manufacturer's instructions and used
3. Testing and its certification wire ropes, slings, D-shackles, chain pulley blocks using in the process of piling work by competent person
4. Adequate support and secured foundation of the piling equipment to avoid toppling
5. Hoses should be lashed and adequately secured
6. Proper work platform is to be provided on piling frame
7. Safe work procedures and close supervision to prevent unsafe acts of operators/any unsafe conditions that may arise
8. Only experienced and trained operators are engaged for the piling operation
9. Provision of Personal Protective Equipment (PPE) like safety shoes/gumshoes/safety helmet/safety belt etc. and its use by their workmen.
10. Special care and precautions If work is near electrical live cables/ electrical equipment
11. Cordoning of work area to prevent un authorized entry
12. Guarding of revolving parts
13. Specific measures to prevent over turning of pile driver/missing of hammer/ hammer movement out of range

13.2.2.3 Batching

Following Safety considerations for batching plant are to be ensured:

1. Modern type batching plant should be used in which all the moving parts are protected and



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emergency and safety features are incorporated.

2. Installation of external Electric moto-vibrators in the feeding hopper of all batching plants to reduce human intervention.
3. Installation of safety devices like pull-chord on both the sides of conveyor for stopping the conveyor in emergency
4. Workers carrying cement / sand to be given appropriate PPEs like respiratory masks & gloves.
5. Conveyor belt/rotating parts must be guarded properly.
6. Safety awareness shall be inculcated in workmen about the risk involved in rotating parts.
7. The agency shall ensure to erect the batching plant as per drawing including installation of all safety devices as provided by manufacturer and witnessed by BHEL Engineer in charge before starting of machine in future.
8. Safety audit to also focus on Batching plant.
9. The site shall impose penalty on the agency who has violated the safety norms as per contract.

13.2.2.4 Mobile Plant

Mobile plant includes tractors, trailers, dumpers, excavators, bulldozers, road rollers etc. for earthmoving purpose and concrete mixers, concrete transit mixtures, concrete pumps etc for concreting purpose. Due to the very nature of their function and movement in difficult terrains, congested areas, working in tandem with manual work and other operations the danger is inherent. Reverse horn is compulsory for all earth moving machineries.

Following Safety measures to be ensured for Mobile Plant:

1. Where movement around site is involved, routes should be planned, obstruction free and well maintained
2. Observe specified speed limits
3. Operating personnel should be aware of associated risks and its preventive measures
4. Only experienced, trained and authorized persons with valid license (wherever applicable) should operate the mobile equipment/vehicles
5. Provide and use Warning lights and reverse horn for cautioning the people around
6. Operation should be on level and stable ground with adequate working clearance.
7. Loading of out riggers/stabilizers should be well within safe ground bearing capacity
8. No person should be on equipment or vehicle during loading and unloading of material
9. Operators should be protected by warning barriers or switching off power when working in close proximity of overhead power lines
10. The equipment /vehicles should be well maintained and provided with effective brake system and other safety devices (wherever require)
11. Rotating parts of equipment should be adequately guarded
12. Provide necessary personal protective appliances and ensure its use by the operating personnel
Ensure effective measures at source to control harmful emissions, dust, fumes contaminating atmosphere and cause health hazards to the operators and people in the vicinity.
13. No overloading/over stressing of vehicles/plant is allowed
14. Hoses, pipes, receivers, gauges and valves involved in carrying out hydraulic fluid/ compressed air should be checked for leaks and tested prior to operation.
15. Adequate safe clearance for swing and movement is to be judged during operation of Concrete mixer



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16. Setting of machine on firm and level ground with wheel locked to prevent movement of machine
17. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket
18. Operator leaving work spot should ensure that the equipment/vehicle is kept in neutral position and place on firm and level ground.
19. The hand brake should be kept in position and block road wheels as additional safety measure
20. Blades/buckets should be kept low while moving
21. The dozer blades should not be used as brakes except in emergency
22. The ground should be examined for its bearing capacity and general safety especially when operating road roller at the edges of slopes, embankments.
23. The roller should not be moved downhill with the engine out of gear
24. If operating near excavations the following precautionary measures are to be ensured
25. Barricading, edge protection to prevent fall of persons/vehicles over running while reversing etc.
26. Suitable support system and adequate allowance to avoid the danger of side collapsing
27. Experienced signaler /attendant should be always accompanied with operator/driver for proper direction /signal and also to caution others in the working Zone during operation of mobile plant

13.2.2.5 Concrete Vibrators

1. Revolving parts/belt drives should be adequately guarded and Vibrating unit shall be completely enclosed and have suitable overload relays and effectively earthed
2. Ensure sufficient length of cable to the Vibrator.
3. Ensure electric starters and other accessories are firmly fixed adequately supported
4. Ensure locking of needle load while inserting needle in to the vibrator,
5. Ensure periodical lubrication and maintenance

13.2.2.6 Concrete Mixers

1. Setting of machine on firm and level ground with wheel locked to prevent movement of machine
2. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket

13.2.3 WELDING & GAS CUTTING SAFETY (HOT WORK)

1. All Hot Work shall require a Hot Work Permit
2. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced.
3. All safety precautions shall be taken for welding and cutting operations as per IS-818.
4. When possible, items to be welded, cut, heated, etc. shall be moved to a safe location free of combustible or flammable material. If this is not possible, then all combustibles/ flammables that can be removed from the area shall be removed within a 35-foot circumference and a positive means of confining arcs and sparks generated by the process shall be ensured and additional person(s) shall be stationed as fire-watch for the area(s) still exposed, along with obtaining the Hot Work Permit as applicable.
5. Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times suitable for the type of Fire.
6. Drums, tanks, and similar containers that have contained flammable or toxic material shall not be welded, cut, or heated until they have been made safe by water filling, thorough cleansing or similar accepted practices. The container shall also be ventilated during the welding, cutting, or heating process.



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7. Proper ventilation is required for any welding or torch operations performed in a confined space.
8. Any welding or gas cutting operations performed on metals of toxic compounds or coating such as zinc, stainless steel, lead, cadmium, chromium, and beryllium shall be properly ventilated and/or proper respiratory protection shall be worn by any person that could be exposed to fumes, vapors, and gasses created by the welding and gas cutting processes.
9. Wherever it is practical, all arc welding operations shall be shielded to prevent direct light rays or sparks from contacting persons in the vicinity or from reaching areas normally used to travel through or into the vicinity. Where this is not practical, persons who shall be in the area are to use proper eye and skin protection. Other persons who are not participating in the welding or gas cutting operations are not to be allowed into the hazard zone.
10. Welders and other employees who are exposed to arc welding radiation shall wear suitable clothing and protective apparel to prevent burns and other types of ultraviolet radiation damage to the skin.
11. Arc welding machines shall be shut down when being moved or when they are not in continuous use. Electrode holders left unattended shall have electrodes removed and shall not be left where they might contact employees or conducting objects.
12. Arc welding power supply cable shall be of proper rating and material, e.g. copper.
13. Welders shall guard against allowing materials adjacent to or behind them to reflect radiation back toward them or towards others in the area. Reflected radiation can cause skin burns and eye flash burns.
14. Valve caps shall be in place when cylinders are not in use. Valve caps shall never be used for lifting the cylinder vertically.
15. Torches shall only be lit by approved strikers; never with matches, cigarette lighters, or hot-work.
16. **Splatter / Slag Collector**

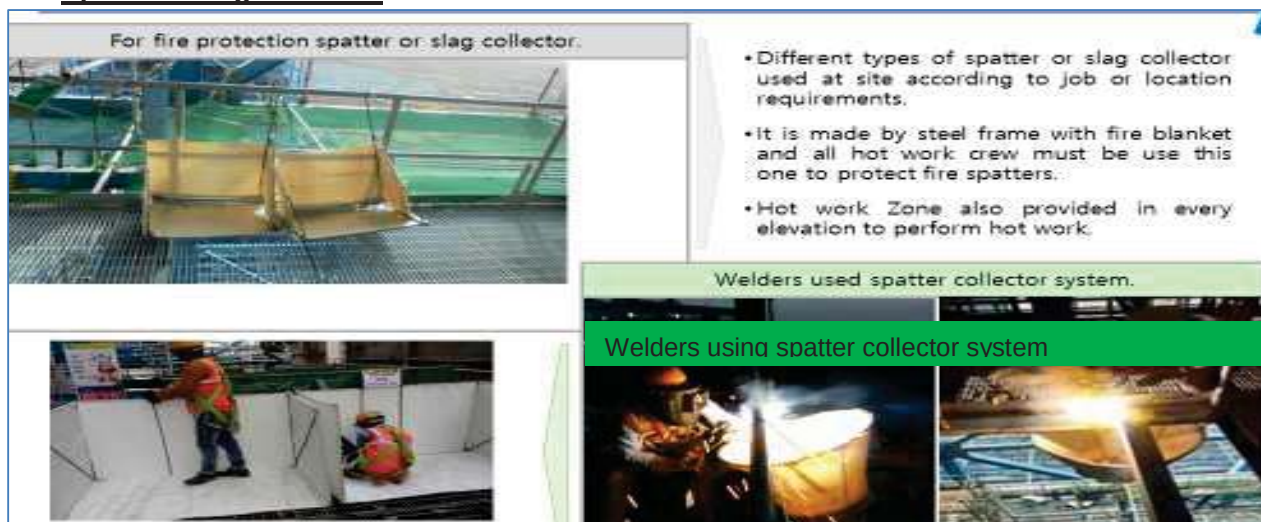


Fig. 13.2.3.1 Splatter / Slag Collector

While carrying out job at height, the sparks or molten slag shall be prevented from falling down by putting a fire-resistant (non-asbestos) sheet or patter/ slag collector or even MS Sheet. The passage of falling sparks or molten slag shall be barricaded till ground floor and any cable/ tubes/ any other objects interfering in the passages hall either be removed or covered with Fire-resistant sheet or MS Sheet.



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13.2.3.1 COMPRESSED GAS

1. All cylinder valves shall be closed when any work is finished and when any Cylinders are empty or being moved. Valve protection caps shall be placed and secured properly before gas cylinders are transported, moved or stored.
1. Compressed gas cylinders shall be secured in an upright position with chain or appropriate means during storage & use. However, a trolley shall be used for transportation.
2. Compressed gas cylinders shall always be secured from tipping or falling, whether in use, in storage or in transit. The cylinders shall always be secured upright, except during times when actually being hoisted or carried.
3. When cylinders are transported by powered vehicle they shall be secured in a vertical position.
4. Regulators shall be removed when cylinders are not in use or are in transit, unless the cylinder is firmly secured on a special carrier designed for this purpose.
5. Gas cylinders are not allowed to be used in man-basket when occupied.
6. Cylinders containing oxygen or fuel gasses shall not be taken into confined spaces.
7. Oxygen cylinders shall be stored a minimum of 6 meters from fuel gas cylinders or shall have an approved firewall between them.
2. All cylinders shall be kept at a safe distance from welding or cutting operations or shielded from arc/ sparks / slag.
3. All cylinders shall be placed where they cannot become part of the electrical circuit.
4. Oxygen and acetylene shall not be stored together. Oxygen must be separated from acetylene (or ANY fuel gas) or combustible material by at least 20ft or a barrier with a 30 minute fire resistance rating.
5. All Cylinders should be stored upright in a designated area with labels for the type of gas. All applicable precautions to be ensured during storage
6. Oxygen and fuel gas regulators, hoses and associated equipment shall not be altered and shall be in proper working order while in use.
7. Compressed air can be extremely dangerous if allowed to penetrate the skin. As such, the use of compressed air to clean off yourself or other workers shall be strictly prohibited.
8. All gas cylinders shall be stored in upright position. Suitable trolley shall be used for cylinder movement, the design of which shall be submitted to BHEL Engineer for approval.
9. No of cylinders shall not exceed the specified quantity as per OCP
10. Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
11. All cylinder should be kept only in cylinder trolley.
12. Cylinder shall be transported in upright vertical position by suitable mean.

13.2.4 LIFTING & RIGGING SAFETY

1. All Heavy / Complex Lifting operations as defined in Clause 6.12 shall require a Lifting Work Permit.
2. All the cranes and lifting tools & tackles shall be inspected on daily / weekly basis as well as



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monthly by expert as per applicable formats.

3. In addition, inspection / certification as mandated by law shall be carried out wherein these shall be tested and certificates of fitness shall be obtained from 3rd party State Govt. approved competent agency before deploying at site and later periodically. BHEL shall be given advance intimation of any such inspections
4. The last date of Third Party Inspection and the next Due date shall be conspicuously displayed on all cranes. A copy of certificate shall be pasted on operator's cabin of all the lifting equipment.
5. Following requirements shall be mandatorily followed, wherever applicable:
 - a. The manufacturer's instruction for maintenance shall also be followed. All safety measures shall be followed.
 - b. All tools tackles, lifting appliances; material-handling equipment etc. used by the subcontractor shall be of safe design and construction.
 - c. The operators, slingers and signalers shall be qualified as per IS 13367 (part-1):2003 "Safe use of cranes- code of practices".
 - d. There shall be a person responsible for co-ordination among cranes where multiple cranes are used, and lifting over 75% of the crane capacity to be avoided.
 - e. Mobile phone should be banned for crane operator and lifting operation. Only walki talki shall be allowed in rigging/Lifting purpose.

13.2.4.1 Personnel Lifts (Man-Basket / Jhoola):

The design of personnel man basket shall be submitted to BHEL Engineer for approval before use. Relevant permit (Height work & others as applicable) shall be completed prior to lifting any people, along with a rigging plan.

- a. A separate Lifeline / Fall arrestor anchored to a fixed structure outside of Jhoola shall be provided for the workers inside the basket. All occupants of the basket shall have Safety Harnesses equipped with rope grabs, which are to be hooked to the vertical lifeline.
- b. Man-basket shall be used where access through ladders or scaffolding is not feasible.
- c. Man-baskets shall be designed and engineered by a manufacturer (job made man-baskets are not allowed, unless designed and tested by a certified engineer), and built robust with MS Angles and flats or plates or channels only.
- d. Guard rails top and mid, must be in place and screened-in to avoid material from falling out of basket. The factor of safety shall be 200%.
 - e. It shall have a door with double latches and shall open inside. Anchor points shall be identified within the man-basket.
- f. The man-basket shall be thoroughly inspected and load tested and a trial run performed without personnel before being put to job.
- g. It shall be treated as a lifting tool (T&P Item) and shall undergo same certification cycle and inspection as other lifting equipment.
- h. An additional sling of required lifting capacity shall be fixed the man-basket main lifting point and attached to the crane above the ball or block.



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- i. While lifting man-basket, the crane shall maintain a uniform speed of lift without any swing.
- j. Once man-basket reaches the destination, the lift brakes shall be locked as long as the basket remains at that point. The same care shall be taken in its descent.
- k. As for hanging man-basket, the same shall be hung off a rigid structure with help U-shaped handle welded to man-basket. This shall be tested once in a year by a competent person.
- l. Use of Rebar steel for making and monkey-ladder must be avoided.

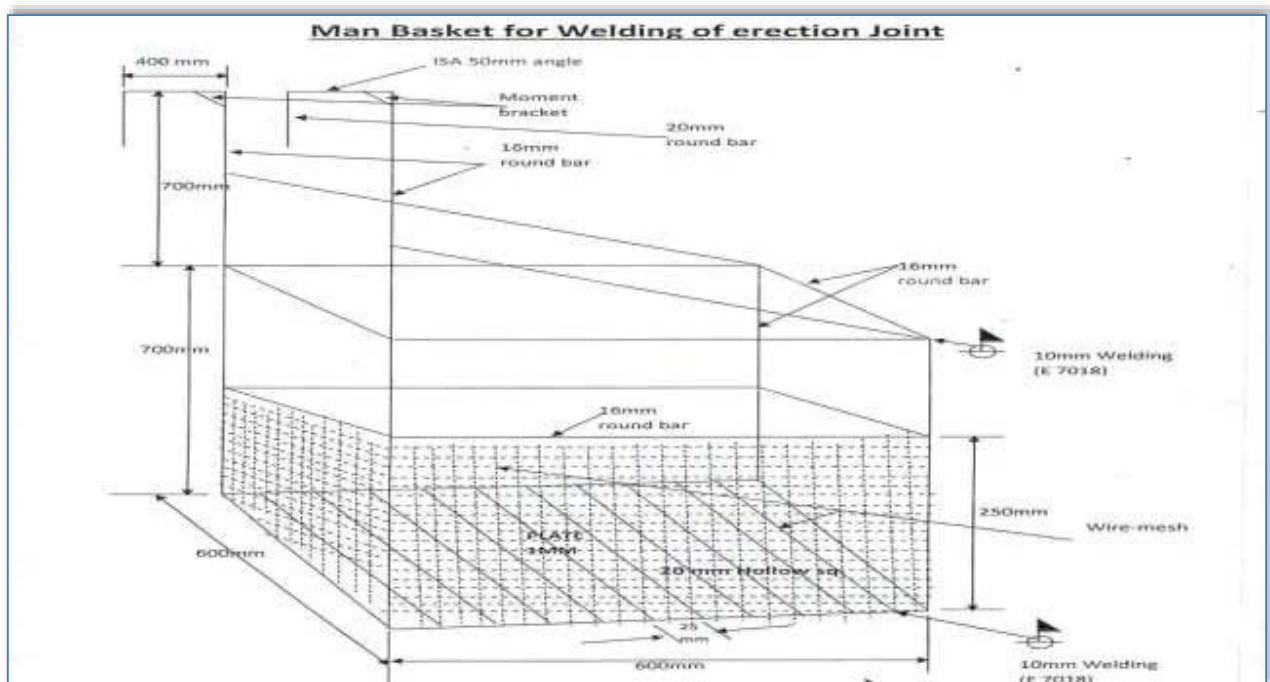


Fig. 13.2.4.1 Man Basket for Welding Erection Joint

13.2.4.2 Cranes & Hoisting Equipment:

This section provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.



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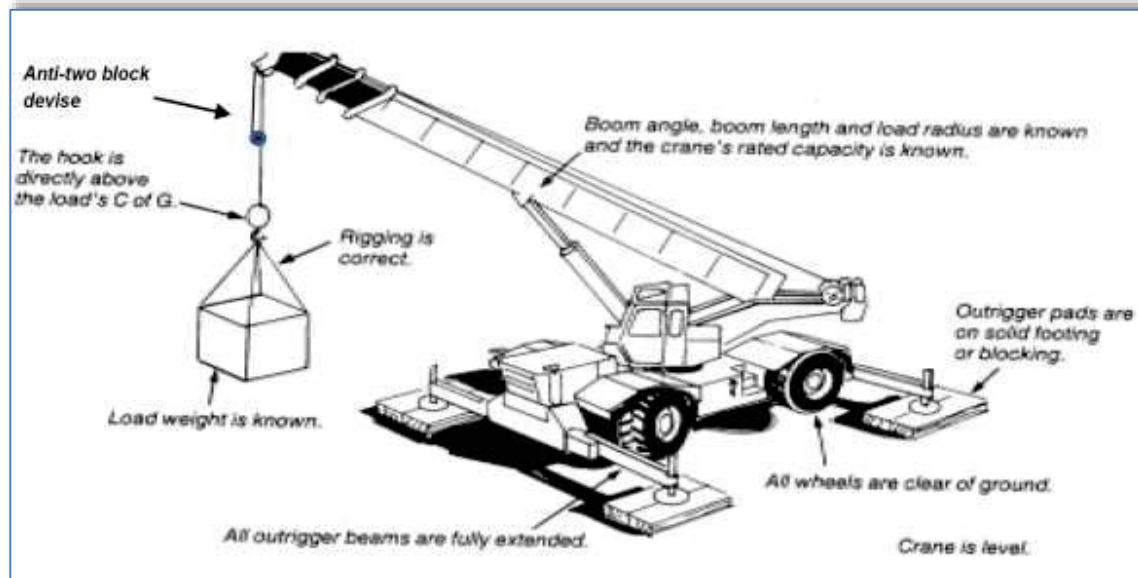


Fig. 13.2.4.2 Proper Crane Setup

- a. On every crane or piece of hoisting equipment notices of all rated load capacities, recommended operating speeds, and any hazard warnings or special instructions shall be conspicuously posted. All instructions and warning shall be visible from the equipment operator 's station.
- b. Cranes shall have an Anti-Two-block safety device installed
- c. All mobile cranes shall have overload and backup alarms, load angle indicators and limit switches
- d. All areas within swing radius of cranes that are potentially accessible by pedestrian, vehicular, or equipment movement shall be barricaded to prevent anyone or any vehicle or equipment from being struck by the crane or hoisting equipment, or its load(s).
- e. No part of the lifting equipment or its load shall be within the distance as specified in the Indian Electricity Act from an energized power line
- f. Cranes shall have annual certified third party inspection and be inspected before use by the operator. Any defects shall be corrected before use. Logs of crane inspection shall be kept with the crane.
- g. Make certain that the rigging personnel, material, and equipment have the necessary capabilities for the job and are in safe condition.
- h. Communicate with person(s) directly responsible for accomplishing the work and / or work area to establish requirements/responsibilities and make certain that all preparatory work is complete.
- i. Mats/Pads must be used on all lifting equipment, equipped with out riggers.
- j. Pick and carry must have the load secured to the rig in front.
- k. Only BHEL Approved Plate Lifting Spreader Beam configuration shall be used (Sample in Fig. 13.2.4.2)



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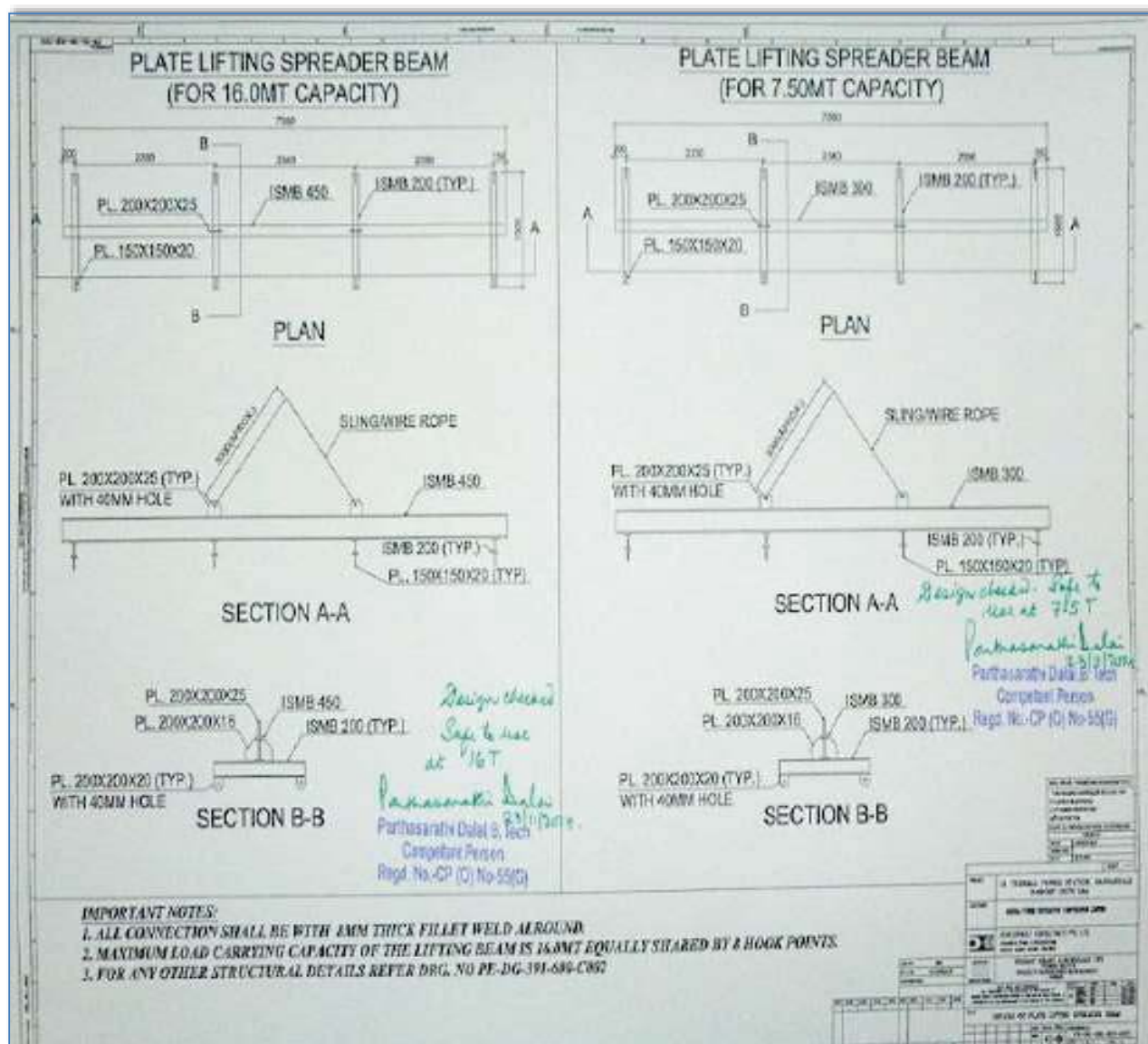


Fig. 13.2.4.3 Typical Plate Lifting Spreader Beam Configuration for 7.5 MT and 15 MT Loads

I. Crane operators must follow the following:

1. Pass an annual Operator's Physical examination
2. Carry a valid training certification card at all time while operating issued by the Govt. or other recognized institute.



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13.2.4.3 SAFE RIGGING PRACTICES

13.2.4.4

- a. Review the planned operation and requirements with the operator and rigging crew.
- b. Ensure a pre-lift meeting is conducted with crane operator, tagline operator, signal personnel, and Safety Manager.
- c. Designate a qualified person from the rigging crew to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
- d. Clear the lift area of all unnecessary personnel.
- e. Hydras shall only be allowed for loading & unloading works & shall not be allowed to move with load

13.2.4.4.1 RULES FOR SAFE RIGGING

1. Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
2. Never allow wire rope to lie on the ground for any length of time or on rusty steel or near solvents, chemicals or corrosive substances.
3. Slings must not be pulled from between or under loads with load resting on the sling.
4. Keep all rope away from flame cutting or welding operations.
5. Never use rope as sling material.
6. Never wrap a wire rope completely around a hook.
7. Do not bend wire rope near any attached fitting.
8. The sling must be selected to suit the most heavily loaded leg rather than the total weight when using multi-legged sling to lift loads in which one end is heavier than the other.
9. When using 3 and 4 legged sling configurations, any two legs must be capable of supporting the entire load.
10. Where possible, wire rope choker hitches must include a shackle with the eye around the shackle pin to prevent breaking wires of the choke. The choker hitch must be "snugged down" prior to lifting, not after tension is applied.
11. Unless authorized by the hook manufacturer when more than two rope eyes are placed over a hook, install a shackle, pin resting in the hook, and place the rope eyes in the bowl of the shackle.
12. Properly rig all loads to prevent dislodgment of any part.
13. Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.
14. Loads must be safely landed and properly blocked before being unhooked and unslung. Tag lines must not be used in situations that jeopardize the safety of the lift.
15. Lifting beams must be plainly marked with their weight and designed working load and must only be used in the manner for which they were designed.



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16. The hoist rope or chain must never be wrapped around the load. The load must be attached to the hook by slings or other rigging devices that are adequate for the load being lifted.
17. Multiple part lines must not be twisted around each other.
18. The hook must be brought over the center of gravity of load before the lift is started.
19. If there has been a slack rope condition, determine that the rope is properly seated on the drum and in the sheaves prior to lifting.
20. Keep hands away from pinch points as the slack is being taken up.
21. Leather gloves are recommended when handling wire rope.
22. Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.
23. Never ride on a load that is suspended.
24. Avoid allowing the load to be carried over the heads of any personnel.
25. Never work under a suspended load until the load has been adequately supported from the floor and all conditions have been approved by the supervisor in charge of the operation.
26. Never leave a load suspended unless emergency evacuation is required.
27. Never make temporary repairs to sling.
28. The capacity of a sling is determined by its angle, construction, type of hitch and size.
29. Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.
30. Never point load a hook unless it is especially designed and rated for such use.
31. Make certain that the load is broken free before lifting and that all legs are taking the load.
32. When using two or more slings on a load make certain all slings are made from the same materials.
33. Lower the loads on to adequate blocking to prevent damage to the slings.
34. Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.
35. The weight of the hook, load block and any material handling devices must be included when determining crane capacity.
36. Calculated weights cannot exceed 75% of the chart without written approval.
37. Personnel must be completely clear of loads being picked up or set down by crane. Tag lines will be used to control the loads. Loads must not be touched by hand while placing/ moving.

13.2.4.4.2 SLINGS

a. Synthetic Slings

The following are rules for safe use of synthetic slings:

- i. Synthetic slings must be marked to show the rated capacity for each type of hitch and type of web material.
- ii. Nylon web slings must not be used where fumes, vapors, sprays or mists or liquids of acids or phenolic are present. Web slings with aluminum fittings must apply in this category.
- iii. **Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:**



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- a. Acid or caustic burns
- b. Melting or charring of any part of the sling surface
- c. Snags, punctures, tears or cuts
- d. Broken stitches
- e. Distortion of fittings
- f. Synthetic web slings of polyester or nylon must not be used at or come in contact with temperatures in excess of 82°C
- g. Polypropylene web slings must not be used at or come in contact with temperatures in excess of 93°C
- h. Insulated hooks must be tested yearly to insure insulation integrity to at least manufacturer's specifications.

iv. Wire Rope Slings must be removed from service and destroyed if any of the following conditions are present:

- a. In (10) randomly distributed wires broken in one (1) rope lay, or five (5) broken wires in one (1) strand in one (1) rope lay.
- b. Wear or scraping of one-third the original diameter of outside wires.
- c. Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure such as:
- d. Evidence of heat damage.
- e. End attachments that are cracked, deformed worn.
- f. Corrosion of the rope or end attachments.

v. Metal mesh slings must be immediately removed from service if any of the following conditions are present:

- a. A broken weld or broken brazed joint along the sling edge.
- b. Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
- c. Lack of flexibility due to distortion or corrosion.

vi. Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:

- a. Acid or caustic burns
- b. Melting or charring of any part of the sling service
- c. Snags, punctures, tears or cuts
- d. Broken stitches
- e. Distortion of fittings

vii. Requirements of Plate Clamps:

- 1. The rated load of the plate clamp must be marked on the main structure.
- 2. Care must be taken to make certain the load is correctly distributed for the plate clamp being used.
- 3. Do not allow load or plate clamp to come into contact with any obstruction.
- 4. The plate clamp must not be used for side pulls or sliding the load.
- 5. When lifting stainless steel or special alloys, ensure plate clamp is designed for use on



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the specific metal.

13.2.4.4.3 SIGNALING PRACTICES:

- The "slinger" is responsible for attaching and detaching the load to and from the crane. He shall:
 - have received appropriate training on general safe lifting operations;
 - be capable of selecting lifting gears suitable for the loads;
 - liaise with the operator and direct the movement of the crane safely.
- The "signaller" is responsible for relaying the signal from the slinger to the crane operator. He shall:
 - have received appropriate training on general safe lifting operations;
 - be able to direct the movement of the crane and loads.

Suggested hand signals



Note: During the lifting operation, either the slinger or signaller shall communicate with the operator. Other communication methods (e.g., wireless walkie-talkies, telephones, etc.) may also be used.

Fig. 13.2.4.4 Recommended Signalling Practices



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13.2.5 DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured, besides using the Work Permit:

1. All roads and open areas adjacent to the work site shall either be closed, suitably protected or restricted for movement
2. No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
3. All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

13.2.6 T&Ps General

1. All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test /calibration certificates bearing endorsement from competent authority of BHEL.
2. Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
3. Tagging and punching in all lifting tool is compulsory with SWL, sr. no. and due date.
4. All T&Ps shall be inspected by authorized Third Party agency as per applicable frequency. BHEL shall be kept informed of any such scheduled inspection
5. All T&Ps shall be internally inspected in each quarter and colour coded as below.

13.2.6.1 T&P Color Coding Procedure:

Inspections and tests shall be documented by means of color coding which shall verify that inspections or testing are current and that all receptacles, portable Power tools, Lifting Tools & Tackles have been inspected and tested as required. The color codes used on the project shall be:

GREEN	BLUE	YELLOW	RED
January February March	April May June	July August September	October November December

Table. 13.2.6.1 T&P Color Coding Procedure

- i. The cycle of colors shall be Quarterly as a minimum or as decided by BHEL. The color code tape / Sticker shall be clearly visible to designate the period for which the inspections and tests were conducted.



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- ii. Following the initial inspection, the equipment must be color-coded quarterly as per color-coding instructions that will be issued by the subcontractor.
- iii. Fire extinguisher with the current month color-coding inspection sticker must be provided and secured in the platform.
- iv. All slings shall be regularly inspected in accordance with the requirement of the project for frequent and periodic inspections and discard immediately if they fail to meet the minimum requirements of the project.
- v. The Subcontractor's Safety Officer shall ensure that all PPE is inspected prior to its issue. He is to ensure all subcontractor personnel are using safe and proper PPE equipment. Regular inspections on the PPE shall be carried out and personnel not adhering to those inspections shall be removed immediately from the site.
- vi. A five (10) day interval period shall be given into each monthly color code change. During this five (10) day period either color shall be acceptable.

13.2.7 CHEMICAL HANDLING

1. Displaying safe handling procedures & MSDS for all chemicals such as lube oil, acid, alkali, sealing compounds etc, at work place.
2. Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.
3. The used containers of chemicals shall be segregated and disposed off suitably
4. In case the used containers need to be re-used, all traces of the chemical to be removed by thorough cleaning with detergents etc. under trained supervision

13.2.8 ELECTRICAL SAFETY

1. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
2. Power supply to all equipment at site to be routed through MCBs of appropriate rating. A 'Power Supply Distribution Plan' shall be prepared and submitted to BHEL Engineer for approval



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3. All power supplies through cables shall be underground or overhead with height > 3mtrs.
4. All distribution boxes shall be locked and the key controlled by site management of concerned subcontractor.
5. All individual equipment & tools at site shall be powered through Earth Leakage Circuit Breakers of 30 mA sensitivity.
6. These MCBs and ELCBs shall be regularly tested as per Clause 14
7. All fuses and fuse wires shall be of standard size and rating.
8. All electrical appliances used in the work shall be in good working condition and shall be properly double earthed other than armour earthing.
9. All extension boards shall have separate switches for all sockets / connections
10. All portable electric tools used by the subcontractor shall have safe plugging system to source of power and be appropriately earthed.
11. Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts especially in confined spaces like inside water boxes, turbine casings, condensers etc.
12. Electrical appliance shall have proper earthing and for appliances equal to & more than 415V shall have two separate earthing (as per IS-3043-1987)
13. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
14. The subcontractor shall use only properly insulated and armoured cables and conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.
15. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the risk & cost of the subcontractor.
16. No maintenance work shall be carried out on live equipment
17. Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
18. The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
19. Wiring and Branch Circuits Must be protected by a proper amperage over-current device such as a HRC fuse or circuit breaker. Such installations must be located so as to prevent physical damage to the wire conductors & panels.

20. Portable Electric Lights

- a. Portable electric lights used in wet or potentially wet locations must be either low voltage type (24 volts or less) or protected by a GFI (ground fault interrupter).
- b. They must be visually checked before each use and periodically while in use to assure their original integrity is maintained.
- c. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately.
- d. Repairs to extension cords shall only be performed by qualified/ licensed electricians.
- e. Must not be allowed to lie in wet or potentially wet areas.



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21. Underground Cables:

- a. Every electric line or cable of unknown origin that is discovered or exposed during a digging, drilling, probing, or similar operation is to be considered as energized and life threatening.
 - b. The senior company employee on the site will ensure that all necessary safety precautions are taken in order to isolate the line from all workers and the public.
 - c. Such precautions may include halting the operation if appropriate.
 - d. The senior company employee on the site is to then contact the proper authorities to have the line identified and either confirmed to be abandoned and/or made safe for continuing the work.
 - e. Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.
22. In general, equipment or machinery being moved or transported must maintain minimum clearances of 25 ft. to all power lines.
23. TAG IN/ TAG OUT must be in force in Switch Room and all Distribution Boxes for live power line. The authorized person's name and contact no shall be displayed
24. Ensure "double insulated" three - core cables and three pin connectors are used and are properly ground "all insulated" types, all electrical tools and appliances must be manufactured for industrial use.
25. All connections shall be electrically and mechanically sound and properly insulated. Taped joints are not permitted. Connections to socket outlets must be made with proper plugs.
26. Splices in electrical cords are not permitted. Repairs must be made at the socket connection and retain the same mechanical and dielectric condition of the original connection.
27. Damaged or defective electric tools, equipment and extension cords, etc. must not be used and shall be tagged out of service, removed from the work area and taken back to stores.
28. Only licensed electricians are authorized to repair and work on electrical equipment. Tampering with electric tools or equipment by others could result in termination.
29. Temporary electric cabling should be elevated 2.2 meters above the floor/ground or covered for protection. It must be kept clear of walkways and other locations where it may be exposed to damage or create a tripping hazard.
30. Energized wiring in junction boxes, circuit breaker panels and similar places must be covered and locked at all times.
31. Areas with live high voltage wires or terminals must be barricaded against entry and warning signs posted Danger – High Voltage and Authorized Personnel Only.
32. Personnel should never work on energized equipment, de-energizing (lockout/tag out) the equipment is always the first requirement.
33. The lockout and tag out procedure will be used when testing or working on, or around, energized installation.
34. Working around energized equipment should never be done alone. A second electrician must always be available for assistance.



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35. If lockout/tag out of the work is infeasible (must be demonstrated), work on energized electrical circuits must be approved by the Site In-charge. All safety precautions necessary must be taken, PPE use must be evaluated per the exposure and used, i.e high/low voltage gloves, insulated shoes, overcoats/aprons, face shields, and other protective equipment like insulated tools, blankets, mats, etc. must be used.
36. The welding machines earth leads shall be properly fixed without loose contacts. The earth cable only has to be used. No steel members shall be used as earth leads.
37. Electrical crews must be qualified for the equipment and tools they work on, including being trained in Cardio-Pulmonary Resuscitation (CPR) methods and First Aid for rendering help in the event of electric shock.

38. Qualified Persons for Electrical Works

One who is trained and wiremen licensed to Govt of State and familiar with the construction, operation and safety hazards of the equipment upon which they are permitted to work.

- i. Qualified persons are intended to be only those who are well acquainted/experienced with and thoroughly conversant in the electric equipment and electrical hazards involved with work being performed.
- ii. Only qualified persons may be permitted to work on or near exposed energized parts. Such persons are required to have been trained in three specific areas:
- iii. Qualified persons must be capable of working safely on energized circuits;
- iv. Must be familiar with the proper use of special precautionary techniques and procedures based on equipment and exposure; and
- v. Must be familiar with required personal protective equipment, insulating and shielding materials, and insulated tools.
- vi. Qualified persons are expected to be able to evaluate unknown situations and adjust their activities in such a way that only safe work practices are used. Such behavior is the responsibility of the qualified person.
- vii. It is possible and likely for an individual to be 'qualified' with regard to certain equipment in the work place, and unqualified on other equipment they must know their limitation and stop work if not qualified on what equipment they were to work on.
- viii. An employee who is undergoing on-the-job training, who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties. The process must be documented as proof.

13.2.9 USE OF HAND TOOLS AND POWER-OPERATED TOOLS

13.2.9.1 General Provisions

- a. All hand and power tools and similar equipment, shall be maintained in safe condition.
- b. When power operated tools are designed to accommodate guards, they shall be equipped
- c. with such guards, when in use;
- d. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;
- e. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be



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provided with the particular personal protective equipment necessary to protect them from the hazards;

- f. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive on-off control.
- g. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

13.2.9.2 Hand Tools

- a. The subcontractor shall not issue or permit the use of unsafe hand tools;
- b. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;
- c. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;
- d. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

13.2.9.3 Power Operated Tools

- a. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;
- b. The use of electric cords for hoisting or lowering loads shall not be permitted;
- c. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming incidentally disconnected;
- d. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being incidentally expelled;
- e. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm² pressure at the tool a safety device on the muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;
- f. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm² and that too with effective chip guarding. The 2 kg/cm² pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;
- g. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;
- h. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;
- i. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's



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recommended procedure;

- j. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;
- k. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;
- l. Loaded tools shall not be left unattended;
- m. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;
- n. Driving into materials that can be easily penetrated shall be avoided unless backed by a
- o. substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;
- p. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;
- q. Only non-sparking tools shall be used in an explosive or flammable atmosphere;
- r. All tools shall be used with the correct shield, guard or attachment as recommended by the manufacturer.

13.2.9.4 Abrasive Wheels and Tools

- a. All grinding wheel must be ISO certified only.
- b. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;
- c. Grinding machines shall be equipped with suitable safety guards;
- d. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than 900, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 1200. In either case, the exposure shall begin not more than 8.650 above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;
- e. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;
- f. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;
- g. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of incidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 1800;
- h. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;
- i. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of incidental breakage, shall be used;
- j. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that



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they are free from cracks or defects;

- k. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;
- l. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

13.2.9.5 Wood Working Tools

- a. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off-position;
- b. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is re-tensioned for a different speed, the marking shall be corrected to show the new speed;
- c. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;
- d. All portable power driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

13.2.10 START UP, COMMISSIONING AND TESTING:

There are various activities involved prior to commissioning- the major ones are -Hydraulic Test, Steam Blowing, Transformers Charging, Boiler Light Up, Rolling and Synchronisation and Full loading of unit.

- a. These activities shall be personally supervised by the site executive along with the commissioning engineer.
- b. Appropriate Work Permits shall be taken as applicable
- c. The readiness of upstream and downstream system shall be ensured before taking up.
- d. These shall be handled strictly by the authorized persons only and the team shall be suitably briefed about the activity including hazards & risks involved and control plan by the concerned executive-in-charge before start.
- e. Entry of persons to the area of activity shall be suitably restricted and the emergency functions like Ambulance, first aid center and Fire station shall be intimated about the plan well in advance.
- f. Tag-in/ Tag-out shall be in place while charging transformer and whenever necessary.
- g. Electricians with valid wiremen license only shall be permitted to work on power lines.
- h. The area and the passage shall be adequately illuminated.



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13.2.11 FIRE SAFETY

Numbers and types of Fire Extinguishers shall be ensured as follows:

Sl. No	Type of Fire Risk (Class of Fire)	Extinguishing Medium & Relevant Indian Standard	Scale of Equipment (Minimum recommended)
1.	CLASS 'A' Fires involving ordinary combustible materials like wood, paper, textiles, rubber etc. (Ordinary hazard or low fire load)	WATER Soda acid type, water type (gas pressure) and water type (constant air pressure) IS: 934 -1976; IS: 940 -1976; IS: 6234 -1971	For every 600 square meter floor area or part, one 9-litre capacity. Minimum 4 numbers per floor or room; should not be required to travel more than 15 meter to reach any extinguisher.
2.	CLASS 'A' (Extra hazard & high fire load)	-do	-do – (Also, consult local fire authority).
3.	CLASS 'A' (Special hazards)	-do	-do – Extra provision For every 100 square meter floor area or part, one 4.5 Kg. CO ₂ ; minimum 2 numbers per room; should not be required to travel more than 10 meter to reach any extinguisher.
4.	CLASS 'B' (Fires in flammable liquids like oils, solvents, petroleum, products, varnishes, paints, etc. where blanketing effect is essential) (Storage and handling in small quantities)	FOAM / CARBON DIOXIDE / DRY CHEMICAL POWDER IS: 933 -1976; IS: 2878 1976; IS: 2171 1976; IS: 4308 -1982	For every 50 square meter floor area or part, 2 numbers 9 -liters foam or 5 kg dry powder; should not be required to travel more than 10 m in the area of storage to reach any extinguisher.
5.	CLASS 'B' (Bulk storage other than in tank form)	-do -	-do- (but minimum 3 numbers per room)
6.	CLASS 'C' (Fires involving gaseous substances under pressure where it is necessary to dilute the burning gas at a very fast rate with an inert gas or powder) (locations of storage and handling of gas cylinders)	CARBON DIOXIDE / DRY CHEM. POWDER. The best way to extinguish such fire is by stopping the flow of fuel gas to the fire. Container is kept cool with water spray. IS: 2878 1976; IS: 2171 -1976; IS: 4308 -1982	For every 100 square meter floor area or part; 2 numbers, 10 kg powder extinguisher or 6 kg CO ₂ ; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
7.	CLASS 'D' Fires involving metals like magnesium, aluminum, zinc, potassium etc. where the burning metal is reactive to water and which require special extinguishing media or technique	SPECIAL DAY POWDER IS: 2171 -1976 IS: 4861 -1968	For every 50 square meter floor area or part, 2 nos. 5 kg special dry powder; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
8.	MIXED OCCUPANCY (electrical); Generators; Transformers; etc.	CARBON DIOXIDE DRY POWDER, IS: 2878 -1976; IS: 2171 -1976	For every 100 square meter floor area or part one 10 kg CO ₂ . Minimum 2 numbers for every location should not be required to travel more than 10 meter to reach an extinguisher.

Note: Due to peculiarities of the power plant construction sites, there would be locations in the construction areas of Boiler, Turbine, Generator, Transformer, etc. where different types of fire risk (classes of fire) may co-exist. Special



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care shall be taken while selecting and installing portable fire extinguishers for such locations so that all types of fire risk that may co-exist, are adequately covered. Similar special care shall be taken for storage areas.

1. All Electrical welding booths shall be equipped with appropriate Fire Extinguisher
2. Appropriate Fire Extinguishers shall be made within easy reach of all welding operations
3. Fire extinguishers shall be regularly tested and last checked date to be indicated on each.
4. Providing appropriate firefighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
5. Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times.
6. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
7. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed.
8. Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
9. Emergency contacts nos. must be displayed at prominent locations
10. Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

13.2.12 HSE PREPAREDNESS FOR ADVERSE CLIMATES AND WEATHER

Subcontractor to remain updated on possible adverse weather conditions through reliable sources and all precautions taken accordingly.

13.2.12.1 SUMMER

1. The Working Time and Lunch Hour will be as per instruction of Statutory Authorities (no work between 11am to 3:30pm). However, in case temp comes down due to rain/cloudy weather work will continue as per normal routine.
2. During long lunch break, worker will be allowed to go back home for rest. Those who will like to stay back will avail at the facility of rest shed or other designed area.
3. They will be allowed to take small break during work as per their need.
4. Water sprinkling will be done on roads to reduce dust concentration.
5. Workers will be provided with adequate cool drinking water and Butter milk/Lemon water etc.
6. Adequate ORS stock will be made available at the work location in the First-Aid Box for use as needed and at First-aid Center for emergency need.
7. Fire prevention shall be on high alert, with removal of dry grass and bushes, etc, inside and outside the surrounding work areas. No smoking, and control of open flame/sparks shall be maintained and monitored.
8. Worker will be informed about the Do's and Don'ts to be followed during summer in the Pre Job Brief.



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Do's & Don'ts

9. Drink plenty of cool water and other non-alcoholic fluid and keep body well hydrated.
10. Eat salt in food to replenish loss of salt through sweating.
11. Avoid over physical exercise.
12. Have adequate sleep at night.
13. Eat light and less spicy food
14. Avoid eating food which was cooked long time ago.
15. Nobody should use small water bodies such as pits, running rain water through crevices etc. for drinking and cleaning purpose as it may be unhygienic.

Emergency Handling

In case of emergency due to heat disorder:

16. Rescue the victim from workplace and place under shed.
17. If to be rescued from height, use stoke basket or rescue kit.
18. Inform Ambulance immediately.
19. If nearby any air conditioned room/shed is available, place him inside the room/shed.
20. Administer First aid by trained First aider for Heat Disorder
21. If conscious, give him ORS solution to drink.
22. If required send the victim hospital immediately.

13.2.12.2 Monsoon

A. Height Work & Structural Safety:

1. Ensure that all height work platforms are barricaded and avoid any highly hazardous
2. height work.
3. Ensure that all personnel have good quality and intact safety shoes
4. Stop all dangerous height work during rain
5. Explain Do's and Don'ts to workers during Tool Box Meetings
6. Ensure that there are no weak structures, boards etc. that can fall during high winds
7. Do not allow any loose material (e.g. GI sheet, Ply board, empty cement bag, aluminum foil, foam sheets etc.) on roof sheds or top of structures.
8. Do not permit any one to ride up or come down scaffolds frame work during heavy wind or rain.
9. Provide "anchor" of adequate strength to scaffolds and other high-rise structures.
10. All rest sheds and GI sheds will be anchored into the round and wall and roof panels will be secured with J hook to prevent shed from blowing over or parts/pieces becoming airborne. Proper earthing per IS standard is also to be installed.
11. Do not go alone nor permit anyone to stay at tower-tops, roof-tops, high structures or on electrical poles during the course of stormy weather or heavy rain.



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B. Electrical:

1. All electrical connections / loads have to be routed through ELCB / RCCB (residual current circuit breaker) whose rating should be 30mA.
2. RCCB operational checks need to be done DAILY / WEEKLY during monsoon season.
3. Avoid joints on power cables which need to be laid over-head or under-ground, better not to have any joint at all. In case joints become essential, such cables must be housed rigidly and insulation must be provided as per approved standard. The joint shall be suitable for outdoor use.
4. All electrical distribution board shall be properly covered at top and sides to protect from rain water. Extension boards shall be protected from rain water.
5. Ensure proper "earthing" for each and every electrical appliance.
6. Double earthing need to be provided for 3-phase power supply and for voltage more than 220V.
7. Provide lightening arrestors at the top of Boiler 3 and boiler 4 and rest sheds which are not covered by existing lightening arrestor of other installation.

C. Others:

1. Maintain smooth flow on open drains. i.e. no obstruction or blockade shall be made on storm water drains. If required, make temporary drains.
2. Arrange back-filling of excavated pits on war-footing basis.
3. Arrange bringing down booms of all cranes, hydra machines during stormy weather (wind speed 40-50 kmph)
4. Confirm that all gantry cranes are effectively choked to prevent rolling and toppling.
5. Do not forget to deep ready a dew battery operated lights at site-offices during rainy season.
6. Avoid using wet damp clothes.
7. Barricade excavated zone filled with water.
8. Engage diesel operated water pump to dewater work area. For electrically operated water pump, the starter shall be protected from rain water. All rotating parts shall be guarded. Ensure availability of sufficient water pumps.

D. Health and hygiene:

1. Monsoon reduces the immunity of our body and makes us vulnerable to many diseases which are commonly associated with this season. It is time for us to keep our body challenging against disease by boosting our immunity and taking safety measures against these diseases.



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2. The diseases associated with monsoon are Malaria, Jaundice, Gastro-intestinal infections, like typhoid, cholera etc. apart from these viral infections like cold and cough also make their presence felt. Majority of above said diseases are on account of:
3. Puddle of water formed due to rain become breeding grounds for mosquitoes which spread disease like, malaria and dengue fever. As a precautionary measure against mosquito-bite disease one can use mosquito net around the end which is better choice to mosquito repellants like mats and coils.
4. Pollution of drinking water during monsoon is very common. It is very necessary to drink clean and pure water when water-borne monsoon diseases like diarrhea and gastro-intestinal infections threaten us.
5. Walking in dirty water during rainy season leads of numerous fungal infection which affect toes and nails. Diabetic patients have to take a special care about their feet. Keeping feet always dry and clean is very necessary. Avoid walking in dirty water. Keep shoes socks and raincoats dry and clean.

E. Workmen will be made aware of following Do's and Don'ts:

1. Do not sleep in daytime.
2. Avoid over physical exertion.
3. During lightning and thunder storm, do not take shelter under tree. Take shelter inside rest shed or store room.
4. Wash vegetables with clean water and steam them well to kill germs.
5. Avoid eating un-cooked foods and salads should be washed properly before consumption.
6. Drink plenty of water and keep body well-hydrated.
7. Always keep the surrounding area dry and clean. Don't allow to get water accumulated around.
8. Keep body warm as viruses attack immediately when body temperature goes down.
9. Do not enter air conditioned room with wet hair and damp cloths.
10. Dry your feet and webs with soft dry cloth whenever they are wet.
11. Eat light and less spicy food.
12. Avoid eating food which was cooked long time ago.
13. Eat salt in food to replenish loss of salt through sweating.

13.2.12.3 Emergency Weather Conditions

A. Cyclone/Severe thunder storm

In the event of Cyclone/Severe thunder storm, alert will be issued by subcontractor on notification received by Govt. authorities/Metrological departments Customer or BHEL.

The actions required during cyclone/rough weather:

1. Check and advice subcontractors to cleanup work area. Pick up all loose and unused material of respective supervisor's area.
2. Tie to secure all gas cylinders to avoid displacement and unsafe conditions which could be due to wind pressure.



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3. Secure portable electricity generating sets and other equipment, pumps, hoses etc.
4. Make preparation for removal of water logging.
5. Take review of work activity and make preparation for removal of equipment and material from vulnerable areas.
6. Isolate/turn off all electrical power from the main panel/switches. Secure and anchor panels properly.
7. Recheck anchorage/tie of all temporary structures/sheds, tall objects, cranes, rigs, scaffolds etc. to avoid toppling due to wind force.
8. Cranes boom shall be secured, either locked or lowered the booms as reasonably and practicably possible and rigs to safe position for the safety point of view.
9. Group up all trash barrels, wooden pallets, forms; wooden decks etc. and anchor properly.
10. Welding machines, air compressors and such equipment are to be grouped together and secured to the stable objects. Welding leads, electrical cables, hoses are to be rolled up and secured properly.
11. Set on site vehicles on high ground in the site area with brakes set firmly.
12. Anchor all tanks, vessels, gas cylinders that may be moved by high wind and water.
13. Evacuate job site.

Personnel Evacuation:

14. Personnel Evacuation will be required if predicted wind speed and storm surge heights are beyond acceptable limits as per the instructions from Govt. Authorities/ Metrological departments or Customer.
15. Once the warning is received for personnel evacuation, an emergency response team shall be formed. The team will work with local authorities and other agencies formed/deployed to evacuate and transport all personnel involved in the project to the cyclone shelter.
16. Cyclone may be followed by the calm "EYE", be aware of it. If the wind suddenly drops, don't assume the cyclone is over. Violent wind may resume from the opposite side direction. Wait for the official "All clear Signal".
17. After the cyclone, do not go outside until officially communicated about safe situation outside. Use recommended routes for returning. Do not panic or rush while returning.
18. Checking of gas leaks and well being of electrical appliances is essential before leaving the site.
19. Follow local communications for official warning and advice. The construction Manager shall also obtain updates from customer/metrological departments and communicate to the personnel on project site.

13.2.12.4 Preparedness for Other Adverse Climates and Weather Conditions

All Preventive and Precautionary measures to ensure Health & Safety of workers in all possible adverse weather conditions based on the analysis of the local area conditions to be taken by the subcontractor

13.3 ENVIRONMENTAL CONTROL

1. Environment protection has always been given prime importance by BHEL. Environmental



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- damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life.
2. Subcontractor shall list out all applicable environmental aspects and impacts, and ensure control measures to manage the same.
 3. Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used.
 4. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.
 5. Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per MSDS.
 6. In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. Subcontractor shall use appropriate MSDS for clean-up technique. Subcontractor shall be responsible for the cleanliness of their own areas.
 7. Subcontractor shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform BHEL accordingly so that reasonable & practicable precautions can be taken to protect other persons who may be affected.
 8. It is imperative on the part of the subcontractor to join and effectively contribute to environmental protection measures such as tree plantation and towards social causes and maintaining good relations with local populace.
 9. The subcontractor shall carry out periodic air and water quality check and illumination level checking in respective area of work place and take suitable control measure to maintain the same as per applicable laws / standards

13.3.1 WASTE MANAGEMENT

1. Subcontractor shall take suitable measures for waste management and fulfilling requirements of environment related laws/legislation as a part of normal construction activities.
2. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.
3. Details of E-Waste, Hazardous Waste, shall be submitted to BHEL as per Format No. HSEP: 14-F18 and HSEP: 14-F19 respectively

13.3.1.1 BINS AT WORK PLACE

1. Sufficient rubbish bins shall be provided close to workplaces.
2. Bins should be painted yellow and numbered.
3. Sufficient nos. of drip trays shall be provided to collect oil and grease.
4. Sufficient qty. of broomsticks with handle shall be provided.
5. Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

13.3.1.2 STORAGE AND COLLECTION

1. Different types of rubbish/waste should be collected and stored separately.



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2. Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
3. Rubbish should not be left or allowed to accumulate on construction and other work places.
4. Do not burn construction rubbish near working site.

13.3.1.3 SEGREGATION

1. Earmark the scrap area for different types of waste.
2. Store wastes away from building.
3. Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
4. Clinical and first aid waste stored and incinerated separately.

13.3.1.4 DISPOSAL

1. Sufficient containers and scrap disposal area should be allocated.
2. All scrap bin and containers should be conveniently located.
3. Provide self-closing containers for flammable/spontaneously combustible material.
4. Keep drainage channels free from choking.
5. Make schedule for collection and disposal of waste.

13.3.1.5 WARNING AND SIGNS

1. Appropriate signage to be displayed at scrap storage area
2. No toxic, corrosive or flammable substance to be discarded into public sewage system.
3. Waste disposal shall be in accordance with best practice.
4. Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

13.4 HOUSEKEEPING

1. Keeping the work area clean/ free from debris, removing unused scaffoldings, scraps, insulation/ sheeting wastage /cut pieces temporary structures, packing woods etc. will be in the scope of the subcontractor.
2. Such cleaning has to be done by subcontractor within quoted rate, on daily basis by dedicated identified groups equipped with all require PPEs and training. The details of housekeeping group shall be provided to BHEL.
3. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from subcontractor's bill. Such decisions of BHEL shall be binding on the subcontractor.
4. Pests, such as beehives etc. shall be periodically removed in a humane fashion
5. **Following are to be taken care of on daily basis.**
 - i. All surplus earth and debris are removed/disposed of from the working areas to identified locations.
 - ii. Unused/Surplus cables, steel items and steel scrap lying scattered at different places /elevation within the working areas are removed to identify locations.
 - iii. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall



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be removed from workplace to identified locations. Sufficient waste bins shall be provided at different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from high locations

- iv. Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.
- v. Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
- vi. Labor camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.
- vii. Fabricated steel structures, pipes & piping materials shall be stacked properly.
- viii. No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power line.
- ix. Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas

13.5 TRAFFIC MANAGEMENT

13.5.1 SAFE WORKPLACE TRANSPORT SYSTEM

- 1. Traffic routes in a work place shall be suitable for the persons or vehicles using them.
- 2. Traffic routes for pedestrians and vehicles shall be clearly demarcated and indicated
- 3. Traffic routes shall never intersect the area of work and shall not endanger the site personnel
- 4. For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.
- 5. Temporary obstacles shall be brought to the attention of drivers by warning signs / hazard cones.
- 6. Power cables shall be maintained at a minimum height above ground as specified in Indian Electricity Act & Rules.
- 7. Sensible speed limits shall set and clearly displayed. Painted Speed ramps preceded by a warning signs or marker are necessary for stretches of roads exceeding 50 meters.
- 8. The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.
- 9. Safest route shall be provided between places where vehicles have to call or deliver.
- 10. Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse
- 11. Safe areas shall be provided for loading and unloading of material. Loading / Unloading Permit shall be taken from BHEL prior to any significant loading / unloading activity
- 12. Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.
- 13. Ensure road crossings are minimum and clearly signed.
- 14. Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.
- 15. Forklift trucks shall not pass over road hump unless of a type capable of doing so.



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16. Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.
17. The height of Power cables above areas of movement shall conform to Indian Electricity Rules
18. Road traffic signs shall be provided on prominent locations for prevention of accidents and hazards and for quick guidance and warning to employees and public.
19. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done.
20. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.

13.5.2 TRAFFIC ROUTE FOR PEDESTRIANS

1. Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.
2. Separate routes shall be provided for pedestrians to keep them away from vehicles. Provide suitable barriers/guard at entrances/exit and the corners or buildings.
3. Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.
4. Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
5. Provide high visibility clothing for people permitted in delivery area.

13.5.3 WORK VEHICLES

Work vehicles shall be as safe stable efficient and roadworthy as private vehicles on public roads. Subcontractors shall ensure that drivers are suitably trained and have valid license and experience for the designated class of vehicle. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

1. A high level of stability.
2. A safe means of access/egress.
3. Suitable and effective service and parking brakes.
4. Windscreens with wipers and external mirrors giving optimum all round visibility.
5. Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
6. Provision of seat belts.
7. Guards on dangerous parts.
8. Driver protection - to prevent injury from overturning and from falling objects/materials.
9. Driver protection from adverse weather.
10. No vehicle shall be parked below HT/LT power lines in conformance to Indian Electricity Act & Rules.
11. Valid Pollution Under Control certification for all vehicles



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13.5.4 DAILY CHECKS BY DRIVER

There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used. Subcontractors should ensure that drivers carry out these checks as a minimum.

Brakes	Mirrors	Warning signals
Tires	Windscreen waters	Specific safety system i.e. control interlocks
Steering	Wipers	

13.5.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES

1. All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
2. Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
3. All overhangs shall be made clearly visible and restricted to acceptable limits
4. Load shall be checked before moving off and after traveling a suitable distance.
5. On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.
6. Warning signs shall be displayed during transportation of material.
7. All vehicles used by Subcontractor shall be in worthy condition and in conformance to the Land Transport requirement

13.5.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.

13.6 EMERGENCY PREPAREDNESS AND RESPONSE

1. Subcontractor shall develop Emergency preparedness and response capability and Emergency Response Team as per [HSEP06: HSE Procedure for Emergency Preparedness and Response](#)
2. Availability of adequate number of first aiders and fire warden shall be ensured
3. All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures and communicate the same to BHEL.
4. Assembly point shall be earmarked and access to the same from different location shall be shown
5. Fire exit shall be identified and pathway shall be clear for emergency escape.
6. Appropriate type and number of fire extinguisher shall be deployed as per Clause No. 13.2.11 and validity shall be ensured periodically through inspection
7. Adequate number of first aid boxes shall be strategically placed at different work places to cater



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- to all emergency needs. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
8. First aid center shall be developed at site with trained medical personnel and ambulance
 9. Emergency contact numbers of the site shall be displayed at prominent locations.
 10. Tie up with fire brigade shall be done in case customer is not having fire station.
 11. Tie up with hospital shall be ensured in order to ensure the availability of following services to victims quickly without wasting precious time:
 - a. Intensive Care Unit with Ventilator and other necessary life support systems
 - b. Facility of specialized Orthopedic Surgery – in case of fracture / amputation
 - c. Facility of specialized brain / neuro surgery – in case of head trauma
 - d. Facility of specialized burn unit / ward – in case of Fire / burn injury
 - e. and other facilities as per requirement at site location
- In case tie up with multiple hospitals is required to cover all possible accidents, same shall be done. The list of facilities to be regularly checked and updated.
12. A detailed emergency services (Fire / Medical etc.) tie up plan shall be submitted to BHEL in monthly report Format No. HSEP:14-F05
 13. Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

14 HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSEMS requirements. The subcontractor shall maintain necessary safety equipment as applicable, to enable inspection personnel/agency perform Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

The requirements of respective work permits are to be ensured by respective supervisors, safety personnel and area in-charges. In addition, the formats & checklists as per Clause 21 of this document provided by BHEL shall be used for inspection by Safety personnel (as a minimum), and records of inspection to be maintained. BHEL shall reserve the right to modify any Format in this document or introduce additional checklists / formats to ensure regular inspection of all equipment as per requirement.

14.1 DAILY HSE CHECKS

Both the Site Supervisors and HSE Supervisors are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:



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1. Height Work:

- Safe, barricaded platform
 - PPEs
 - Proper method
 - Awareness
- Personal Safety wears & gear compliance.
 - Complying with site safety rules and permit-to-work (PTW).
 - Positions and postures of workers.
 - Use of tools and equipment etc. by the workers.
 - The inspection shall be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day's work ends.

14.2 INSPECTION OF HEIGHT WORKING

- Any kind of height work (above 2 meters) shall not be carried out without active physical supervision by concerned supervisor or safety personnel. All non-conformances related to height work shall be handled on priority and closed immediately after halting the work.
- A roster of personnel deployed for inspection of height work and other critical activities shall be prepared and submitted to BHEL in monthly report Format No. HSEP:14-F05, in order to ensure effective supervision at all times
- Inspection on height working shall be conducted **daily** by supervisors before start of work to ensure safe working condition including provision of:

a. Fall arrestor	d. Fencing and barricading	g. Proper scaffolding with valid
b. Lifelines	e. Warning signage	Tags, access and egress.
c. Safety nets	f. Covering of opening	h. Illumination

- Inspection on height working shall be conducted once in a week by HSE officer as per
- Format no. HSEP: 14-F10.
- Medical fitness, including vertigo test of height worker shall be ensured.
- Height working shall not be allowed during adverse weather.

14.3 INSPECTION OF PPE

PPEs shall be inspected by HSE officer at random once in a week as per Format no. HSEP: 14-F06 for compliance to standard and provisions and any adverse observation shall be recorded in the PPE register.

14.4 INSPECTION OF T&Ps

- All T& Ps being used at site shall be inspected by HSE officer once in a month as per specific Formats in this document, or (if not available) general Format no. HSEP: 14-F07 for its healthiness and maintenance.
- A master list of T&Ps and validity of their inspection certificates shall be maintained by each agency and details shall be submitted to BHEL in monthly format no. HSEP:14-F05.
- The T&Ps which require third party inspection shall be checked for its validity during inspection.



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The third party test certificate should be accompanied with a copy of the concerned competent person's valid qualification record. BHEL shall be given advance intimation of Third Party Inspection. BHEL shall associate with Inspection as per discretion.

14.5 INSPECTION OF CRANES AND WINCHES

1. Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
2. Cranes and Winches shall be inspected by HSE officer once in a month as per Format no. HSEP: 14-F08 & F09 for healthiness, maintenance and validity of third party inspection.
3. The date of third party inspection and next due date shall be painted on cranes and winches.
4. The operators/drivers shall be authorized by sub-contractor based on their competency and experience and shall carry the I-card.
5. The operator should be above 18 years of age and should be in possession of driving license of HMV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

14.6 INSPECTION ON WELDING AND GAS CUTTING OPERATION

1. Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
2. Gas cylinders shall be kept upright.
3. Use of Flash back arrestor shall be ensured at both ends.
4. Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per Format no. HSEP: 14-F11.
5. Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
6. Availability of fire extinguisher in vicinity shall be ensured.

14.7 INSPECTION ON ELECTRICAL INSTALLATION / APPLIANCES

1. Ensure proper earthing in electrical installation
2. Use of ELCB at electrical booth
3. Electrical installation shall be properly covered at top where required
4. Use appropriate PPEs while working
5. Use portable electrical light < 24 V in confined space and potentially wet area.
6. Monthly inspection shall be carried out as per Format no. HSEP: 14-F12.

14.8 INSPECTION OF ELEVATOR

1. Elevators shall be inspected by concerned supervisors once in a week as per Format no. HSEP: 14-F13.
2. All elevators shall be inspected by competent person and validity shall be ensured.
3. The date of third party inspection and next due date shall be painted on elevator.



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14.9 MONTHLY SITE INSPECTION

Subcontractor shall carry out monthly HSE inspection of all work areas as per Format No. HSEP:14-F20 and submit to BHEL

14.10 NON-CONFORMITY HANDLING:

Any serious non-conformances identified during inspection observed shall be addressed immediately.

In case immediate closure of non-conformities is not possible:

- work to be halted in the area
 - Non-conformance to be generated and submitted to responsible person and BHEL
 - non-conformance to be resolved through responsible agency / person
- Only after closure of serious non-conformances, work to be allowed to resume.

All non-conformances & safety violations to be recorded and closed in a time bound manner.

15 HSE PERFORMANCE

HSE performance of subcontractor shall be monitored as per BHEL criteria, based on which, marks will be awarded. Marks can be used to evaluate and rate the contractor as per BHEL internal systems

HSE performance of the subcontractor shall be monitored as per the following parameters: (For each contract-wise package). **Periodicity:** RA Bill period

Sl. No.	Parameters of measurement	Ref Clauses	Weightage	Actual
1	Availability of safety officers at site – absence up to 15% permissible. Score proportionately gets reduced with higher rate of absence. Availability to be reckoned from start date of manpower mobilization	7.1	10	
2	Attendance by the safety officer and site CM (as applicable) in the meeting convened by BHEL	20	5	
3	Level of compliance w.r.t decisions taken in previous meetings/audit/inspection/as reported.	-do-	5	
4	Timely submission of monthly report on safety in the prescribed format	11	3	
5	Timely reporting any incident including near-miss to BHEL /Customer/statutory authority (if required) and submission of investigation report of all LTIs/	12	10	



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	Major Property Loss incident and HSE events			
6	Degree of PPE compliance, Fall protection arrangements and safety net coverage	8.3, 14	15	
7	Level of compliance w.r.t safety rules	13,14	25	
8	Availability of proper first-aid facility , ambulance, hygienic labor colony and other adequate labor welfare initiatives, conducting of health check-up as per BOCW requirements	8	6	
9	Conducting induction training, skill training, tool box meeting, mock-drills, HSE Promotion, Emergency Preparedness and Response. Participation in BHEL training also counted	9.0	6	
10	Level of House-keeping, Environmental Control	13.3, 13.5	10	
11	Level of general illumination	8.4.11	5	
A	TOTAL Obtained		100	

Penalty score:

- i. For each fatality: -10
- ii. For each Major Incident: -07

NET TOTAL score will be arrived after deducting penalty score from Total score.

Subcontractor shall make available all data required for evaluation to BHEL as and when demanded.

- If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job.
- 1.5% of running bill shall be cleared subject to certification of desired safety performance by BHEL

16 HSE PENALTIES FOR NON-COMPLIANCE

- Nonconformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the subcontractor for every instance of violation noticed.
- The applicable penalties for HSE violations are given in Format No. HSEP14-F14 of this document



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3. The list of non-compliances given in above format is not exhaustive. The BHEL site in-charge has liberty to impose a penalty for any other non-compliance and incidents of any nature.
4. If principal customer or statutory and regulatory bodies impose penalty on ground of statutory non-compliance or non-compliance of HSE rules by the subcontractor or any incident of any nature including fatality or permanent disability, the same shall be passed on to the subcontractor with appropriate overhead
5. The penalty amount shall be recovered from subcontractors from the RA Bill, otherwise Final bill.

17 COMPENSATION TO ACCIDENT VICTIMS

1. 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 employees as detailed below.
 - b. **Victim:** Any person who suffers permanent disablement or dies in an accident as defined below.
 - c. **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.
 - d. **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. (ii) In the event of other permanent disability: Rs. 7,00,000/- (Rs. Seven Lakh)
 - e. **Permanent Disability:** A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923. "
2. In addition to above, contractor shall provide appropriate compensation to victims of major and fatal incidents as per Employee Compensation Act, 1923, ESIC Act, 1948 or as per any existing Acts and guidelines



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18 INTERNAL & EXTERNAL HSE AUDITS

1. Subcontractor shall extend full co-operation and maintain necessary documents & records as required by Internal & External HSE Audit carried out by BHEL. / Third Party
2. All non-conformities and observations on HSE shall be disposed of-by subcontractor in a time bound manner as detailed in Audit Report.
3. All required corrective actions shall be taken by the subcontractor in order to avoid recurrence

19 OTHER REQUIREMENTS

1. In case of any delay in completion of a job due to mishaps attributable to lapses by the subcontractor, BHEL shall have the right to recover cost of such delay from the payments due to the subcontractor, after holding an appropriate enquiry and notifying the subcontractor suitably.

2. RISK & COST:

If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety as per contractual requirements, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.

3. If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favourably consider to reward the subcontractor suitably for the performance.
4. The subcontractor shall take all measures at all the sites of work to protect all persons from incidents and shall be bound to bear the expenses of every suit, action or other proceeding of law that may be brought by any persons for injury sustained, death or damage to environment



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owing to neglect of the HSE precautions by the subcontractor; and shall be liable to pay any such persons such compensation, should such claim proceeding be filed against BHEL.

The subcontractor hereby agrees to indemnify BHEL against the same.

20 HSE REVIEW

BHEL shall hold HSE review meeting every month or as per requirement in order to discuss and resolve HSE issues of site and improve HSE performance. It will also discuss the incidents occurred since previous meeting, its root cause and Corrective action. The indicative agenda is given below:

1. Implementation of earlier MOM
2. HSE performance review
3. HSE inspection review w.r.t non-conformances observed and their status
4. HSE audit and CAPA
5. HSE training conducted and requirement
6. Health check-up camp
7. HSE planning for the erection and commissioning and installation activities in the coming month
8. HSE reward and promotional activities
9. HSE data analysis and improvement – Data analyzed will include non-conformances closed and pending, incident data, training data etc.

Subcontractor shall ensure presence of site in-charge, all package in-charges and safety officers, as communicated by BHEL in the meeting.

Subcontractor shall take requisite actions as per record notes and as decided in the meeting, in a time bound manner and submit compliance report to BHEL.



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21 FORMATS USED

This is minimum list of Formats to be used for reporting by the subcontractor. Other Formats are indicated in respective HSE Procedures, Work Permits, OCPs or as specified by BHEL. The medium of reporting can be hard / soft as indicated by BHEL.

BHEL can modify these Formats or introduce new Formats to the extent necessary to get the desired performance data of all HSE activities.

SN	Format Name	Format No.	Frequency of check	Rev
1	Work at Height Permit	HSEP:14-FP01	Before start of work and regularly thereafter as per Permit conditions	00
2	Hot Work Permit	HSEP:14-FP02		00
3	Confined Space Work Permit	HSEP:14-FP03		00
4	Excavation Work Permit	HSEP:14-FP04		00
5	Radiation Work Permit	HSEP:14-FP05		00
6	Lifting Activity Work Permit	HSEP:14-FP06		00
7	Lockout-Tagout Work Permit	HSEP:14-FP07		00
8	Inspection of First Aid Box	HSEP:14-F01	Weekly	00
9	Health Check Up	HSEP:14-F02	With new Induction & as per requirement thereafter	00
10	HSE Induction / Regular / On-the-Job Training	HSEP:14-F03	With new Induction & as per requirement thereafter	00
11	Tool Box Talk	HSEP:14-F04	Daily before job start	00
12	Site HSE Report	HSEP:14-F05	Monthly	00
13	PPE Inspection	HSEP:14-F06	Weekly	00
14	PPE Issue and Receipt	HSEP:14-F06A	With new Induction	
15	Inspection of T&Ps (General)	HSEP:14-F07	Monthly / As per requirement	00
16	Inspection of Cranes	HSEP:14-F08	Monthly / As per requirement	00
17	Inspection of Winches	HSEP:14-F09	Monthly / As per requirement	00
18	Inspection of Height Working	HSEP:14-F10	Daily / As per requirement	00
19	Inspection on Welding & Gas Cutting	HSEP:14-F11	Weekly / As per requirement	00
20	Inspection on Electrical Installation	HSEP:14-F12	Weekly / As per requirement	00
21	Inspection on Elevator	HSEP:14-F13	Weekly / As per requirement	00
22	HSE Penalty	HSEP:14-F14	-	00
23	Initial Verification of PPE's & Lifting Tools & Tackles	HSEP:14-F15	As and when new PPEs and T&Ps are received	00
24	Inspection of Labor Colony	HSEP:14-F16	Monthly / as per requirement	00
25	Recording of First Aid Injuries	HSEP:14-F17	As and when such injuries occur	00
26	E-waste Handled / Generated	HSEP:14-F18	Half Yearly	00
27	Hazardous Waste at the Facility	HSEP:14-F19	Half Yearly	00
28	HSE Checklist-cum-Compliance Report	HSEP:14-F20	As per Audit Calendar	00
29	Illumination Levels	HSEP:14-F21	Weekly / As per requirement	00
30	Incident Reporting	HSEP:14-F22	-	00
31	Incident Recording	HSEP:14-F23	-	00



HSEP:14-FP01

WORK AT HEIGHT PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1	All workers on job are competent and medically fit (No Height Phobia) for working at height		
2	Hazards in the vicinity are identified, controlled and communicated to the worker.		
3	Scaffolding soundness inspected is available for use with valid tag		
4	Work platform is not made of bamboo or weak material. Barricading is available with Top, Mid Rails and Toe Guard.		
5	Working platform is clean without any unwanted material. Floor openings are covered.		
6	Access and exit to workplace are safe, marked and without obstruction.		
7	Adequate lighting provided (for dark hours) as per applicable lux standards (Refer HSEP:13)		
8	Safety nets are provided below working area.		
9	Area below the working platform has been cleared of all activity		
10	Ladders have been secured, inspected and provided as per BHEL standard/contract.		
11	Horizontal life lines are provided to cater to design specification of 2300 kg per person.		
12	Safety harness with life line support/ fall arrester are checked and available in working condition		
13	Safety shoes (non-slip), Helmet with chin strip available with employees		
14	Visible Signboards provided on working platforms in workers' understandable language		
15	All lifting / tightening tools, hand tools/equipment checked and in good condition		
16	ELCB provided for Electrical connections individually. Electrical cable, welding Hose/Compressed air hose properly secured and laid down without obstruction. Earth resistance is OK.		
17	Crane / Winch / Hydra operator is qualified and experienced		
18	Emergency response team & Medical Facilities available. Work area is cordoned off.		
19	Job Safety Analysis Submitted		
20	Additional Permits to be taken (Please specify & attach):		

Declaration: All the points mentioned in the above checklist have been checked and found OK**Permit Receiver:**

Site Engineer (Sub- Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer (Sub-Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer (BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Work at Height Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	Site HSE Engineer, BHEL
Signature:	Signature:
Name:	Name:

General Instructions:

1	This Permit is required for working at height of 2 mtr. and above or above excavation of 2 mtr or deeper.
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work must be clearly indicated by the permittee.
4	Terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day only after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work at height, height phobia needs to be ascertained and proper fitness certificate to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy:
	Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.,



HSEP:14-FP02

HOT WORK PERMIT

Permit No. & Date

Project & Unit:

Emergency Contact Nos:

BHEL Sub-contractor:

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1.	Welder is trained and qualified with good attendance in on-the-job training		
2.	Area ensured safe and free from all hazards (explosives etc.) with barricading and safe inlet / exit		
3.	Proper ventilation and lighting provided (in case of dark hours).		
4.	Gas hoses are in good condition and not cut / leaking		
5.	Pressure gauges/Flash back arrestor (at both ends) provided and in working condition.		
6.	Gas pressure in cylinder is within limits and hydraulic test certificate is available		
7.	Gas cylinders are stacked vertically and not below the welding / cutting area. Regulator key is available with cylinder. Gas cylinders covered with shields to prevent falling splinters.		
8.	Power supply to welding machine is through ELCB of 30 mA rating, which is tested and found ok; Earthing is tested and found OK		
9.	Welding machine input/output cables, welding holder and weld return clamp (Holder) are insulated and in good condition.		
10.	In case of welding in enclosed / confined spaces, the integrity of the structure and supports are ensured, Gas Testing done and evacuation system ensured in place		
11.	Emergency STOP buttons are in working condition. Welder /Helper knows how to operate it.		
12.	Welder & Fitter trained to connect ground/work return clamps (Holder) to work place prior to energization of welding machine.		
13.	Personal Protective equipment Minimum applicable: safety helmet, safety goggles, welding helmet, safety (rubber) shoes, leather gloves, long sleeve and nose mask -provided		
14.	In case of pits, water removed from the pit and wood/rubber insulation provided.		
15.	Safety signboards / cautions are in place.		
16.	Adequate and Suitable nos. of applicable firefighting extinguisher provided.		
17.	Nearby combustible material removed. Housekeeping done.		
18.	All workers explained about the hazards		
19.	First aid in attendance.		
20.	Any other Precautions or Permits required (Height Work, Confined Space etc.), give details and attach		

Declaration: All the points mentioned in the above checklist have been checked and found OK**Permit Receiver:**

Site Engineer (Sub- Contractor):
Signature:
Name: Designation:

Site Safety Officer (Sub-Contractor):
Signature:
Name: Designation:

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):
Signature:
Name: Designation:

Site Safety Officer (BHEL):
Signature:
Name: Designation:

Package-in-charge (BHEL):
Signature:
Name: Designation:

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Hot Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	Site HSE Engineer, BHEL
Signature:	Signature:
Name:	Name:

General Instructions:

1	This Permit is required for all kinds of Hot Work eg. Welding, cutting etc..
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work must be clearly indicated by the permittee.
4	Terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day only after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work, competency and fitness to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy:
	Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.,



HSEP:14-FP03

CONFINED SPACE WORK PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1.	Has the equipment been Isolated from Power/Steam/Air?		
2.	Has the equipment been Isolated from liquid or gases?		
3.	Has the equipment been de-pressurized &/or drained?		
4.	Has the equipment been Blanked/blinded or disconnected?		
5.	Has the equipment been water flushed &/or steamed?		
6.	Whether man ways open and ventilated?		
7.	Whether constant Inert gas flow arranged?		
8.	Whether mechanically ventilated and adequately cooled?		
9.	Whether 24 V lighting provided inside the confined space?		
10.	Whether Radiation sources removed?		
11.	Whether training on confined space provided to the individual / group?		
12.	Whether required PPEs (hand gloves, goggles, face shield, ear plug/muff, protective clothing etc.) used?		
13.	Whether Safety harness and Lifeline used?		
14.	Whether Dust/Gas/Air Line mask used?		
15.	Whether attendant with SCBA/Air mask available?		
16.	Whether grounded air Exhaust/Blower/ AC provided?		
17.	Whether Personal Gas alarm provided?		
18.	Whether communication Equipment Provided?		
19.	Whether rescue equipment/team available?		
20.	Whether firefighting arrangement done		
21.	Any other Precautions or Permits required (Height Work, Confined Space etc.), give details and attach		

Declaration: *All the points mentioned in the above checklist have been checked and found OK***Permit Receiver:**

Site Engineer (Sub- Contractor):	Site Safety Officer (Sub-Contractor):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	Site Safety Officer (BHEL):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____
Package-in-charge (BHEL):	
Signature:	
Name: _____ Designation: _____	

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Confined Space Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6.							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL		Site HSE Engineer, BHEL	
Signature:		Signature:	
Name:		Name:	

General Instructions:

1	This Permit is required for all confined space tasks, where injury can happen due to lack of oxygen, or chances of fire are there due to gas accumulation.
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work must be clearly indicated by the permittee.
4	Terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work, competency and fitness to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy:
	Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.,



HSEP:14-FP04

EXCAVATION WORK PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1	Precautions taken for Underground Electrical Cable		
2	Precautions taken for Under / Above ground sewer/Drinking Water Line		
3	Precautions taken for Underground Telecommunication Line		
4	Precautions taken for Underground Product/Utility Line		
5	Precautions taken for Underground Fire Water Line		
6	Shoring / Shuttering / Sheet piling done to prevent collapse of excavation walls. Strength of Excavation wall ensured at all times		
7	Hard Barricading & Edge Protection provided		
8	Separate Safe Access for Man and Vehicle		
9	Lighting arrangement		
10	Banks Man Provided		
11	Required basic PPEs provided		
12	Slope Cutting/Benching Maintained		
13	Excavated soil / Construction Material / equipment kept away from the edge.		
14	First aid in attendance.		
15	Any other Precautions or Permits required (Height Work, Confined Space etc.), give details and attach		

Declaration: All the points mentioned in the above checklist have been checked and found OK**Permit Receiver:**

Site Engineer (Sub- Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer (Sub-Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer (BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Excavation Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL		Site HSE Engineer, BHEL	
Signature:		Signature:	
Name:		Name:	

General Instructions:

1	This Permit is required for all excavation tasks 1.22 mtr or deeper
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work must be clearly indicated by the permittee.
4	Terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work, competency and fitness to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy:
	Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.,



HSEP:14-FP05

RADIATION WORK PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1.	All the persons at the site informed/removed from the area.		
2.	Area around the source of radiation cordoned off with the rope/chord.		
3.	Radiation warning symbol/boards displayed around radiography work on rope/chord.		
4.	Radiographer worn radiation badges during testing and is within safe limits.		
5.	Radiography camera and carrying case box having radiation symbol.		
6.	Radiation Survey Meter is in working condition, calibrated & within validity period.		
7.	Radiographer has valid certificate from BARC.		
8.	Blinking light provided on road during radiography (in dark hours).		
9.	Proper required Illumination provided		
10.	Safe access and working platform provided to conduct RT work		
11.	All the persons involved in Radiography work are aware of the hazard of radiation		
12.	Any other Precautions or Permits required (Height Work, Confined Space etc.), give details and attach		

Declaration: All the points mentioned in the above checklist have been checked and found OK**Permit Receiver:**

Site Engineer (Sub- Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer (Sub-Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer (BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

Verified by Customer Representative (if applicable), Name:	Sign:	Date:	Time:

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Radiation Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	Site HSE Engineer, BHEL
Signature:	Signature:
Name:	Name:

General Instructions:

1	This Permit is required for all activities in which there is danger of exposure to harmful radiation
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work must be clearly indicated by the permittee.
4	Terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work, competency and fitness to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy:
	Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.,



HSEP:14-FP06

LIFTING ACTIVITY WORK PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

No.	Item	Yes	Not required / Remarks
1.	Crane used for lifting activity TPI tested, certified and approved for rated lifting		
2.	All lifting tackles, gears/appliances are tested and certified for lifting works.		
3.	Crane operator is trained and competent for lifting operation.		
4.	Lifting sling/ belt is protected against sharp edge of the jobs to be lifted.		
5.	Lifting hook is properly latched to prevent material falling over		
6.	Access and exit marked and without obstruction.		
7.	In case of lifting multiple materials at once, same are tied up with strong rope / material		
8.	Area below lifting activity barricaded to prevent movement		
9.	Minimum 2 guidelines have been provided for balancing and guiding jobs to be lifted.		
10.	Periphery area of crane booms as well as lifting job is barricaded and unauthorized/no-entry sign board posted.		
11.	Rigger and signal man is trained and competent for lifting work. Signal is clearly visible to the operator and understood		
12.	No lifting activity to be carried out during lightening, heavy wind/rain. No forecast of these conditions during work period		
13.	If scaffolding to be used during lift, scaffolding with valid tag available for use.		
14.	Add drawing /procedure etc. relevant for the lifting.		
15.	Any other Precautions or Permits required (Height Work, Confined Space etc.), give details and attach		

Declaration: All the points mentioned in the above checklist have been checked and found OK**Permit Receiver:**

Site Engineer (Sub- Contractor):	Site Safety Officer (Sub-Contractor):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	Site Safety Officer (BHEL):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____
Package-in-charge (BHEL):	
Signature:	
Name: _____ Designation: _____	

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Lifting Activity Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL		Site HSE Engineer, BHEL	
Signature:		Signature:	
Name:		Name:	

General Instructions:

1	This Permit is required for all Heavy Lifting Activities that are either / all of the following: 1. Above 50 Tons; 2. Tandem Lifting; 3. Total Load exceeding 75% of capacity of crane; 4. Lift of unusual difficulty or geometry or rigging; 5. Lift over operating Units; 6. Any other Lift as decided by Site HSE / Erection
2	Job Safety Analysis (JSA) to be created for every Lift above 5 Tons.
3	This permit must be available at the work site all the times of the work.
4	Location and description of the work, and terms applicable must be clearly indicated by the permittee.
5	This permit shall be endorsed each day after checking all the compliance jointly by the contractor and BHEL safety.
6	Permit shall be issued for not more than 7 days including the issue date.
7	Permit shall be returned to the HSE Department of BHEL after completion of the job.
8	Before engaging anybody to work, competency and fitness to be ensured.
9	All safety precautions to be taken as per work site HSE plan.
10	Distribution of copy: Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.



HSEP:14-FP07

LOCKOUT/TAGOUT (LIVE ELECTRICAL MAINTENANCE) WORK PERMIT		Permit No. & Date
Project & Unit:		Emergency Contact Nos:
BHEL Sub-contractor:		

Exact Location of Work: _____

Nature / Description of Work: _____

Duration of Work Execution *: From Date: _____ to Date: _____ Daily from _____ hrs. to _____ hrs.

Name of Sub-Contractor Performing the Work: _____

Name of Sub-Contractor's Site Engineer (Permit Requesting Authority): _____ Sign: _____

Name of Sub-Contractor's Package In-charge: _____ Sign: _____ Date: _____

The above described work will be done under all the safety precautions mentioned as under during the currency of the Permit.

Tag No.	Device to be Tagged / Locked I.D. No.	Device Location	Device Position OPEN / CLOSED - ON/OFF	Lock No.	Tag Lock Placed by Name/Sign - Date/Time	Tag / Lock Removed by Name/Sign - Date/Time

Declaration: *All the points mentioned in the above checklist have been checked and found OK***Permit Receiver:**

Site Engineer (Sub- Contractor):	Site Safety Officer (Sub-Contractor):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____

Permit Issuer:

Engineer of Concerned Execution Department (BHEL):	Site Safety Officer (BHEL):
Signature:	Signature:
Name: _____ Designation: _____	Name: _____ Designation: _____
Package-in-charge (BHEL):	
Signature:	
Name: _____ Designation: _____	

Verified by Customer Representative (if applicable), Name: _____ Sign: _____ Date: _____ Time: _____

(* Permit valid for 7 days, subject to daily renewal, and extension as per overleaf instructions / record formats)

Lockout/Tagout Work Permit No. & Date: _____

Daily Work Area Condition Endorsement

Sl. No.	Date	Signature with Date & Time		Remarks
		Agency Safety	BHEL Safety	
Day 2				
Day 3				
Day 4				
Day 5				
Day 6				
Day 7				

Permit Extension Beyond Initially Requested Hours

Sl. No.	Extension Period		Remarks	Signature with Date & Time			
	From..... (Date & Time)	To..... (Date & Time)		Agency Site Engineer	Agency Safety Officer	BHEL Site Engineer (PIA)	BHEL Safety Officer
1.							
2.							
3.							
4.							
5.							
6							

TO BE SIGNED BY THE BHEL HSE & EXECUTION AFTER THE WORK IS OVER

Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL		Site HSE Engineer, BHEL	
Signature:		Signature:	
Name:		Name:	

General Instructions:

1	This Permit is required for all maintenance and erection activities with danger of electrocution from Live Electric Power
2	This permit must be available at the work site all the times of the work.
3	Location and description of the work, and terms applicable must be clearly indicated by the permittee.
4	This permit shall be endorsed each day after checking all the compliance jointly by the contractor and BHEL safety.
5	Permit shall be issued for not more than 7 days including the issue date.
6	Permit shall be returned to the HSE Department of BHEL after completion of the job.
7	Before engaging anybody to work, competency and fitness to be ensured.
8	All safety precautions to be taken as per work site HSE plan.
9	Distribution of copy: Original- Permittee, Duplicate –Department HOS, Contractor, Triplicate - Site HSE Dept.

**POWER SECTOR****Inspection of First Aid Box**

FORMAT NO: HSEP:14-F01

REV NO.: 00

PAGE NO. 01 OF 02

Name of Site :	
Name of Sub-Contractor:	
Inspected by :	
Date of Inspection:	

Number of employees in the site: - _____

Sl. No.	Item	No. Available	Remarks
1	No. of small sterilized dressings		
2	No of medium sized sterilized dressings		
3	No of large sized sterilized dressings.		
4	No of large sized sterilized burn dressings		
5	No of (15 grams) packets sterilized cotton wool		
6	No of pieces of sterilized eye pads in separate sealed packets.		
7	No of roller bandages 10 cm wide.		
8	No of roller bandages 5 cm wide.		
9	Whether tourniquet available		
10	Whether supply of suitable splints available.		
11	No of packets of safety pins.		
12	Whether kidney tray available		
13	Whether sufficient number of eye wash bottles, filled with distilled water or suitable liquid, clearly indicated by a distinctive sign which shall be visible at all times, available.		
14	Whether 4%-xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops available.		
15	Whether (60ml) bottle containing a two percent alcoholic solution of iodine available		
16	Whether (two hundred ml) bottle of mercurochrome (2 per cent) solution in water available.		
17	Whether 120ml bottle containing Sal volatile having the dose and mode of administration indicated on the label,		
18	Whether roll of adhesive plaster (6 cm X 1 meter) available		

**POWER SECTOR****Inspection of First Aid Box**

FORMAT NO: HSEP:14-F01

REV NO.: 00

PAGE NO. 01 OF 02

Sl. No.	Item	No. Available	Remarks
19	No of rolls of adhesive plaster (2 cm X 1 meter)		
20	Whether snake bite lancet available.		
21	Whether (30 grams) bottle of potassium permanganate crystals available.		
22	Whether a pair scissors available		
23	Whether copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labor Institutes, Government of India available.		
24	Whether bottle containing 100 tablets (each of 5 grains) of aspirin available		
25	Whether Ointment for burns available		
26	Whether bottle of a suitable surgical anti-septic solution available		
27	Whether List of Contents pasted on First Aid Box along with respective expiry dates		

Signature of Subcontractor's Site I/C

Date:

**POWER SECTOR****Health Check-Up**

FORMAT NO: HSEP:14-F02

REV NO.: 00

PAGE NO. 01 OF 02

Name of Site :	
Name of Sub-Contractor:	
Name of Employee :	
Age:	

History Of Past Illness	H/O Epilepsy:
	H/O Drug Allergy:
	H/O Diabetics/ Hypertension:
	H/O Unconsciousness:
Personal History	

EXAMINATION**OBSERVATION****General Physical Examination**

Height		
Weight		
BMI		
Built And nourishment		
Pallor		
Temperature		
Chest Expansion	Inspiration	Expansion
Lymph Node Enlargement		
Upper Limbs Strength & Function		
Lower Limbs Strength & function		
Spine Adequately flexible for the job concerned (Yes/No)		
Mental alertness and stability with good eye, hand and foot co-ordination.		

Ear, Nose, Throat

Ear / Hearing	
Nose	
Throat	
<u>Vision</u>	
Left Eye	Right Eye

**POWER SECTOR****Health Check-Up**

FORMAT NO: HSEP:14-F02

REV NO.: 00

PAGE NO. 02 OF 02

EXAMINATION		OBSERVATION	
<u>Cardiovascular System Examination</u>			
Inspection			
Palpation	Pulse	BP	
Auscultation (Heart Sounds)			
<u>Respiratory System</u>			
Inspection	Respiratory Rate		
Palpation:			
Percussion			
Auscultation (Breath Sounds)			
<u>Examination of Abdomen</u>			
Inspection			
Palpation			
Auscultation (Bowel Sounds)			
Any Other			
Clinical Impression			

Signature of the examining doctor

Date:

**POWER SECTOR****HSE Induction / Regular / On-the-Job
Training Records**

FORMAT NO: HSEP:14-F03

REV NO.: 02

PAGE NO. 01 OF 01

Name of Site :				
Name of Sub-Contractor :				
Date of Training (dd/mm/yyyy) :		Duration (Hrs)		
		From	To	
Name & Details of Trainer:				
Subject of Training	Induction		On-The-Job Training (Give details)	
Name of Training Co-ordinator:				

Sl. No.	Name	Designation	Organization	Signature

I certify that Training has been carried out as per HSEP04: HSE Procedure for Training & Awareness

Signature of Training Coordinator

Date:

**POWER SECTOR****Toolbox Talk**

FORMAT NO: HSEP:14-F04

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :	
Sub-Contractors Name :	
Date :	

Topic	Name of person delivered Tool Box Talk	No. of Participants attended	Remarks

Signature of Site I/C of Subcontractor

Date:

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 01 of 6

Name of subcontractor:	Report Month:

A) Accidents/Incidents Details: -

a	Lost time in Accidents	No. of incidents	Man Hours Lost	No. of People Involved	No. of person reported to Govt.		
	For the Month						
	Cumulative						
b	Minor Injuries						
	For the Month						
	Cumulative						
c	Fires	No. of Near-Misses	No. of First- Aid cases	No. of persons injured	No. of equipment damaged	No. of Fire reported Outside	
	For the Month						
	Cumulative						
d	Other mishaps not covered in a, b, c.	No. of Near-Misses	No. of First- Aid cases	No. of persons injured	No. of equipment damaged	Total near misses and First-Aid	
	For the Month						
	Cumulative						

B) Data for Man-hours worked:

Details	Value	Remarks if any
No. of people		
Man Hours worked		
O.T. Hours		
Total Man Hours		
Grand Total of man hours worked during the month(A+B)		
Cumulative man-hours (from _____ to _____): (Since commencing of operations)		

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 02 of 6

C) Status of Deployment of Work force, Safety Officers/Supervisors & Construction Medical Officer(s) & Electricians:

Description	Name	Qualification & Experience
Safety Officers		
Safety Supervisors		
Construction Medical Officer		
Nursing Staff.		
Electricians		
Scaffolding Inspectors		
T&P Inspectors		

D) Status of deployment of manpower for critical HSE activities:

(All height work and other hazardous activities to be actively supervised by trained personnel. Area to be divided in manageable sections to ensure effective supervision at all times. For example, multiple elevations in a structure can be divided among multiple supervisors)

Activity	Location	Shift Timings	Personnel deployed	Remarks
Height Work	Boiler Unit- (Level 1-3)			
	Boiler Unit- (Level 4-6)			
	ESP			
Housekeeping	Boiler Unit-			
	ESP Unit			
Others				

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 03 of 6

E) Lifting Tools, Tackles, Equipment and Pressure Vessels:

Item	Nos. Deployed	Nos. Tested by competent person	Identification Nos. (Comma separated) (A)	Validities of Test Certificates (Comma separated – corresponding to column A)	Whether internal testing using Color Coding or similar system done
Winches					
Chain Blocks					
Wire Rope Slings					
Man Cages					
D-Shackles					
Air Compressors					
Crawler Cranes					
Mobile Cranes					
Hydra Cranes					
Hydraulic Jack					
Others					

F) Reverse Horns in Construction Vehicles:

Item	Nos. Deployed with serial numbers (Comma separated) (A)	Nos. Having Functional reverse horns	Inspection Dates (Comma separated corresponding to column A)
Transit Mixers			
Hydra Cranes			
Dumpers/Trippers			
Backhoes			
Other Vehicles			

G) ELCBs:

No. Of ELCBs provided with Serial Nos. (Comma separated) (A)	Nos. Functional	When They were last Tested (Comma separated corresponding to column A)

H) Electrical Earthing:

No. Of Earth resources with serial numbers and locations (Comma separated) (A)	Whether Double Earthing provided to all equipment	When they were last tested (Comma separated corresponding to column A)

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 04 of 6

I) Fire Extinguishers

Name & designation of person responsible for maintenance of Extinguishers at different locations : (Individual subcontractor's Safety Officers).

A. FIRE EXTINGUISHERS AT ERECTION SITE:

Type (Add more rows if required)	Sizes	Qty + Serial numbers (Comma separated) (A)	Healthiness – Last checked dates (Comma separated corresponding to column A)	Locations (Comma separated corresponding to column A)
FOAM TYPE				
SODA TYPE				
DRY TYPE (DCP)				
C02 TYPE				

B. FIRE EXTINGUISHERS AT SITE OFFICES & STORES:

Type	Size (Add more rows if required)	Qty + Serial numbers (Comma separated) (A)	Healthiness – Last checked dates (Comma separated corresponding to column A)	Locations (Comma separated corresponding to column A)
FOAM TYPE				
SODA TYPE				
DRY TYPE (DCP)				
C02 TYPE				

J) Tie-Ups with Emergency Services

Service (Add more rows if required)	Name, location & distance from site	Emergency contact details	Remarks
Hospital with ICU and facilities for orthopedic, neurological etc. trauma			
Fire services			
Others:			

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 05 of 6

K) Implementation of Checklist, Work Permits:

Item	Numbers During the Month	Major Deviations

Note:- Please attach photocopies of all filled Checklists & Work permits for that month.**L) Personal Protective Equipment Issued (Extend table for each subcontractor):**

Item	Issued this Month	Nos. Issued up to the Month	Percentage of usage at Site (as per physical verification)
Name of subcontractor:			
Safety Helmet			
Safety Shoes			
Full Body Harness			
Fall Arrestor			
Safety Nets			
Hand Gloves			
Face shield			
Welder shield			
Nose Mask			
Reflective Jacket			
Other PPEs.			

M) Safety Observations by Subcontractor Executives- Observations package wise:

Topic	Date Of Programme	No. Of Participants	Level Of Participants

• Tool-Box talks on Safety:

Date	Tool Box Talk - No of Participants	Topic	Remarks

• Safety Induction Trainings:

Date	Safety Induction No. of Participants	Topic	Remarks

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Monthly Site HSE Report**

FORMAT NO: HSEP:14-F05

REV NO.: 00

Page 06 of 6

N) Progress of Management Programmes at Site

SL	Description Of MPs	Annual Plan	Achievement In This Month	Cumulative Achievement
A. Environment Improvement Programme				
1	Plantation of Trees			
2	Installation of Scrap Bins			
3	Chemical Storage & Handling system			
B. Improvement of Working Environment				
4	Increasing LTI free days			
5	Air Quality Monitoring			
6	Water Quality Monitoring			
7	Illumination level Monitoring			

O) HR Information:

Designation	Total No. Inducted	Total no. of Induction Balance	Total no. of Gate Pass Issued	Total no. of Gate Pass Balance	Total no. of Gate Pass Cancelled	Medical Checkup Completed	Medical Checkup Balance

P) Rewards on Account of Good Safety Performance

Serial Number	Reward Issued to	Details of Reward Issued (Amount etc.)	Brief Reason

Note: Photos of Reward Functions to be attached**Q) Other Safety initiatives / Safety Activities conducted (with photos, if any):**

Signature of Subcontractor Site In-charge

Signature of Subcontractor HSE Officer

**POWER SECTOR****Personal Protective Equipment Inspection**

FORMAT NO: HSEP:14-F06

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Item	Total Checked	Numbers Found in Order	Remarks
Safety Helmet			
Safety Shoes			
Full Body Harness			
Fall Arrestor			
Safety Nets			
Hand Gloves			
Face shield			
Welder shield			
Nose Mask			
Reflective Jacket			
Other PPEs (Specify)			

Signature of Site I/C of Subcontractor:

Date:



POWER SECTOR

Format for Register of Issue and Receipt of PPEs

Site:

Subcontractor:

[illegible]

**POWER SECTOR****Inspection Of T&Ps**FORMAT NO: **HSEP:14-F07**

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :	
Name of Sub-Contractor :	
Date of Inspection :	

Sl.No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs / overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	
Signature-Subcontractor HSE Officer		Signature-Subcontractor Site In-charge

**POWER SECTOR****Inspection Of Cranes**

FORMAT NO: HSEP:14-F08

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :

Name of Sub-Contractor :

Inspected by :

Date of Inspection:

Crane Reg. No (Make/Model)

Name of Driver/Operator

Sl.no.	Description	Observation	Measures
1	Valid Driving license		
2	Hook & Hook Latch		
3	Over Hoist limit switch		
4	Boom limit switch		
5	Boom Angle Indicator		
6	Boom limit cutoff switch		
7	Condition of Boom		
8	Condition of ropes		
9	Number of load lines		
10	Size and condition of the slings		
11	Stability of the cranes		
12	Soil Condition		
13	Swing Break And Lock		
14	Proper Break And Lock		
15	Hoist Break And Lock		
16	Boom Break And Lock		
17	Main Clutch		
18	Leakage in Hydraulic Cylinders		
19	Out riggers fully extendable		
20	Tyre pressure		
21	Condition of Battery And Lamps		
22	Guards of moving and rotating parts		
23	Load chart provided		
24	Number and position of pedant ropes		
25	Reverse Horn		
26	Load Test Details		
27	Operator's fitness		
28	Pollution under control certificate		
29	Fire extinguisher of appropriate type.		
30	Training of the operator		

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection Of Winches**

FORMAT NO: HSEP:14-F09

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Winch Reg. No (Make/Model) _____

Name of Operator _____

Name of Operator:					
Sl. No.	Description	YES	NO	NA	Remarks
1	Has the copy of Third Party Inspection certificate been provided in winch machine shed?				
2	Is safe operating instructions displayed near winch?				
3	Is winch machine operator experienced enough to operate the winch machine?				
4	Is the winch machine operated by someone other than the winch machine operator?				
5	Is there guard provided in all moving parts like wheel and motor's shaft?				
6	Will it protect against unforeseen operational contingencies?				
7	Are brakes, clutch and locking arrangement working properly?				
8	Has it been ensured that the guard does not constitute a hazard by itself?				
9	Are the cranks and the connecting rods protected by guardrails?				
10	Is there provision for fully covered shed with wooden plank roof?				
11	Is wire rope free from any kind of damage or wear and tear?				
12	Is split pin provided for the protection of clutch and brake locking arrangement?				
13	Is pulley inspected by competent person and certified before use?				
14	Is pulley free from any wear and tear visually?				
15	Is winch rope barricaded with clipsheet for the protection of rope and person?				
16	Is the wire rope lubricated by cardium oil?				
17	Is there any friction in wire rope which may damage the wire rope rather than the rolling parts?				
18	Is there any oil leakage in the hydraulic system of the winch machine?				
19	Has it been ensured that the guard will not cause discomfort or inconvenience to operator?				
Total NO		Total NA		% Compliance	

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection of Height Working**

FORMAT NO: HSEP:14-F10

REV NO.: 00

PAGE NO. 01 OF 2

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Sl. No.	Descriptions	Observation (Yes/No)	Remarks
A. General			
1	All the workers have been explained safe work method?		
2	Adequate illumination has been ensured.		
3	Work area inspected prior to the start of the work.		
4	Is the work area barricaded to prevent fall and platforms are of adequate strength (bamboo, jute / plastic ropes not to be used).		
5	The temporary work platforms & structures for height work including those used in Boiler structures, water walls, ESP, Powerhouse are fully barricaded with railings (as per IS 3696)		
6	Fabricated makeshift arrangements are checked for quality and type of material welding, anchoring etc.		
7	Are floor gaps, permanently covered and barricaded		
8	Area below the work place barricaded, particularly below hot work.		
9	Workers provided with bags /box to carry bolts, nuts and hand tools		
10	Arrangement for fastening hand tools made.		
11	All work platforms ensured to be of adequate strength and ergonomically suitable.		
12	Work at more than one elevation at the same segment is restricted.		
13	An established communication system has been established and explained to the workers.		
B. Access/Egress			
1	Walkways provided with handrail, mid-rail and toe guard?		
2	All checkered plates, gratings properly welded/ bolted?		
3	Are ladders inspected and they are in good condition?		
4	Are ladders spliced?		
5	Are ladders properly secured to prevent slipping, sliding or falling?		
6	Stairs erected above and below 1 tier column for safe access?		
7	Do side rails extend 36" above top landing?		

**POWER SECTOR****Inspection of Height Working**

FORMAT NO: HSEP:14-F10

REV NO.: 00

PAGE NO. 02 OF 2

Sl. No.	Descriptions	Observation (Yes/No)	Remarks
8	Are built up ladders constructed of sound materials?		
9	Are rugs and cleats not over 12" on center?		
10	Metal ladders not used around electrical hazards.		
11	Proper maintenance and storage.		
12	Ladders placed at right slope.		
13	Ladders / staircases welded/ bolted properly.		
14	Any obstruction in the stairs.		
15	Are landing provided with handrails, knee rails, toe boards etc.?		
16	Whether ramp is provided with proper slope.		
17	Proper hand rails / guards provided in ramps.		
C. Housekeeping			
1	Walkways, aisles & all overhead workplaces cleared of loose material.		
2	Is any nut bolt/scrap left on beam/column?		
3	Flammable materials, if any, are cleared.		
4	All the de shuttering materials are removed after de shuttering is done.		
5	Platforms and walkways free from oil/grease or other slippery material.		
6	Collected scrap are brought down or lowered down and not dropped from height.		
D. PPE And Safety Devices			
1	Use of safety helmet, safety belts ensured for all workers		
2	Anchoring points provided at all places of work.		
3	Common lifeline provided wherever linear movement at height is required.		
4	Safety nets are use wherever required.		
5	Proper fall arrest system is deployed at critical workplaces.		
6	Crawler boards/Safety system or works on fragile roof are used.		
7	Is man-lift being used for personnel lifting?		
8	Does man basket / personnel lift system has an independent lifeline and all occupants safety harnesses connected to it with rope grab?		

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection of Welding and Gas Cutting**

FORMAT NO: HSEP:14-F11

REV NO.: 00

PAGE NO. 01 OF 02

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

Welding				
Sl.no.	Description	Y e s	N o	Remarks
1	Is electric connection given through 30 mA ELCB/RCCB to welding m/c?			
2	Is welding machine more than 10 years old?			
3	Is there provision of fuse and is it bypassed?			
4	Is electric cable fitted properly in junction box on m/c?			
5	Is electrical cable free from joints?			
6	Are the joints attached firmly & insulated with tape?			
7	Is double earthing given to body of m/c?			
8	Is the physical condition of the m/c good?			
9	Is ON/OFF switch connected to the m/c is working and in good condition?			
10	Are indication lamps on m/c working?			
11	Is the electrode holder in good condition?			
12	Are the cables of the welding m/c lugged & tight properly?			
13	Is cable to welding machine terminal joint loose / burnt / glowing?			
14	Are return lead connected properly (Rod, Angle, Channels shall not be used)			
	Total No of NO			
	Total No of YES			

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection of Welding and Gas Cutting**

FORMAT NO: HSEP:14-F11
REV NO.: 00
PAGE NO. 02 OF 02

Gas Cutting				
Sl.no	Description	Yes	No	Remarks
1	Are Cylinders kept on trolleys?			
2	Physical condition of Gas cylinders Good?			
3	Is there Oil/Grease on valve of the cylinder?			
4	Are pressure regulators in good condition?			
5	Condition of hose pipe OK?			
6	Are hose pipe clamped with hose clip?			
7	Is flash back arrestor & NRV fitted on torch both for O2 and LPG cylinder?			
8	Is nozzle of the torch cleaned?			
	Total Number of NO			
	Total No of YES			
	% Compliance			

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection Of Electrical Installation**

FORMAT NO: HSEP:14-F12

REV NO.: 00

PAGE NO. 01 OF 02

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

Sr. No.	Contents	Yes/No	Remarks
A	Cable		
1.	Whether the condition of cable is checked?		
2.	Are cables received from other sites checked for insulation resistance before putting them into use?		
3.	Are all main cables taken either underground / overhead?		
4.	Are welding cables routed properly above the ground?		
5.	Are welding and electrical cables overlapping?		
6.	Is any improper joining of cables/wires prevailing at site?		
B	DBs/SDBs		
1.	Is earth conductor continued up to DB / SDB?		
2.	Whether DBs and extension boards are protected from rain / water?		
3.	Whether DB and extension board have separate MCB/ELCB		
4.	Is there any overloading of DBs / SDBs?		
5.	Are correct / proper fuses & CBs provided at main boards and sub-boards?		
6.	Is energized wiring in junction boxes, CB panels & similar places covered all times?		
C	ELCB		
1.	Whether the connections to all equipment are routed through individual ELCBs?		
2.	Is sensitivity of each ELCB maintained at 30 mA?		

**POWER SECTOR****INSPECTION OF ELECTRICAL INSTALLATION**

FORMAT NO: HSEP:14-F12

REV NO.: 00

PAGE NO. 02 OF 02

Sr. No.	Contents	Yes/No	Remarks
3.	Are the ELCB numbered and tested periodically & test results recorded in a logbook countersigned by a competent person?		
D	Grounding		
1.	Is natural earthing ensured at the source of power (main DB at Generator or Transformer)?		
2.	Whether the continuity and tightness of the earth conductor are checked?		
3.	Mention the gauge of the earth conductor used at the site.		
4.	Mention the value of Earth Resistance.		
E	Electrically operated Machines or Accessories.		
1.	Whether the plug top is provided everywhere.		
2.	Are all metal parts of electrical equipment and light fittings / accessories grounded / double earthed?		
3.	Is there any shed or cover for welding machines?		
4.	Are halogen lamps fixed at proper places?		
5.	Are portable power tools maintained as per norms?		
6.	Any other information:		

Signature of Site I/C of Subcontractor:

Date:

**POWER SECTOR****Inspection of Elevator**

FORMAT NO: HSEP:14-F13

REV NO.: 00

PAGE NO. 01 OF 01

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

Sr. No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs/overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	

Signature-Subcontractor/ Subcontractor's Safety Officer

Signature-Site Safety Officer (BHEL)



POWER SECTOR

HSE Penalty Format

FORMAT NO: HSEP:14-F14

REV NO.: 00

PAGE NO. 01 OF 2

Sub: MEMO for Penalty for non-compliances in Safety and Fabrication Quality requirement

Following lapse (tick marked) was observed and penalty is imposed as stated at the bottom of this memo. It is requested that such occurrences may please be avoided in future.

S. No	Nature of Non - Compliance	Penalty (in Rs.)	Remarks
A. PPEs			
1.	Not wearing safety helmet / wearing without chin straps	500	Per Person/ day
2.	Not Wearing safety shoes	500	Per Person/ day
3.	Not wearing gloves, nose masks where required	350	Per Person/ day
4.	Not using grinding goggles while doing grinding operations	500	Per Person/ day
B. Height Work			
1.	Not providing Lifelines for height work	1000	Per location per day
2.	Not ensuring barricading of working platforms	1000	Per location per day
3.	Not using temporary platform during work at height	1000	Per case per day
4.	Not wearing safety belt while working at height (> 2 meters) or not anchoring to lifeline	2000	Per Person/ day
5.	Not providing proper barricades (caution tape at 2 elevations)	500	Per location per day
	Use of mobile phones by Height worker / Crane / Hydra Operator	1000	Per case per day
C. Electrical			
1.	Not using 24 V supply for lighting in confined spaces	500	Per case per day
2.	Lack of Electrical Earthing	2000	Per case per day
3.	Improper earthing of welding & Other electrical Machines. Earth resistance not OK	500	Per Machine per incidence
4.	Electrical plug not used for connection/ hand machines	500	Per connection per incidence
5.	Unsafe electrical practice like not installing ELCB/ RCCB	500	Per case per day
6.	Using frayed/ broken welding cables	500	Per machine per week
D. Lifting			
1.	Use of lifting equipment without having valid Third Party Test certificate	5000	Per equipment per seven days
2.	Lifting hooks without latches	500	Per hook per day
3.	Using damaged slings or not slinging properly	2000	Per event Per T&P
4.	Lifting cylinders without cage or rolling of cylinders	500	Per Event per incidence
5.	Non removal of scrap from platforms	1000	Per Event Per location per 7 days
E. Hot Work / Cylinder Handling			
20.	Gas cutting without flash back arrestor	2000	Per machine per incidence
21.	Gas cutting at height without sheet below	500	Per event
22.	Not keeping gas cylinders vertically / in trolley on ground	500	Per event
23.	Gas cutting with damaged hose pipes	500	Per event
	Not covering welding cylinder with top cover	500	Per event
F. Construction Vehicles			
24.	Not having valid driving license for the type of vehicle/ T&P	2000	Per driver per event
25.	Two wheeler entry in construction area	500	Per vehicle
26.	Using Hydra for material movement at site in unsafe manner	1000	Per case
27.	Using Two Hydra in Tandem for material movement	2000	Per case
28.	Vehicles, Hydras, Cranes, Dumpers and Earth Movers not having automatic back horns linked to gear	1000	Per Equipment per day
29.	Not using guide rope while moving material using Hydra or Crane	1000	Per event
30.	Violating speed limit during vehicle movement	1000	Per event

	POWER SECTOR	FORMAT NO: HSEP:14-F14 REV NO.: 00 PAGE NO. 02 OF 2
	HSE Penalty Format	

	Nature of Non - Compliance	Penalty in Rs.)	Remarks
Engineering / Administrative Controls / General			
31.	Major Accident – Victim not reporting for work within 48 hours – resulting in partial loss in earning capacity & termination / demotion in employment	200000	
32.	Fatal Accident/Accidents Resulting in total Loss in Earning Capacity #	500000	Per victim#
33.	Unsafe Act in violation of standards / clauses of this document	500-5000	Per case
34.	Activity carried out without safety work permit where applicable	2000	Per person per event
35.	Using untrained / unqualified personnel for hazardous work	2000	Per event
36.	Not maintaining proper hygiene in canteen as per BOCW	1000	Per event

or as deducted by customer, whichever is higher.

For repeated **major and** fatal incidents under the same subcontractor for the same package in the same Unit, the subcontractor will pay 2 times the penalty compared to previously paid

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.)

Penalty imposed:

1, Rate as per above chart_____

2. No. of Persons/ machine/ event/ labor_____

3. Total Penalty= 1. X 2. =_____

BHEL Personnel:

Signatures:

Name_____

Attachments: Photographs & Documentary proof (if available) for violation

Distribution: 1 Copy: to Sub- contractor Site In-charge,
1 Copy to Site Construction Manager (BHEL)

**POWER SECTOR****Format for Inspection of Labor Colony**

FORMAT NO: HSEP:14-F16

REV NO.: 00

PAGE NO. 01 OF 1

Name of Site :	
Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

S. No	Particulars	No	Yes	Comments
1	Sufficient living space ensured for each occupant with Kitchen area			
2	Area cleanliness ensured through regular cleaning			
3	Toilet facility sufficient for all occupants available, in order with adequate lighting, cleaned regularly and in hygienic condition			
4	Washing facilities available with adequate water supply			
5	Availability of sufficient drinking water in protected tanks with weekly tank cleaning and source tested annually as per IS10500 ensured			
6	Adequate drainage to remove waste and rain water, no flooding			
7	"Unsafe for Drinking" posted near accessible non-potable water and sources; posted in language of occupants or universal symbol			
8	Prevention of mosquitoes, flies, and rodents in immediate housing area through insecticide sprays if required			
9	Electricity provided & electrical connections safety ensured			
10	Fans, Coolers / Quilts, Heaters provided as required to cater to weather conditions along with adequate electricity supply			
11	Houses Walls and roof tight and solid; floors rigid and durable, with smooth, cleanable finish in good repair			
12	Availability of nominal rate ration / common use items shop within / nearby the colony			
13	Emergency medical plan developed: (A) Potential injuries determined (B) Local EMS response determined (C) Qualified first-aid person on site, if required			
14	Emergency plans posted where employees gather			
15	Transportation to nearest suitable facility			

Any other checks:

Remarks:	Name & Sign. Of Subcontractor HSE Officer			



POWER SECTOR

Format for Recording of First Aid Injuries

FORMAT NO: HSEP-14-F17
REV NO.: 00
PAGE NO. 01 OF 1

Name of Site:	Name of Subcontractor:

[illegible]

**POWER SECTOR****Format for Maintaining Records of E-waste
Handled / Generated**

FORMAT NO: HSEP:14-F18

REV NO.: 00

PAGE NO. 01 OF 1

(Generated Quantity in Metric Tons (MT) per year)

Site		
Subcontractor		
Date		
Types & Quantity of e-waste handled/generated**	Category	Quantity
	Item Description	
Types & Quantity of e-waste stored	Category	Quantity
	Item Description	
Types & Quantity of e-waste sent to collection center authorized by producer/dismantler/recycler/refurbisher or authorized dismantler/ recycler or refurbisher **	Category	Quantity
	Item Description	
Types & Quantity of e-waste transported*	Category	Quantity
	Item Description	
Name, address and contact details of the destination		
Types & Quantity of e-waste refurbished*	Category	Quantity
	Item Description	
Name, address and contact details of the destination of refurbished materials		
Types & Quantity of e-waste dismantled*	Category	Quantity
	Item Description	
Types & Quantity of e-waste recycled*	Category	Quantity
	Item Description	
Types & Quantity of materials recovered	Quantity	
Name, address and contact details of the destination		
Types & Quantity of e-waste sent to recyclers by dismantlers	Category	Quantity
	Item Description	
Name, address and contact details of the destination		
Types and Quantity of other waste sent to respective recyclers by dismantlers / recyclers of e-waste	Category	Quantity
	Item Description	
Name, address and contact details of the destination		
Types and Quantity of e-waste treated & disposed	Category	Quantity
	Item Description	
Name, address and contact details of the destination		

Signature of Subcontractor Site In-charge:**Date**

**POWER SECTOR****Format for Maintaining Records of Hazardous Waste at the Facility**

FORMAT NO: HSEP:14-F19

REV NO.: 00

PAGE NO. 01 OF 1

1. Name of Site:
2. Name of the Subcontractor:
3. Date:
4. Description of hazardous waste:

Physical form with description	Chemical form	Total volume and weight (in kg.)

5. Description of storage and treatment of hazardous waste:

Date	Method of storage of hazardous wastes	Date	Method of treatment of hazardous wastes

6. Details of transportation of hazardous waste:

Name & address of consignee of package	Mode of packing/of the waste for transportation	Mode of transportation to site of disposal	Date of transportation

7. Details of disposal of hazardous waste:

Date of disposal	Concentration of hazardous material in the final waste form	Site of disposal (identify the location on the relevant layout drawing for reference)	Method of disposal	Persons involved in disposal

8. Data of environmental surveillance:

Date of measurement	Analysis of ground water			Analysis of soil samples			Analysis of air sampling			Analysis of any other samples (give details)
	Location of sampling	Depth of sampling	Data	Location of sampling	Depth of sampling	Data	Location of sampling	Data		

9. Details of the hazardous wastes reused and recycled:

Date	Total quantity of hazardous waste generated	Details of hazardous waste minimization activity	Material received	Final quantity of waste generated	Net reduction in waste generation quantity and percentage

Signature of Subcontractor Site In-charge:

Date:

**POWER SECTOR****HSE Audit / Inspection Checklist-cum-Compliance Report**

FORMAT NO: HSEP:14-F20

REV NO.: 00

PAGE NO. 01 OF 3

PROJECT: _____

CONTRACTOR: _____

DATE: _____

OWNER : _____

INSPECTION BY: _____

Note : write 'NA' wherever the items is not applicable

Item	Y e s	N o	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
Other				
PERSONNEL PROTECTIVE EQUIPMENT				
Goggles; shields				
Face protection				
Hearing protection				
Respiratory masks etc.				
Safety belts				
Other				
EXCAVATIONS / OPENINGS				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				
WELDING, CUTTING				
Gas cylinders chained upright				
Cable and hoses not obstructing				
Fire extinguisher (s) accessible				
Others				
SCAFFOLDING				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Others				
LADDER				
Extension side rails 1 m above				
Top of landing				
Properly secured				
Angle + 70° from horizontal				
Other				



POWER SECTOR

HSE Checklist-cum-Compliance Report

FORMAT NO: HSEP:14-F20

REV NO.: 00

PAGE NO. 02 OF 3

HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaf OK				
Condition of slings, chains, hooks OK				
Inspection & maintenance log maintained				
Outriggers used				
Signals observed and understood				
Qualified operators				
Others				
MACHINERY, TOOLS & EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
TEMPORARY FACILITIES				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
General neatness				
Others				
FIRE PREVENTION				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
Hydrants				
Clearance				
Others				
ELECTRICAL				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				
HANDLING & STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				
Other				

**POWER SECTOR****HSE Checklist-cum-Compliance Report**

FORMAT NO: HSEP:14-F20

REV NO.: 00

PAGE NO. 03 OF 3

WORKING AT HEIGHT				
Safety nets				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
ENVIRONMENT				
Lubricant waste/engine oils properly dispose.				
Waste from Canteen, offices, sanitation etc. disposed properly.				
Disposal of surplus earth, stripping materials, expired batteries, oily rags and combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.				
Availability of first-aid facilities				
Proper sanitation at site, office & labor camps.				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				
Provision of crèches for children.				

Signature of Subcontractor Site In-charge:

Date:

**POWER SECTOR****Format for Inspection of Illumination / Lux Levels**

FORMAT NO: HSEP:14-F21

REV NO.: 00

PAGE NO. 01 OF 1

Name of Site :

Name of Sub-Contractor :

Inspected by :

Date of Inspection :

Details of Lux Meter Used for Illumination Checking

Serial Number

Last inspection Date

Inspection Due Date

S. No	Location	Applicable Lux Value	Measured Lux Value	Comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Any other checks:

Remarks:

Name & Sign. Of Subcontractor HSE Officer

**POWER SECTOR****Format for Incident Reporting**

FORMAT NO: HSEP:14-F22

REV NO.: 00

PAGE NO. 01 OF 2

Type of incident: Fatal/Major//Fire/Property damage (Tick what is applicable)

1	Name Of Site		3	Activity Area	
2	Scope Of Work		4	Name Of Contractor	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	Date & Time Of Accident		7	Date Resumed	
8	No. Of Work-Days Lost by Victim (If Duty Not Resumed, Give Estimated Figure)				
9	No. Of Man-hours Lost By Others				
10	Personal Details Of Injured and/or Details Of Materials/Equipment/ Property Damaged				
Name			Name Of Material / Equipment / Property		
Period Of Employment					
Age	Yrs.	Sex	Male/Female	Estimated Cost	Actual Cost
Marital Status		Single/ Married			
Occupation		Nature Of Damage			
Part Of Body Injured					
Nature Of Injury					
Agency (Object / Equipment / Substance) Most Responsible For Causing Accident / Injury / Damage					
12	Person (Name & Designation) With Most Control Over Agency (Object / Equipment / Substance) Causing Accident Injury / Damage				
13	Describe Clearly How the Accident Occurred (Use Additional Sheet, If Required)				

**POWER SECTOR****Format for Incident Reporting**

FORMAT NO: HSEP:14-F22

REV NO.: 00

PAGE NO. 02 OF 2

Analysis

14	What Acts and/or Conditions Contributed Most Directly to This Accident	
15	What Are the Basic Reason for The Existence of These Acts and/or Condition?	
16	What Corrective Actions Have Been Taken to Prevent Accident Recurrence?	
	Date:	Signature Of Site HSE Coordinator
17	Comments of Head/Sox	
	Date:	Signature Of Head/SOX



POWER SECTOR

Format for Incident Recording

FORMAT NO: HSEP:14-F23
REV NO.: 00
PAGE NO. 01 OF 1

[illegible]

SECTION-B

Special Requirements

(Applicable to this Contract Only)



POWER
SECTOR

HEALTH, SAFETY AND ENVIRONMENT PLAN
FOR
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(SECTION-B)

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1. Establishment of Common Facilities for whole Project – cost to be borne in full by subcontractor.

Table 1.1

S. No.	Item	Details as per Clause No. of this Section	Applicable / Not Applicable with Remarks	Package
1	Construction of Medical Centre	a	Applicable	Civil
2	Construction of Worker Training Centre (A part of safety park)	b	Applicable	Civil
3	Construction of Vertigo Test Structure (A part of safety park)	c	Applicable	Civil
4	Deployment of Specialists	d	Applicable	By concerned agencies
5	HSE Equipment	e	Applicable	By concerned agencies
6	HSE measurement devices	f	Applicable	By concerned agencies
7	Urinals in under-construction structures	g	Applicable	By concerned agencies
8	Safety Park	h	Applicable	Civil

a. MEDICAL CENTRE

- i. A medical center shall be setup at site with basic facilities for handling medical emergencies
- ii. Deployment of Medical Professional:
 1. **A qualified medical professional shall be deployed at site at all times.**
 2. **When total employee & worker strength at site crosses 500, medical professional with MBBS Degree from recognized institute shall necessarily be deployed**
- iii. Ambulance shall be deployed along with a trained driver and accessories as per Schedule V of BOCW Central Rules, 1998. Ambulance shall be utilized exclusively for transporting the accident victim. Ambulance drivers shall be regularly trained in First Aid.
- iv. Non deployment of Ambulance and First Aider as above shall invite a penalty of Rs. 30000 pm and Rs10000 PM respectively
- v. Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste – Management and Handling Rules, 1998).
- vi. Above are bare minimum requirements. Any legal requirements over and above these specifications shall supersede the above requirements



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b. WORKER TRAINING CENTRE

- i. Indoor Worker Training Center to be developed at site with seating capacity of at least 50 trainees
- ii. Projector with following minimum specifications:

Native Resolution	XGA, 1024x768
Brightness (ANSI lumens)	3300
Contrast Ratio	13000:1
Display Color	30 Bits
Aspect Ratio	4:3

- iii. A Laptop or Desktop PC with following minimum specifications:

Processor	Intel Celeron Dual Core
Memory (RAM)	2 GB
Graphics Card	2GB Video Memory
Hard Disk Capacity	60 GB
Monitor Size	14 inches
Keyboard	
Mouse	

- iv. Stereo speakers with minimum 50W RMS sound output
- v. PA system for Addressing Workers
- vi. Seating arrangement

c. Development of Vertigo Test Structure:

Vertigo test Structure to be developed as per **Annexure 04**

d. Specialists:

Following specialists shall be deployed by the subcontractor, who shall cater to whole project as per BHEL requirements / instructions

- I. **Qualified T&P Inspector: subcontractor** shall engage one qualified T&P inspector having undergone a certification course in the discipline.
- II. **Qualified Scaffolding Erector and Inspector:** Subcontractor shall deploy one qualified Scaffolding Supervisor and Inspector having undergone a certification course in the discipline



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- e. **Tools & Equipment:** Following equipment conforming to relevant IS Codes for the job shall be ensured by subcontractor:

S. No.	Item
1	Lifelines
2	Retractable Fall Arrestors
3	Safety Nets (10m X 5m)
4	Sky Climbers
5	Fire Blanket
6	Honey Bee Removal Suit & Kit
7	Flashback Arrestors
8	Barricading Tape
9	Binoculars
10	Walkie-Talkies
11	LOTO kit
12	24-Volt light
13	Sand Buckets
14	Hard barricading planks
15	Standby Fire kits

S. No.	Item	Type of Job / Purpose	Remarks
1	Lifelines (Steel Rope) and posts	Height work	
2	Retractable Fall Arrestors	Height Work	
3	Safety Nets (for fall protection; railings also to be covered)	Height Work	
4	Sky Climbers	Height Work	
5	Fire Blanket, Spark/ slag collector	Hot Work	
6	Honey Bee Removal Suit & Kit	General	
7	Flashback Arrestors	Hot work	
8	Barricading –Hard (Scaffolding Pipes & Clamps or fabricated using structural/round	Height Work, Excavation, General Barricading	
9	Binoculars	HSE Inspection	
10	Walkie-Talkies	Lifting	
11	LOTO kit	Working on charged line	
12	24-Volt light	Confined Space/ temp work	
13	Sand and Water Buckets	Hot work/Electrical work	
15	Standby Fire kits Fire extinguisher stands	Hot work/Electrical work	



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Above equipment are bare minimum to be essentially maintained at all times. Additional numbers to be deployed as and when required in order to ensure fulfillment of all Safety requirements

f. HSE Measurement Equipment & Tools

S. No	Device
1	ELCB Tester
2	Multi meter (Light cables)
3	Earth Resistance Meter
4	Lux Meter
5	Decibel Meter
6	Anemometer
7	Breath Analyzer (Alcohol)
8	Multi-gas analyzer
9	Gas leakage detector / alarm
10	Gas monitor (confined space)
11	Radiation meter & Badges
12	Blood pressure monitor
13	Fire detectors
14	Dust Particle Detector

g. Urinals in Under-construction structures:

Urinals for in under-construction structures for easy access eg. In case of Boiler elevations etc.

2. Shared Facilities – where part of operating cost is borne by subcontractor in proportion to contract value

The subcontractor shall bear running expenses of above facilities on a 'proportional to contract value sharing basis as finalized by BHEL.

S. No.	Facility
1.	Operation of Ambulance, Nurses, Medical Consumables
2.	Construction, Maintenance & Upkeep of Latrines and Urinals in Common spaces
3.	Drinking Water Provision in Common Spaces
4.	Dust Control / Water Sprinkling, Pest Control, Fumigation at Site



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LIST OF REFERENCES

S. No	Code Name	Title
1	IS: 818-1888 (Reaffirmed 2003)	Code of Practice for Safety and Health requirements in Electric and Gas Welding and Cutting operations.
2	IS: 1179-1967 (Reaffirmed 2003)	Specification for Equipment for Eye & Face protection during welding.
3	IS: 1989 (Part 2):1986 (Reaffirmed 1997)	Specification for Leather Safety Boots & Shoes
4	IS:2925 – 1984 (Reaffirmed 2010)	Specification for Industrial Safety Helmets
5	IS:3521: 1999 (Reaffirmed 2002)	Industrial Safety Belts & Harnesses-Specification
6	IS:3646(Part II) – 1966(Reaffirmed 2003)	Code of Practice for Interior Illumination
7	IS:3696 (Part I) – 1987 (Reaffirmed 2002)	Safety Code for Scaffolds and Ladders
8	IS: 3696(Part 2) : 1991 (Reaffirmed 2002)	Scaffolds and Ladders-Code of Safety
9	IS: 3764:1992	Excavation Work – Code of Safety
10	IS:3786 – 1983 (Reaffirmed 2002)	Method for Computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents
11	IS.4014.2.1967	Steel tubular Scaffolding
12	IS:4770: 1991 (Reaffirmed 2006)	Rubber Gloves Specification (Electricals Purposes)
13	IS:4912: 1978 (Reaffirmed 2002)	Safety Requirements for Floor and Wall Openings, Railings and Toe Boards
14	IS: 5557 – 1969	Industrial and Safety rubber knee boots.
15	IS: 5983 – 1980 (Reaffirmed 2002)	Specification for Eye-Protectors
16	IS:6519 – 1971 (Reaffirmed 1997)	Code of Practice for Selection, Care and Repair of Safety Footwear
17	IS.6549.1972	Glossary of terms used for Lifting tackles
18	IS:6994(Part I)-1973 (Re affirmed 1996)	Specification for Industrial Safety Gloves Leather and Cotton Gloves
19	IS.7215.1974	Steel Structure Fabrication
20	IS.7969.1975	Handling and storage of building material



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21	IS:8519 – 1977 (Reaffirmed 1983)	Guide for Selection of Industrial Safety Equipment for Body Protection.
22	IS:8520 – 1977 (Reaffirmed 2002)	Guide for Selection of Industrial Safety Equipment for Eye, Face and Ear Protection.
23	IS:9167:1979	Specification for Ear-Protectors
24	IS:9473:2002	Respiratory Protective Devices-Filtering Half Masks to protect against Particles-Specification.
25	IS: 9944:1992 (Reaffirmed 2003)	Natural and Man-made Fiber Rope Slings- Recommendations on Safe working loads.
26	IS 11006 : 2011	Flash Back(Flame) Arrestor Specification
27	IS: 11226 – 1985	Leather Safety footwear having direct molding sole.
28	IS:11057 – 1884 (Reaffirmed 2001)	Specification for Industrial Safety Nets
29	IS: 12254:1993 (Reaffirmed 2002)	Polyvinyl Chloride (PVC) Industrial Boots Specification
30	IS:13367(Part 1):1992 (Reaffirmed 20030)	Safe Use of Cranes-Code of Practice
31	IS: 14166:1994 (Reaffirmed 2002)	Respiratory Protective Devices-Full Face Masks Specification
32	IS:14746: 1999 (Reaffirmed 2003)	Respiratory Protective Devices-Half Masks and Quarter Masks - Specification
33	IS: 15397 :2003 (Reaffirmed 2008)	Portable Extinguisher Mechanical Foam Type(Stored Pressure)-Specification
34	IS: 19011:2002	Guidelines for Quality and/or Environmental Management Systems Auditing

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As per Contract Labor (Regulation & Abolition Act), Central Rules, 1971,

- (1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

(a) For establishments in which the number of contract laborers employed does not exceed fifty, each first aid box shall contain the following equipment:

(i)	6 small sterilized dressings
(ii)	3 medium size sterilized dressings
(iii)	3 large size sterilized dressings
(iv)	6 pieces of sterilized eye pads in separate sealed packets.
(v)	6 roller bandages 10 cm wide.
(vi)	6 roller bandages 5 cm wide.
(vii)	One tourniquet
(viii)	A supply of suitable splints
(ix)	Three packets of safety pins.
(x)	Kidney tray.
(xi)	3 large sterilized burn dressings.
(xii)	1 (30ml) bottle containing a two percent alcoholic solution of iodine
(xiii)	1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label
(xiv)	1 snake bite lancet
(xv)	1 (30gms) bottle of potassium permanganate crystals.
(xvi)	1 pair scissors
(xvii)	1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labor Institutes, Government of India.
(xviii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xix)	Ointment for burns
(xx)	A bottle of suitable surgical anti-septic solution



HSEP:14 - ANNEXURE 03

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Details and Contents of First Aid Box

(b) For establishment in which the number of contract laborers exceeds fifty each first-aid box shall contain the following equipment:

(i)	12 small sterilized dressings
(ii)	6 medium size sterilized dressings
(iii)	6 large size sterilized dressings.
(iv)	6 large size sterilized burn dressings
(v)	6 (15 grams) packets sterilized cotton wool
(vi)	12 pieces of sterilized eye pads in separate sealed packets.
(vii)	12 roller bandages 10 cm wide.
(viii)	12 roller bandages 5 cm wide.
(ix)	One tourniquet.
(x)	A supply of suitable splints.
(xi)	Three packets of safety pins.
(xii)	Kidney tray.
(xiii)	Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
(xiv)	4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops.
(xv)	1 (60ml) bottle containing a two percent alcoholic solution of iodine
(xvi)	One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
(xvii)	1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
(xviii)	1 roll of adhesive plaster (6 cmX1 meter)
(xix)	2 rolls of adhesive plaster (2 cmX1 meter)
(xx)	A snake bite lancet.
(xxi)	1 (30 grams) bottle of potassium permanganate crystals.
(xxii)	1 pair scissors
(xxiii)	1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labor Institutes, Government of India.
(xxiv)	a bottle containing 100 tablets (each of 5 grains) of aspirin
(xxv)	Ointment for burns
(xxvi)	A bottle of a suitable surgical anti septic solution.

(2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.



POWER
SECTOR

HEALTH, SAFETY AND ENVIRONMENT PLAN
FOR
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Doc. No.: HSEP:14

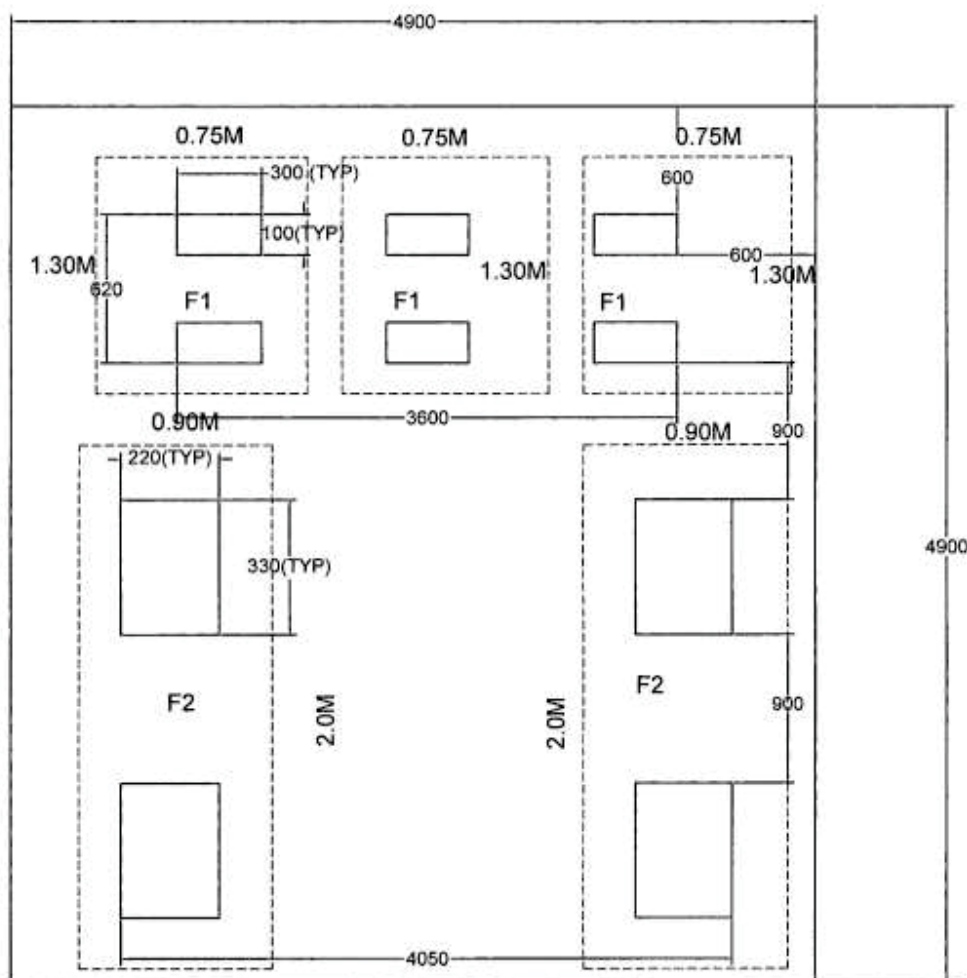
Rev.: 01

Date:

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Table 1

S. No.	Topic
1	Vertigo / Height working Test Structure Layout
2, 3	Structure Layout Sketch
3	Actual Photo of a typical structure
4	Bill of Materials
5	Guidelines for Conducting the Test



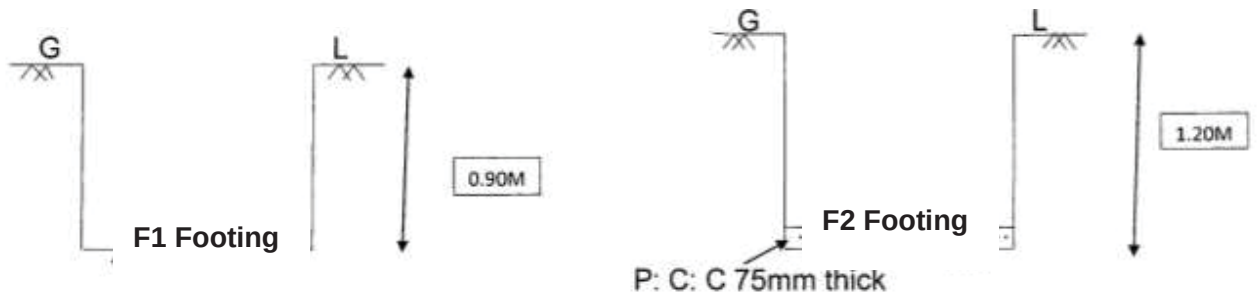
Note:

- All dimensions are in mm
- Drawing is not to scale
- Inside boundary area to be filled with sand to level with road (external)
- Details of F1 and F2 are shown below

Figure 1: Vertigo / Height Work Test Structure Layout



Vertigo Test Structure Specifications



Note:

- Concrete Grade is M15
- Drawing is not to scale
- TOC is at Road Level
- G L refers to Ground Level

Figure 2

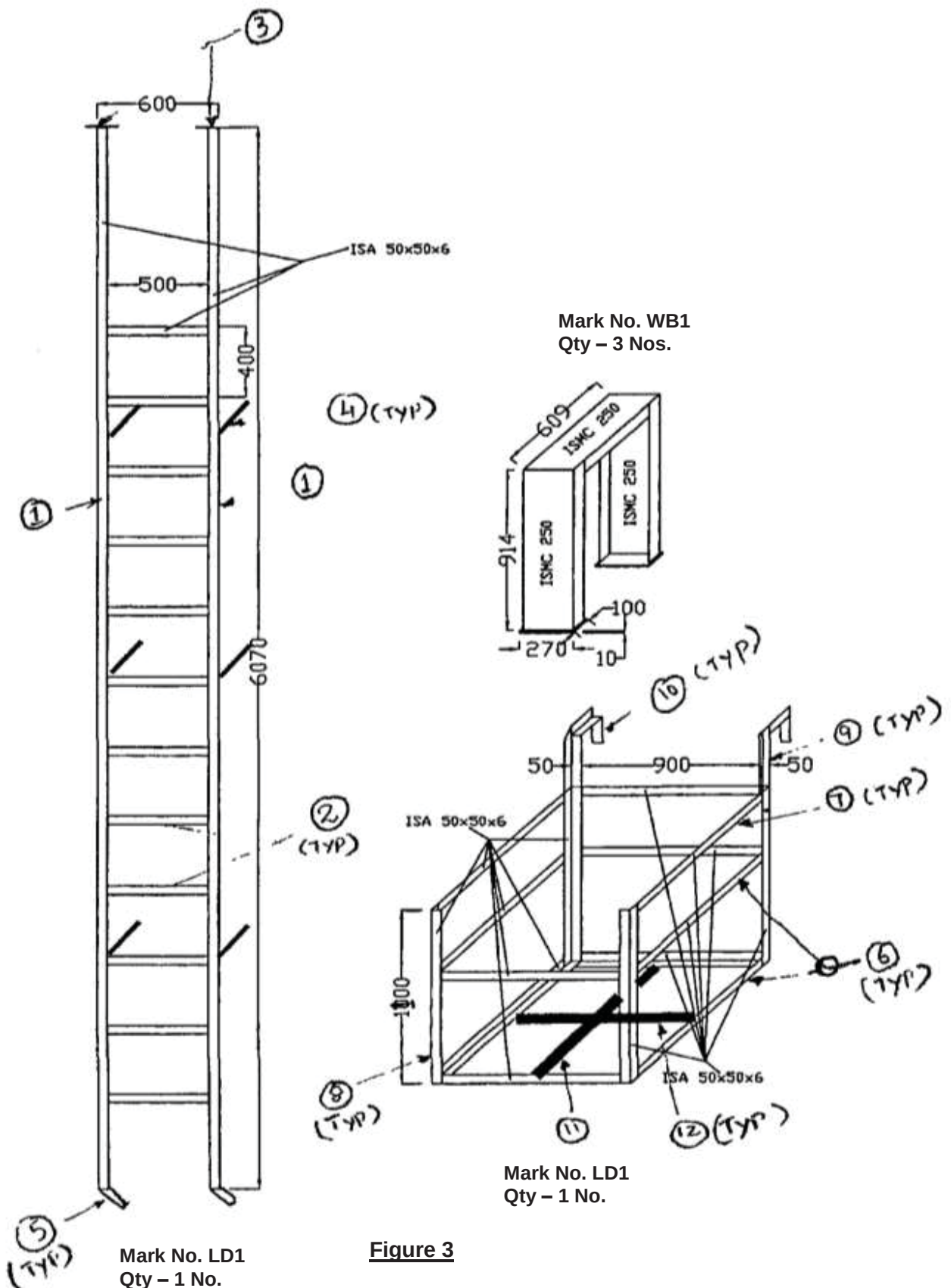


Figure 3

Figure 4

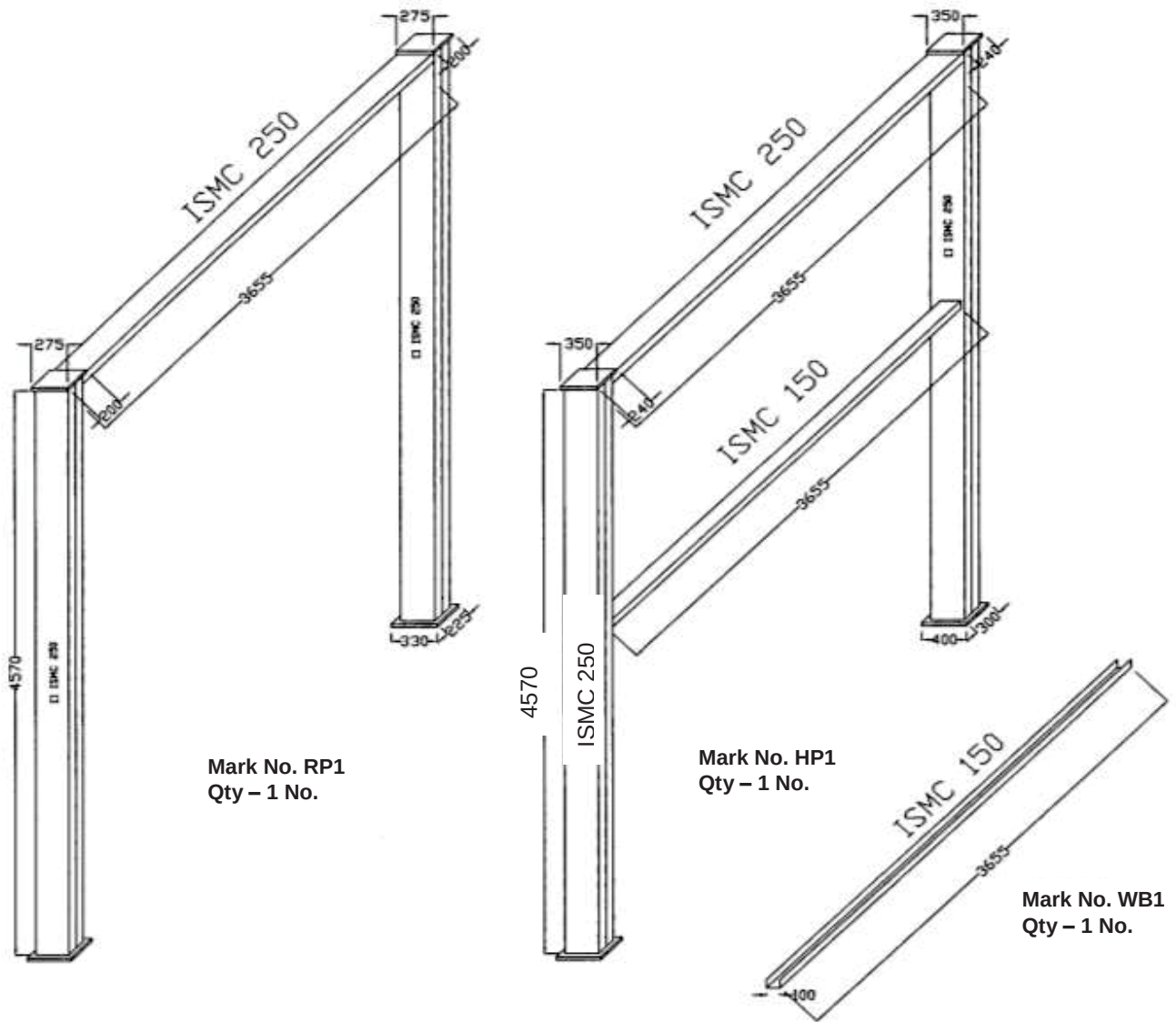



Table 2: BOM FOR HEIGHT WORK INDUCTION TRAINING MODULE

Sl. No.	Description	Width (mm)	Length (mm)	Qty (No's)	Unit Wt (Kgs)	Total Wt. (Kgs)
MKD NO. WB1						
1	ISMC250		609	3	34.20	62.483
2	ISMC250		914	6	34.20	187.553
3	ISMC100		3655	1	9.56	34.942
4	PL10	100	270	6	78.50	12.717
			Total Weight (Kgs)			297.695
MKD NO. RP1						
1	ISMC250		4570	4	34.20	625.176
2	ISMC250		3655	1	34.20	125.001
3	PL25	225	330	2	196.25	29.143
4	PL25	200	275	2	196.25	21.588
			Total Weight (Kgs)			800.908
MKD NO. HP1						
1	ISMC250		4570	4	34.20	625.176
2	ISMC250		3655	1	34.20	125.001
3	ISMC150		3655	1	16.80	61.404
4	PL25	300	400	2	196.25	47.100
5	PL25	240	350	2	196.25	32.970
			Total Weight (Kgs)			891.651
MKD NO. LD1						
1	ISA50X50X6		6070	2	4.50	54.630
2	ISA50X50X6		500	12	4.50	27.000
3	PL12	75	75	2	94.20	1.060
4	ISA50X50X6		300	6	4.50	8.100
5	ISA50X50X6		255	2	4.50	2.295
6	ISA50X50X6		1000	8	4.50	36.000
7	ISA50X50X6		910	3	4.50	12.285
8	ISA50X50X6		1100	4	4.50	19.800
9	ISA50X50X6		650	2	4.50	5.850
10	ISA50X50X6		350	2	4.50	3.150
11	PL8	75	900	1	62.80	4.239
12	PL8	75	410	2	62.80	3.862
			Weight (Kgs)			178.271
			Total Weight (Kgs)			2168.525



A. Test Procedure / Guidelines

Fear of height may be physiological or psychological. Therefore, to rule out any possibility of physiological factor, detailed medical check-up of workers is carried out before vertigo test. Medical check-up of workers includes the following:

history of past illnesses (like epilepsy, drug allergy, diabetics/ hypertension, unconsciousness etc.), general physical examination (like height, weight, BMI, build and nourishment etc.), measurement of pulse rate, Blood Pressure, respiratory rate.

After this check-up, those who are found suitable for height work by examining doctor, are allowed to undergo vertigo test.

During this health check-up, psychology of workers is also studied. If any worker finds it extremely difficult/ frightening to climb the monkey ladder & walk on the beam, during/after performing vertigo test or even before performing, then he is treated as disqualified.

As per standard, during vertigo test, worker is allowed to climb on a foundation through monkey ladder, walk on a beam, then steps down at the other end of beam, through monkey ladder. Height of the beam should be at least six feet from ground level. All necessary safety precautions are taken during this test. Worker has to wear full body harness with double lanyard. A horizontal lifeline is run parallel to the beam and worker has to put his lanyards into the lifeline. Additionally, a safety net is also put below the beam for rescue of the victim in case of a fall from beam.

Following activities are generally carried during testing:

1. Walking Bench Training:

- a. Person should walk over the channel. He should maintain balance & walk without much problem.
- b. If the person has problem to balances himself on repeated chances, he may be having flat foot or some other problem. So, he may not be fit for height work.

2. Rope Climb Training:

Person should be able to climb the rope up to the top channel for ensuring that in case of fall, a person hanging on the safety harness, will be able to safely climb back to the platform within minimum time period before the safety harness start breaking down under the load.

3. Height Work Training:

Person should walk freely on the middle channel while holding the top channel with the help of safety harness.

4. Ladder for Vertical fall arrestor Training:

Vertical fall arrestor rope is fixed from top to bottom of the ladder. It will ensure:

- Usage of vertical fall arrestor.
- Usage of two lanyards of a safety harness.
- Ensure 3-point contact on the ladder while climb.

5. Chair for work at height Training:

- Climb though vertical ladder with two lanyard ropes.
- Hooking of two lanyard ropes to life line. With this safe arrangement, he can walk to chair.
- Sits in the chair safely, comes out & walks back to the vertical ladder & come down from vertical ladder. After completion of vertigo test, blood pressure of worker is again measured. If it is not within acceptable limits for any worker, concerned worker is denied height pass.

Only those who pass the above training are fit for height work.

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<u>Safety Park Requirements</u>		
S.No	Training room(capacity 40 persons)	Qty.
1	Class room chair	25
2	Office Table	3
3	Rolling chair	3
4	Almirah	1
5	Visitor chair	10
6	Drawer	2
7	Single bed	1
8	Mattress	1
9	Projector	1
10	Projector screen	1
11	Sound speakers	1
12	Desktop Computer	3
13	Printer	1
14	White Board	1
15	Marker	5
16	Duster	1
17	Door Mat	9
18	Dustbin(Smaal + BIG)	7+1
19	Mannequin	1
20	Helmet	1
21	Face Shield	1
22	Safety Goggle	1
23	Welding sheild	1
24	Ear Muff	1
25	Ear Plug	1
26	Nose Mask	1
27	Breathing Apparatus	1
28	Hand Gloves(Cotton)	1
29	Hand Gloves for Electrician (Rubber)	1
30	Hand gloves Rubber	1
31	Hand Gloves Lather	1
32	Construction Safety Uniform(Boiler Suit)	1
33	Welding Apron	1
34	Safety Shoes	1
35	Leg Guard For Welder	1
36	Poster for Occupational Disease like Pneumoconosis,silicosis etc.	1
37	Gum Boot	1

38	Full Body Harness	1
39	8 MM Wire rope for life line. Length 20 Feet(FT).	1
40	Sfety Net for man & materials.Size 15 FT X 15FT.	1
41	MonkEy ladder 15 FT.	1
45	Fire Extingusher All types(DCP,CO2 & Foam)	1
46	Bed Sheet	1
47	Pillow	1
48	Curtain	12
49	curtain fittings	12
50	AC (1.5 TON)	3
51	AC (2 TON)	2
52	Rope pully.	1
53	PP Rope for pully 20 MTR.	
54	Ladder Clamps	6
55	Allumuniam ladder 6 MTR.	1
56	Carry Bag	
57	Scaffolding all Materilas for 5 Mtr. Height like.Sacffolding tubes,Sole plate,base plate,Right angle clamps,Swielclamps,beam clamps,Joint box/joint pin,toe guard/board,	



Health, Safety & Environment, Power Sector Headquarters

Bharat Heavy Electricals Limited

Regd. Office: BHEL House, Siri Fort, New Delhi – 110049, India

Website: www.bhel.com

TENDER NO: PSER:SCT:NKP-C1974:19

VOLUME -IE

FORMS & PROCEDURES

FOR

Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)

POWER SECTOR – EASTERN REGION

PLOT NO. – 9 / 1, DJ – BLOCK,

SECTOR – II, KARUNAMOYEE,

SALT LAKE CITY,

KOLKATA – 700091.

FORMS & PROCEDURES

INDEX

SN	Description	Form No	Remarks
1.0	Forms		
1.1	Offer forwarding Letter/Submission of Tender	F-1 (Rev 00)	
1.2	Declaration by Authorised Signatory	F-2 (Rev 00)	
1.3	No Deviation Certificate	F-3 (Rev 00)	
1.4	Declaration confirming knowledge about Site Conditions	F-4 (Rev 00)	
1.5	Declaration for relation in BHEL	F-5 (Rev 00)	
1.6	Non Disclosure Certificate	F-6 (Rev 00)	
1.7	Bank Account Details for E-Payment	F-7 (Rev 00)	
1.8	Form for seeking clarifications	F-8 (Rev 00)	
1.9	Capacity Evaluation of Bidder for current Tender	F-9 (Rev 00)	
1.10	Contract Agreement	F-10 (Rev 00)	
1.11	Bank Guarantee for Security Deposit	F-11 (Rev 00)	
1.12	Bank Guarantee for ~~Interest Bearing Refundable~~ Advance	F-12 (Rev 00)	
1.13	Extension of Validity of Bank Guarantee	F-13 (Rev 00)	
1.14	Monthly Plan & Review with Contractors	F-14 (Rev 00)	
1.15	Monthly Performance Evaluation of Contractor	F-15 (Rev 01)	Revised
1.16	~~Evaluation of Contractor Performance (Quarterly)~~	~~F-16 (Rev 00)~~	Deleted
1.17	Evaluation of Contractor Performance (Annual)	F-17 (Rev 01)	Under revision ##
1.18	Evaluation of Contractor Performance for the Contract (Overall)	F-18 (Rev 01)	Under revision ##

FORMS & PROCEDURES

SN	Description	Form No	Remarks
1.19	Milestone Completion Certificate	F-19 (Rev 00)	
1.20	Completion Certificate	F-20 (Rev 01)	Revised
1.21	Indemnity Bond	F-21 (Rev 00)	
1.22	Consortium Agreement	F-22 (Rev 00)	
1.23	Refund of Security Deposit	F-23 (Rev 00)	
1.24	Refund of Guarantee Money	F-24 (WAM-11)	
1.25	Power of Attorney for Submission of Tender/Signing Contract Agreement	F-25 (Rev 00)	
1.26	Analysis of Unit Rates Quoted	F-26 (Rev 00)	
1.27	RA Bill Format	WAM-6	
1.28	Final Bill Submission format with No Claim Certificate and No Demand Certificate	WAM-7	
1.29	PROFORMA FOR PERFORMANCE BANK GUARANTEE		
1.30	BANK GUARANTEE FOR SD CUM PBG BOND		
2.0	Procedures		
2.1	Procedure and Business Rules for Reverse Auction	As per Company Policy	
2.2	Integrity Pact	As per Company Policy	
3.0	Customer specific procedures		
3.1			

- BANK GUARANTEE FORMATS FOR "RELEASE OF AMOUNTS WITHED/ LIQUIDATED DAMAGES AMOUNT", "SUPPLY FREE ISSUE MATERIAL" & "EARNEST MONEY" IS ALSO GIVEN.

: will be released later

FORMS & PROCEDURES

Form No: F-01 (Rev 00)

OFFER FORWARDING LETTER / TENDER SUBMISSION LETTER (To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

Offer Reference No:.....

Date:.....

To,

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

Dear Sir,

Sub : Submission of Offer against Tender Specification No:

I/We hereby offer to carry out the work detailed in the Tender Specification issued by Bharat Heavy Electricals Limited, Power Sector-....., in accordance with the terms and conditions thereof.

I/We have carefully perused the following listed documents connected with the above work and agree to abide by the same.

1. Amendments/Clarifications/Corrigenda/Errata/etc issued in respect of the Tender documents by BHEL
2. Notice Inviting Tender (NIT)
3. Price Bid
4. Technical Conditions of Contract
5. Special Conditions of Contract
6. General Conditions of Contract
7. Forms and Procedures

Should our Offer be accepted by BHEL for Award, I/we further agree to furnish 'Security Deposit' for the work as provided for in the Tender Conditions within the stipulated time as may be indicated by BHEL.

I/We further agree to execute all the works referred to in the said Tender documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

I/We have deposited/depositing herewith the requisite Earnest Money Deposit (EMD) as per details furnished in the Check List.

Authorised Representative of Bidder

Signature :

Name :

Address :

Place:

Date:

FORMS & PROCEDURES

Form No: F-02 (Rev 00)

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

(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 by Authorised Signatory**

Ref : 1) NIT/Tender Specification No:,
2) All other pertinent issues till date

I/We, hereby certify that all the information and data furnished by me with regard to the above Tender Specification are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations and all other pertinent issues till date, and agree to comply with the requirements and Intent of the specification.

I further certify that I am authorised to represent on behalf of my Company/Firm for the above mentioned tender and a valid Power of Attorney to this effect is also enclosed.

Yours faithfully,

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

Date:

Enclosed : Power of Attorney

FORMS & PROCEDURES

Form No: F-03 (Rev 00)

NO DEVIATION CERTIFICATE

(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 : **No Deviation Certificate**

Ref : 1) NIT/Tender Specification No:
2) All other pertinent issues till date

We hereby confirm that we have not changed/ modified/materially altered any of the tender documents as downloaded from the website/ issued by BHEL and in case of such observance at any stage, it shall be treated as null and void.

We also hereby confirm that we have neither set any Terms and Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT/Tender Specification.

We further confirm our unqualified acceptance to all Terms and Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)

FORMS & PROCEDURES

Form No: F-04 (Rev 00)

DECLARATION CONFIRMING KNOWLEDGE ABOUT SITE CONDITIONS

(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 confirming knowledge about Site conditions**

Ref : 1) NIT/Tender Specification No:
2) All other pertinent issues till date

I/We, _____ hereby declare and confirm that we have visited the Project Site as referred in BHEL Tender Specifications and acquired full knowledge and information about the Site conditions including Wage structure, Industrial Climate, the Law & Order and other conditions prevalent at and around the Site. We further confirm that the above information is true and correct and we shall not raise any claim of any nature due to lack of knowledge of Site conditions.

I/We, hereby offer to carry out work as detailed in above mentioned Tender Specification, in accordance with Terms & Conditions thereof.

Yours faithfully,

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

Date :

Place:

FORMS & PROCEDURES

Form No: F-05 (Rev 00)

DECLARATION FOR RELATION IN BHEL

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder failing which the offer of Bidder is liable to be summarily rejected)

To,

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

Dear Sir,

Sub : **Declaration for relation in BHEL**

Ref : 1) NIT/Tender Specification No:,

I/We hereby submit the following information pertaining to relation/relatives of Proprietor/Partner(s)/Director(s) employed in BHEL

Tick(✓) any one as applicable:

1. The Proprietor, Partner(s), Director(s) of our Company/Firm DO NOT have any relation or relatives employed in BHEL

OR

2. The Proprietor, Partner(s), or Director(s) of our Company/Firm HAVE relation/relatives employed in BHEL and their particulars are as below:

(i)

(ii)

Signature of the Authorised Signatory

Note:

1. Attach separate sheet, if necessary.
2. If BHEL Management comes to know at a later date that the information furnished by the Bidder is false, BHEL reserves the right to take suitable action against the Bidder/Contractor.

FORMS & PROCEDURES

Form No: F-06 (Rev 00)

NON DISCLOSURE CERTIFICATE

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

NON DISCLOSURE CERTIFICATE

I/We understand that BHEL PS __ is committed to Information Security Management System as per their Information Security Policy.

Hence, I/We M/s.....
who are submitting offer for providing services to BHEL PS __ against
Tender Specification No: _____,
hereby undertake to comply with the following in line with Information
Security Policy of BHEL PS __, _____

- To maintain confidentiality of documents & information which shall be used during the execution of the Contract.
- The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL PS__.

(Signature, date & seal of Authorized
Signatory of the bidder)

Date:

FORMS & PROCEDURES

Form No: F-07 (Rev 00)

BANK ACCOUNT DETAILS FOR E-PAYMENT

(To be given on Letter head of the Company /Firm of Bidder, and **ENDORSED (SIGNED & STAMPED) BY THE BANK** to enable BHEL release payments through Electronic Fund Transfer (EFT/RTGS))

1. Beneficiary Name :
2. Beneficiary Account No. :
3. Bank Name & Branch :
4. City/Place :
5. 9 digit MICR Code of Bank Branch :
6. IFSC Code of Bank Branch :
7. Beneficiary E-mail ID :
(for payment confirmation)

NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same

FORMS & PROCEDURES

Form No: F-08 (Rev 00)

FORMAT FOR SEEKING CLARIFICATION

(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 : **Request for Clarification**

Ref : 1) NIT/Tender Specification No:,

2) All other pertinent issues till date

Sl no	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1				
2				
3				

Yours faithfully,

(Signature, date & seal of Authorized
Representative of the Bidder)

FORMS & PROCEDURES

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Form No: F-09 (Rev 00)

CAPACITY EVALUATION OF BIDDERS FOR CURRENT TENDER

SL NO.	DESCRIPTION OF WORK (Similar to Tendered Scope)	WORK ORDER REF & DATE	CONTRACT VALUE (Rs. LACS)	CUSTOMER NAME & ADDRESS	CURRENT STATUS OF THE JOB ALONG WITH LATEST MILE STONE COMPLETED	%AGE OF WORK COMPLETED	VALUE OF BALANCE WORK (Rs. Lacs)
1							
2							
3							
4							
5							

NOTES:

1. BIDDERS ARE REQUIRED TO FURNISH ALL THE JOBS OF SIMILAR NATURE WHICH THEY ARE EXECUTING (IN PROGRESS) AT THE TIME OF SUBMISSION OF TENDER, AS PER ABOVE FORMAT.
2. BIDDERS HEREBY UNDERTAKE THAT THEY HAVE FURNISHED THE DETAILS SOUGHT AS PER POINT NO. 1 IN TOTALITY AND THAT THE DETAILS FURNISHED IS COMPLETE IN ALL RESPECT.
3. BHEL WILL TAKE APPROPRIATE ACTION AS DEEMED FIT , IN CASE, IT IS FOUND AT A LATER DATE THAT THE CONTRACTOR HAD SUPPRESSED THE FACTS AND HAVE NOT FURNISHED THE CORRECT & COMPLETE INFORMATIONS.

Signature

DATE :

PLACE:

Name, Designation & Seal of Bidder

FORMS & PROCEDURES

CONTRACT AGREEMENT

Form No: F-10 (Rev 00)

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – Region

CONTRACT AGREEMENT

AGREEMENT NO. _____

NAME OF WORK	
NAME OF THE CONTRACTOR WITH FULL ADDRESS	
VALUE OF WORK AWARDED	
LETTER OF INTENT NO.	
TIME ALLOTTED FOR COMPLETING THE WORK (DATE OF COMPLETION)	

SIGNATURE OF CONTRACTOR

(SIGNATURE OF BHEL OFFICER)

FORMS & PROCEDURES

CONTRACT AGREEMENT

THIS AGREEMENT MADE THIS _____ DAY OF _____ between BHARAT HEAVY ELECTRICALS LIMITED (A Government of India Enterprise) a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort New Delhi- 110049 (herein after called BHEL) of the ONE PART.

AND

M/S _____
_____ (hereinafter called the 'Contractor') of the SECOND PART.

WHEREAS M/s -----state that they have acquired and possess extensive experience in the field of -----

And Whereas in response to an Invitation to Tender No. ----- issued by BHEL for execution of ----- the contractor submitted their offer No.- -----dated -----And whereas BHEL has accepted the offer of the Contractor on terms and conditions specified in the Letter of Intent No.-----dated -----read with the references cited therein.

THIS AGREEMENT WITNESSES AND it is hereby agreed by and between the parties as follows:

1. That the contractor shall execute the work of -----and more particularly described in Tender Specification No -----including Drawings and Specifications (hereinafter called the said works) in accordance with and subject to terms and conditions contained in these presents, instructions to Tenderers, General Conditions of Contract, Special Conditions, Annexures, Letter of Intent dated -----and such other instructions, Drawings, Specifications given to him from time to time by BHEL.
2. The Contractor is required to furnish to BHEL Security deposit in the form of cash/ approved securities/ Bank Guarantee valid upto ----- for a sum of Rs.----- towards satisfactory performance and completion of the Contract.
3. The Contractor has furnished a Bank Guarantee bearing no.-----dated -----for a sum of Rs.-----executed by ----- in favour of BHEL towards Security Deposit valid upto -----

OR

The Contractor has furnished to BHEL an initial Security Deposit of Rs.-----in the form of cash / approved Securities/ B.G No.----- dated ----- for Rs.-----executed by ----- in favour of BHEL valid upto ----- and has agreed for recovery of the balance security deposit by BHEL @ 10% of the value of work done from each running bill till the entire Security Deposit is recovered.

OR

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The contractor has furnished to BHEL an initial Security Deposit of Rs.----- (Rs.----- vide Bank draft No.----- dated ----- and by adjusting EMD of Rs.----- submitted vide Bank draft No.----- dt.-----) and has agreed for recovery of balance Security Deposit by BHEL @ 10% of the value of work done from each running bill till the entire security deposit is recovered.

4. The Contractor hereby agrees to extend the validity of the Bank Guarantee for such further period or periods as may be required by BHEL and if the Contractor fails to obtain such extension(s) from the Bank, the Contractor, shall pay forthwith or accept recovery of Rs.----- from the bills in one installment and the contractor further agrees that failure to extend the validity of the Bank Guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum of Rs.-----

OR

In case the contractor furnishes the bank guarantee at a later date the contractor hereby agrees to extend the validity of bank guarantee for such further period or periods as may be required by BHEL and if the contractor fails to obtain such extension(s) from the bank, the contractor shall pay forthwith or accept recovery of the amount of bank guarantee given in lieu of security deposit from the bills in one installment and the contractor further agrees that failure to extend the validity of bank guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum.

5. That in consideration of the payments to be made to the Contractor by BHEL in accordance with this Agreement the Contractor hereby covenants and undertakes with BHEL that they shall execute, construct, complete the works in conformity, in all respects, with the terms and conditions specified in this Agreement and the documents governing the same.
6. That the Contractor shall be deemed to have carefully examined this Agreement and the documents governing the same and also to have satisfied himself as to the nature and character of the Works to be executed by him.
7. That the Contractor shall carry out and complete the execution of the said works to the entire satisfaction of the Engineer or such other officer authorised by BHEL, within the agreed time schedule, the time of completion being the essence of the Contract.
8. That BHEL shall, after proper scrutiny of the bills submitted by the Contractor, pay to him during the progress of the said works such sum as determined by BHEL in accordance with this Agreement.
9. That this Agreement shall be deemed to have come into force from ----- the date on which the letter of intent has been issued to the Contractor.

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10. That whenever under this contract or otherwise, any sum of money shall be recoverable from or payable by the Contractor, the same may be deducted in the manner as set out in the General Conditions of Contract or other conditions governing this Agreement.
11. That all charges on account of Octroi, Terminal and other taxes including sales tax or other duties on material obtained for execution of the said works shall be borne and paid by the Contractor.
12. That BHEL shall be entitled to deduct from the Contractor's running bills or otherwise Income Tax under Section 194 (C) of the Income Tax Act, 1961.
13. That BHEL shall be further entitled to recover from the running bills of the Contractor or otherwise such sum as may be determined by BHEL from time to time in respect of consumables supplied by BHEL, hire charges for tools and plants issued (Where applicable) and any other dues owed by the Contractor.
14. That it is hereby agreed by and between the parties that non-exercise, forbearance or omission of any of the powers conferred on BHEL and/or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents and the liability of the Contractor with respect to compensation payable to BHEL or Contractor's obligations shall remain unaffected.
15. It is clearly understood by and between the parties that in the event of any conflict between the Letter of Intent and other documents governing this Agreement, the provisions in the Letter of Intent shall prevail.

16. The following documents

1. Invitation to Tender No-----
and the documents specified therein.
2. Contractor's Offer No-----
dated-----.
3. _____
4. _____
5. _____
6. Letter of Intent No_____ dated_____.
7. _____

shall also form part of and govern this Agreement.

IN WITNESS HEREOF, the parties hereto have respectively set their signatures in the presence of

WITNESS

(CONT

RACTOR)

FORMS & PROCEDURES

1. (to be signed by a person holding
a valid Power of Attorney)

2.

WITNESS (For and on behalf of BHEL)

1.

2.

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having agreed to exempt (Name of the Vendor / Contractor / Supplier) having its registered office at _____¹ (hereinafter called the said Contractor which term includes supplier), from demand under the terms and conditions of the Contract reference No. _____² dated _____² valued at Rs. ² (Rupees -----)² for <Nature of the Work>³ (hereinafter called the said Contract) of Security Deposit for the due fulfilment by the said contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs. _____⁴ (Rupees _____ only), we _____ (indicate the name and address of the Bank) having its Head Office at _____ (address of the head Office) (hereinafter referred to as the Bank) at the request of _____ [Name of Contractor(s)] do hereby undertake to pay to the Employer an amount not exceeding Rs. _____ in the event of any breach by the said Contractor(s) of any of the terms and conditions contained in the said Contract.

We, _____ (indicate the name of the Bank), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Employer. Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claim satisfied or discharged or till _____⁵ or till the office/Department/Division of Bharat Heavy Electricals Limited certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) and also including the satisfactory performance of the equipment during guarantee period and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____⁶, (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all the liability under this guarantee thereafter.

We, _____ (indicate the name of the Bank) _____ further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,..... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to ⁸
- c) Unless the Bank is served a written claim or demand on or before _____⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ (indicate the name of the Bank) _____ lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

Date _____ Day of _____
for _____ (indicate the name of the Bank) _____

(Signature of Authorised signatory)

¹ NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ DATE OF EXPIRY OF CLAIM PERIOD

⁷ BG AMOUNT IN FIGURES AND WORDS.

⁸ VALIDITY DATE

⁹ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.

2. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
- b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter-Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

- b.2** In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
- b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
- b.4** The BG should clearly specify that the demand or other document can be presented in electronic form.

BANK GUARANTEE FOR ADVANCE

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at _____¹ (hereinafter called "the Contractor" which expression shall include its successors and permitted assigns) a contract Ref No.....dated ²valued at Rs.....(Rupees -----) for <Nature of Work> ³(hereinafter called the 'Contract')

AND WHEREAS the Employer has agreed to advance to the Contractor, a sum of Rs..... (Rupees..... only), equivalent to _____% of the said value of the Contract (hereinafter called "the said Advance"), upon the condition, that the said Advance shall be secured by undertaking guarantee for Rs ----- (Rupees -----)⁴ from a Bank as hereinafter appearing.

We, ..., (hereinafter referred to as the Bank), having registered/Head office at and a branch at being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums upto a maximum amount but not exceeding Rs ----- (Rupees -----).

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Contractors/Supplier shall have no claim against us for making such payment.

We the Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including.....⁵ and shall be extended from time to time on the request of the Employer for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ⁶ (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this Guarantee.

We, ... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to ⁸
- c) Unless the Bank is served a written claim or demand on or before ⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, ... Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Date.....

Place of Issue.....

¹ NAME OF VENDOR /CONTRACTOR / SUPPLIER

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ DATE OF EXPIRY OF CLAIM PERIOD

⁷ BG AMOUNT IN FIGURES AND WORDS

⁸ VALIDITY DATE

⁹ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.
2. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
 - b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2 **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

FORMS & PROCEDURES

Form No: F-13 (Rev 00)

FORM for EXTENSION OF VALIDITY OF BANK GUARANTEE

1. To be typed on non judicial Stamp Papers of value as applicable in the State of India from where the BG has been issued or the State of India where the BG shall be operated
2. The non judicial stamp papers shall be purchased in the name of the Party on whose behalf the BG is being issued or the BG issuing Bank

BANK GUARANTEE No:

Date:.....

To

(Write Designation and Address of Officer of BHEL inviting the Tender)

Dear Sir

Sub : Validity of Bank Guarantee No:..... Dated for
..... Rs in favour of yourself, expiry date, on
account of M/s in respect of Contract
Number....., (herein after called the Original bank Guarantee)

At the request of M/s....., we Bank, having its
branch Office at and having Head office at, do
hereby extend our liability under the above mentioned Bank Guarantee number..... dated
..... for a further period of Months/years from to expire on
.....

Except as provided above, all other terms and conditions of the Original Bank Guarantee No
..... Dated..... shall remain unaltered and binding on us.

Kindly treat this extension as an integral part of the original Bank Guarantee to which it would be attached.

Yours faithfully

Signature.....

Name & Designation.....

Power of Attorney/Signing Power No

Seal of Bank

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#1.01	Cumulative number of days in the month, the nominated Quality Officer or his authorised nominee was not available	QUALITY	1.5		Quality Officer or his authorised nominee should be available for all the days of working at site	Daily Log Book entry/Incident Registers/letter references
#1.02	Number of instances of non- compliance wrt FQP, Standard Drawings, Specifications, E&C Manuals etc.	QUALITY	1.5		No deviation from FQP, Standard Drawings, Specifications, E&C Manuals etc. is allowed without BHEL Engineer's approval.	Daily Log Book entry/Incident Registers/letter references
#1.03	Percentage submission of test certificates for batches of welding electrodes, cement, sand, aggregate, consumable, Paints etc. as applicable for this month OR In case of MM & MH package, monthly checks for Storage/Preservation of material.	QUALITY	1		Submission of 100% Test certificates for materials as per FQP is mandatory. MM & MH package: Storage/Preservation as per manual/procedure.	Daily Log Book entry/Incident Registers/letter references
#1.04	Number of incidences of improper storage & preservation (not in accordance to the guidelines of BHEL MUs or approved FQP) of materials, consumables (viz. gases, welding electrodes & fluxes, fuel etc.) & bought-out items (paints, fasteners etc.) under the custody of the contractor	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#1.05	Rework/ Rejection instances in a month necessitated due to deviation from Standard Drawings /Specifications /Manuals /E&C procedures /FQPs or due to Poor Workmanship by contractor	QUALITY	2		Reworks/ Rejection should be as minimum as possible. Total number of reworks/ rejections due to reasons attributable to contractor.	Daily Log Book entry/Incident Registers/letter references
#1.06	Delay in preparation & submission of signed protocols / log sheets / site register / NDT test reports as per approved FQP/ Qualified Welder List along with photocopies of Welder ID cards / Welder Performance Evaluation records etc. in the month OR in case of MM / MH package reconciliation statement / verification report.	QUALITY	1		Within 2 days of measurements taken or within first 3 working days of next month, as advised by BHEL Engineer	Daily Log Book entry/Incident Registers/letter references
#1.07	Number of instances for Major equipment/product failure due to negligence/improper work/poor workmanship by contractor	QUALITY	1		No such event should happen	Daily Log Book entry/Incident Registers/letter references
#1.08	Total number of complaints received in the month on the quality of finish / aesthetics	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#2.01	Cumulative number of days of delay in submission of Plan FOR THE MONTH supported by deployment plan of Major T&Ps and Manpower (as per Form F-14) and relevant construction/layout drawings - like A4 plan / elevation views of plan status for structures / pressure parts/Civil Works, Piping isometrics for piping, Layout / PID / System reference sketch, Unloading / storage plans etc.as applicable.	PERFORMANCE	5		Number of days delayed from second working day of the month	Daily Log Book entry/Incident Registers/letter references
#2.02	Percentage of timely submission of Daily Reports for Progress of work, Resources, Consumables etc.	PERFORMANCE	1.5		Percentage of timely submission of daily reports/ Scheduled date is successive next day for each day	Daily Log Book entry/Incident Registers/letter references
#2.03	Number of days delayed for submission of FQP log sheets / protocols / Monthly Progress Reports for the work executed during the month under measurement	PERFORMANCE	1.5		Number of days delayed/Scheduled date is first 2 working days of next month	Daily Log Book entry/Incident Registers/letter references
#2.04	Percentage Shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month as per Form-14	PERFORMANCE	35		As per Part-A of Form-14	Progress review formats
#2.05	Number of days delayed in submission of Running bills with complete supporting documents (including updated reconciliation statement of BHEL issued material) for the month	PERFORMANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#2.06	Number of times the Top Management of contractor did not respond to critical issues of site, for the month	PERFORMANCE	1		Total number of instances	Daily Log Book entry/Incident Registers/letter references
#2.07	Cumulative number of days in the month the works were stopped / refused on interpretation of contract clauses/scope due to tendency of taking undue advantage by interpreting contract clauses in their favour	PERFORMANCE	2		Cumulative number of days lost	Daily Log Book entry/Incident Registers/letter references
#2.08	Number of times rework was refused by contractor	PERFORMANCE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#2.09	Cumulative number of days in the month recording / logging was not done in daily log / history register / hindrance register / soft form in a PC maintained at BHEL Site Office	PERFORMANCE	1		Cumulative number of days recording or logging was not done / all days of the month	Daily Log Book entry/Incident Registers/letter references
#3.01	Percentage of Manpower Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B2 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.02	Percentage of T&P Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B1 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.03	Cumulative number of major instances in the month hampering / affecting progress of work due to breakdown or non-availability of major T&P and MME for the work, under the scope of Contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#3.04	Cumulative number of major instances in the month hampering / affecting progress of work due to non-availability of Consumables/ use of improper consumables under the scope of contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#4.01	Number of non-compliances during the month for Statutory requirements like validity of Labour Licence, Insurance Policy, Labour Insurance, PF, BOCW Compliance etc. and any other applicable laws/ Regulation, Electrical Licence, T&P fitness certificate, Contractors' All Risk Policy etc. as applicable	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#4.02	Cumulative number of days in a month poor illumination is reported at storage area, erection area, pre-assembly area and other designated areas by BHEL site.	SITE INFRASTRUCTURE & SERVICE	0.5		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.03	Cumulative number of days of non-availability of well-maintained toilets facilities for workers (separate for men and women) and non-availability of potable drinking water stations for workers in specified areas.	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#4.04	Total number of instances in the month, Housekeeping NOT attended to in spite of instructions by BHEL -i.e. removal / disposal of surplus earth / debris / scrap / unused / surplus cable drums / other electrical items / surplus steel items / packing materials, thrown out scrap like weld butts, cotton waste etc. from the working area to identified locations	SITE INFRASTRUCTURE & SERVICE	2		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.05	Total number of instances in a month, Site Office with reasonably good facilities including enough nos. of computers and printers etc. for use by office and supporting staff was not made available/maintained.	SITE INFRASTRUCTURE & SERVICE	0.5		No discrepancy during regular or surprise visits	Photograph and report of the Engineer
#5.01	Number of days delayed in making labour payments for the last month	SITE FINANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#5.02	Number of complaints from labour/ sub supplier/ sub-contractor for non-receipt of payments from contractor	SITE FINANCE	1.5		Total number of complaints or reporting	Daily Log Book entry/Incident Registers/letter references
#5.03	Number of times the site operations were hampered for want of funds at the disposal of site-in-charge.	SITE FINANCE	1.5		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.01	Cumulative number of days in a month the nominated Safety Officer was not available	HSE & SA	1		Safety Officer should be available for all the days	Daily Log Book entry/Incident Registers/letter references
#6.02	Shortfall in number of weekly safety meetings in the month conducted or attended by the Safety Officer	HSE & SA	0.5		Safety meetings to be held every week	Copy of Minutes of meeting
#6.03	Level of compliance w.r.t decisions taken in previous Safety meetings	HSE & SA	0.5		Number of consolidated issues discussed in Safety meetings	Copy of Minutes of meeting, Non-compliance intimation documents from BHEL site
#6.04	Delay in submission of monthly report on safety (including electrical safety for equipment & personnel etc.) in the prescribed form	HSE & SA	1		Number of days delayed/Scheduled date is third working day of next month	Daily Log Book entry/Incident Registers/letter references
#6.05	Number of days taken for lodging FIRs from date of occurrence/notice of incident of theft / accident etc.	HSE & SA	0.5		Number of days delayed/Scheduled date is within 24 Hrs of occurrence/notice of incidence	Copy of FIR lodged by Contractor

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#6.06	Number of times written(email, letters etc.) warning issued for non-availability/ use of improper Fall protection and rescue arrangement as lifeline, fall arrestors, safety net, hand-railings, covered floors, man-basket, rescue basket & kit etc. by the contractor	HSE & SA	2		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.07	Number of times punitive fines imposed for unsafe practices as per contract like non-availability/use of PPEs as safety shoes, helmets, goggles, gloves, lifeline, safety belts etc.	HSE & SA	1		Total number of non-compliances	Non-compliance intimation documents from BHEL site
#6.08	Percentage compliance to Emergency preparedness and response plan: Portable Fire-extinguishers, Buckets, Fire-wardens, display of emergency numbers, mock-drills, Hazard Identification and Risk Assessment(HIRA) etc.	HSE & SA	1		Compliance should be 100% as per HSE Plan or as finalized in Safety Meetings	Non-compliance intimation documents from BHEL site
#6.09	Number of times the agency has defaulted on display of safety posters / safety slogans / safety barriers/emergency numbers etc. in identified areas	HSE & SA	0.5		Total number of instances	Non-compliance intimation documents from BHEL site
#6.10	Non compliances observed during HSE and Safety Audit	HSE & SA	0.5		Total number of non-compliances	Non-compliance intimation documents from BHEL site, Audit Reports
#6.11	Cumulative number of days in the month, non-availability of First Aid Kit, First Aider & Emergency Vehicles/Ambulance.	HSE & SA	0.5		Cumulative number of days	Non-compliance intimation documents from BHEL site
#6.12	Number of days taken for submission of Root Cause analysis (RCA) for the accident from the cut-off date intimated by BHEL for submission of RCA	HSE & SA	0.5		Number of days delayed/Scheduled date is cut-off date intimated by BHEL	Daily Log Book entry/Incident Registers/letter references
#6.13	Non conductance of training (induction, job specific, height work etc.), tool box meeting and health check-up as per Contract requirements	HSE & SA	0.5		Number of incidences of non-conductance during the month	Daily Log Book entry/Incident Registers/letter references
Total			100			

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
	Less Deduction in Score Due to Major Accidents (Fatal, Permanent Disability or bodily injury by which person injured is prevented to resume to work within 48 hours or more after accident,, Major Damage to Equipment etc.) attributable to the contractor @ 3 points/ accident					
	Less Deduction in Score Due to Minor Accidents attributable to the contractor @ 1 point/ accident					
	Less Deduction in Score Due to not Maintaining of Labour Colony (if applicable) as per BHEL HSE policy @2 points in a month on verification any day					
	Final Score					

Performance Score Summary for the Month	Total Score	Score Obtained
QUALITY	10	
PERFORMANCE	50	
RESOURCES	20	
SITE INFRASTRUCTURE & SERVICE	5	
SITE FINANCE	5	
HSE & SA	10	
OTHERS (deductions if any)	0	
TOTAL	100	

Note:

- 1) It is only indicative and shall be as per the online format issued by BHEL time to time.
- 2) No request will be entertained after specified date of current month w.r.t. changes requested in the scores of immediate previous month.

FORMS & PROCEDURES

Form No: F-19 (Rev 00)

MILESTONE COMPLETION CERTIFICATE **(issued by BHEL on the specific request of Contractor)**

Ref :

Date:

To,

(Name & address of Contractor)

Dear Sir,

References

1. Contract No:
2. Job Description:

This is to hereby confirm that the following Milestone Activity has been achieved in respect of the Contract /Job under reference

Sl No	Milestone Activity	Remarks

This certificate is issued as per your request vide letter no
without any prejudice to the rights of BHEL in line with the terms and conditions of the
above referred Contract

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Construction Manager/Head (Subcontracts)

FORMS & PROCEDURES

Form No: F-20 (Rev 01)

CONTRACT COMPLETION CERTIFICATE (Issued by BHEL/HQ on the specific request of Contractor)

Ref :

Date:

To Whom so ever it may concern

1	DESCRIPTION OF WORK	
2	NAME AND ADDRESS OF THE CONTRACTOR	
3	CONTRACT NO	
4	CONTRACT VALUE	
5	LETTER OF INTENT NO & DATE	
6	CONTRACT PERIOD//CONTRACT DURATION	
7	DATE OF START/COMPLETION	
8	FINAL EXECUTED VALUE	
9	PERFORMANCE	GOOD SATISFACTORY UNSATISFACTORY

This certificate is issued as per your request vide letter no
without any prejudice to the rights of BHEL to use this certificate for evaluation of your offers for future
tenders

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Head (Subcontracts)

FORMS & PROCEDURES

Form No: F-21 (Rev 00)

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

This Indemnity Bond executed by <name of company> having their Registered Office at <xxxxxxxxxx> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, having its Registered Office at BH EL House, Siri Fort, Asiad, New Delhi - 110049 through its Unit at Power Sector _____ Region, _____, _____ State.
(Hereinafter referred to as the Company)

And whereas the Company has entered into a Contract with M/s xxxxxxxxx, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxxxx".

AND WHEREAS under the provisions of G C C further stipulates that the Contractor shall indemnify the Company against all claims of whatever nature arising during the course of execution of Contract including defects liability period of <xx Months > i.e till <xx xx xxxx>

Now this deed witnesses that in case the Company is made liable by any Authority including Court to pay any claim or compensation etc. in respect of all labourers or other matters at any stage under or relating to the Contract with the Contractor, the Contractor hereby covenants and agrees with the Company that they shall indemnify and reimburse the Company to the extent of such payments and for any fee, including litigation charges, lawyers' fees, etc, penalty or damages claimed against the Company by reason of the Contractor falling to comply with Central/States Laws, Rules etc, or his failure to comply with Contract (including all expenses and charges incurred by the Company).

The Contractor further indemnifies the Company for the amount which the Company may be liable to pay by way of penalty for not making deductions from the Bills of the Contractor towards such amount and depositing the same in the Government Treasury.

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The Contractor further agree that the Company shall be entitled to with hold and adjust the Security Deposit and/or with ho ld and adjust payment of Bills of Contractor pertaining to this Contract against any payme nt which the Company has made or is required to mak e for which the Contractor is liable under the Contract and that such amount can be withheld, adjusted by the Company till satisfactory and final settlement of all pending matters and the Contractor hereby gives his consent for the same.

The Contractor further agrees that the terms of indemnity shall s urvive the termination or completion of this contract.

The contractor further agrees that the liability of the contractor shall be extended on actual basis notwithstanding the limitations of liability clause, in respect of :

1. breach of terms of contract by the contractor
2. breach of laws by the contractor
3. breach of Intellectual property rights by the contractor
4. breach of confidentiality by the contractor

Nothing contained in this deed, shall be construed as absolving or limiting the liability of the Contractor under said Contract between the Company and the Contractor . That this Indemnity Bond is irrevocable and the condition of the bond is that the Contractor shall duly and punctually c omply with the terms and the conditions of this deed and contractu al provisions to the satisfaction of the Company.

In witness where of M/s xxxxxxxxxxxxxx these presents on the day, month and year first, above written at xxxxxxxx by the hand of its signatory Mr. xxxxxxxxxxxx.

Signed for and on behalf of
M/s xxxxxxxxxxxxxxxxxxxx

Witness:

1
2

FORMS & PROCEDURES

Form No: F-22 (Rev 00)

CONSORTIUM AGREEMENT

(To be executed on Rs. 50/- Non – Judicial Stamp Paper)

THIS AGREEMENT is made and executed on this _____ day of _____, by and between (1) M/s _____, (The First Party, i.e, the Bidder) a company incorporated under the Company's Act 1956, having its registered office at _____ (herein after called the "Bidder", which expression shall include its' successors, administrators, executors and permitted assigns) and (2) M/s _____, (The Second Party, i.e, the associates), a company incorporated under the Company's Act 1956, having its registered office at _____ (herein after called the " Associates", which expression shall include its' successors, administrators, executors and permitted assigns).

WHEAEAS the Owner, Bharat Heavy Electricals Ltd, a Government of India Undertaking, proposes to issue / issued an NIT (herein after referred to as the said NIT) inviting bids from the individual Bidders for undertaking the work _____ of _____ at _____ (herein after referred to as the said works).

WHEREAS the said NIT enables submission of a bid by a Consortium subject to fulfillment of the stipulations specified in the said NIT.

AND WHEREAS M/s _____ (The First Party, i.e, the Bidder) will submit its proposal in response to the aforesaid invitation to _____ bid by the Owner for _____ as detailed in the Bid doc. no. < TENDER REF----->

FORMS & PROCEDURES

AND WHEREAS M/s _____ (The First Party, i.e the Bidder) itself is meeting all the qualifying requirements except the qualifying requirements of _____ (as detailed in the NIT) and in order to fully meet the qualifying requirements of NIT, this tie-up agreement is _____ being entered into with M/s _____ (The Second Party, the Associates), who fully meet the balance part of the said work _____ s _____).

WHEREAS the First Party and the Second Party are contractors engaged in the business of carrying out various items of works. WHEREAS the two parties have agreed to constitute themselves into a consortium for the purpose of carrying out the said works, and that the consortium will be continued till the completion of the works in all respects.

WHEREAS the parties have agreed to certain terms and conditions in this regard:

NOW THEREFORE THIS AGREEMENT WITNESSETH AS FOLLOWS :

1. First and Second parties hereby constitute themselves into a Consortium for the purpose of bidding and undertaking the said works pursuant to the said NIT as hereinafter stated.
2. The First Party will be the leader (Lead Partner) and will be responsible for the entire works.

FORMS & PROCEDURES

CONSORTIUM AGREEMENT

3. The First Party shall undertake the following part(s) of work detailed in _____ the NIT namely _____
4. The Second Party shall undertake the following part(s) of work detailed _____ in the said NIT namely _____
5. The parties hereby declare and confirm that each of them will fulfill the required minimum qualifying requirements as prescribed in the said NIT for the works agreed to be undertaken by them as stated here-in-above.
6. It is also agreed between the parties hereto that all of them shall be individually and severally responsible for the completion of the said works as per the schedule. Further, if the Employer/Owner sustains any loss or damage on account of any breach of the Contracts, we the, Consortium partners individually and severally undertake to promptly indemnify and pay such losses / damages caused to the Employer/Owner on its written demand without any demur, reservation, contest or protest in any manner whatsoever.
7. The parties hereby agree and undertake that they shall provide adequate finances, suitable Tools, Plants, Tractors, Trailers, other transportation equipment, other Tools & Plants, Measuring & Monitoring Equipments (MMEs), Men and Machinery etc. for the proper and effective execution of the works to be undertaken by them as specified here-in-above.

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8. It is agreed interse between t he parties hereto that all the consequences liabilities etc., arising out of any default in the due execution of the said works shall be borne by the party in default, that is by party in whose area of works default has occurred, provided however, so far as M/s Bharat Hea vy Electricals Limited is concerned, all the parties shall be liable jointly and severally.

IN WITNESS HEREOF the parties above named have signed this agreement on the day month and year first above written at _____(Place) .

WITNESS

For

1. NAME (FIRST PARTY)

2. OFFICIAL ADDRESS

WITNESS

For

1. NAME (SECOND PARTY)

2. OFFICIAL ADDRESS

[The successful bidder shall have to execute the " JOINT DEED OF UNDERTAKING " in the format to be made available by BHEL at the time of awarding].

FORMS & PROCEDURES

Form No: F-23 (Rev 00)

REFUND OF SECURITY DEPOSIT

To,
The Construction Manager
BHEL Site Office

Dear Sir,

Sub : **Refund of Security Deposit**

Ref : Contract No:

Work:.....

I/We have submitted Final Bill in respect of the above Contract/Work vide our letter no:.....
dated In line with Tender conditions (GCC clause no 1.11), kindly arrange to
release/refund the Security Deposit along with Final Bill payments.

The details of Security Deposit are as below:

1. Cash Portion :
2. BG Portion :

Thanking You

Date: _____

Authorised representative of Contractor

To be filled up by BHEL

1. Security Deposit to be refunded:
 - a. Cash Portion:
 - b. BG Portion :
2. Less
 - a. Amount spent by BHEL on behalf of Contractor:
 - b. Payments made by BHEL on behalf of Contractor:
 - c. Other recoveries for Services etc
 - d. Any other recoveries
 - e. Total of 'a' to 'd':
3. Net Amount to be released (1-2) :
4. Certified that
 - a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
 - b. Contract Guarantee period of Months commenced wef : _____
 - c. All objections raised so far have been settled
 - d. A note for refund of Security Deposit has been made in the Measurement Book

Signature of BHEL Engineer

Construction Manager

Date:-----

FORMS & PROCEDURES

Form No: F-24 (Rev 00)

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR, _____ REGION

Ref No:

Date:

1. Name and Address of Contractor :
2. Contract Agreement/LOI No :
3. Date of Contract Agreement/LOI :
4. Name of the Work undertaken :
5. Date of commencement of the Work :
6. Date of Completion of the Work :
7. Period of Maintenance :
(Guarantee Period)
8. Date on which the Final Bill was paid :
9. Last date of making good the defect :
during Maintenance Period
10. Expenditure incurred by BHEL during :
Maintenance Period, if any, recoverable
11. Date on which Guarantee Money refund:
falls due as per Contract
12. Amount of Guarantee Money to be refunded:
13. Less Amounts recoverable (with details)
 - a. Amount spent by BHEL on maintenance :
 - b. Payments made by BHEL on behalf of Contractor:
 - c. Court dues/penalties/compensation :
 - d. Other recoveries for Services, etc :
 - e. Total of 'a' to 'd' :
14. Net Amount recommended for release (12-13) :

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Signature of BHEL Engineer

Date: _____

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL _____, for the work done or for labour or material supplied or any other account arising out of or connected with the Contract Agreement/LOI (No _____ dated _____) and the payment of this bill shall be in full and final settlement of all my/our claims and demands including the 'Deposits' of the Contract Agreement/LOI referred to.

Signature of Contractor

Date: _____

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER/CONSTRUCTION MANAGER

1. Certified that
 - a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
 - b. Maintenance period (Contract Guarantee period) is over and the Contractor has carried out the works required to be carried out by him during the period of maintenance (Guarantee) to our satisfaction, and all expenses incurred by the Company on carrying out such works have been included for adjustment
 - c. All objections raised so far have been settled
 - d. A note for refund of Guarantee Amount has been made in the Measurement Book and Contract Agreement/Work Order

Signature of BHEL Engineer

Construction Manager

Date:-----

FOR USE IN ACCOUNTS DEPARTMENT

Passed for Rs _____ (Rupees _____ only)

Accountant

Accounts Officer

ACKNOWLEDGE BY THE CONTRACTOR

Received Rs _____ in full and final settlement of my/our claim

Signature of Contractor

Date: _____

FORMS & PROCEDURES

Form No: F-25 (Rev 00)

POWER OF ATTORNEY for SUBMISSION OF TENDER/SIGNING CONTRACT AGREEMENT

(To be typed on non judicial Stamp Papers of appropriate value as applicable and Notarised)

KNOW ALL MEN BY THESE PRESENTS, that I/We do hereby make, nominate, constitute and appoint Mr , whose signature given below herewith to be true and lawful Attorney of M/s..... hereinafter called 'Company', for submitting Tender/entering into Contract and inter alia, sign, execute all papers and to do necessary lawful acts on behalf of Company with M/s Bharat Heavy Electricals Ltd, Power Sector _____ Region, _____, in connection with

.....
.....
..... vide Tender Specification No :
_____, dated _____.

And the Company do hereby agree to ratify and confirm all acts, deeds, things or proceedings as may be lawfully done by the said attorney and by or on behalf of the company and in the name of the company, by virtue of the powers conferred herein and the same shall be binding on the company and shall have full force and effect.

IN WITNESS WHEREOF the common seal of the company has been hereunto affixed in the manner hereinafter appearing on the document.

Dated at _____, this _____ day of _____

Director/CMD/Partner/Proprietor

Signature of Mr.....(Attorney)

Attested by: Director/CMD/Partner/Proprietor

Witness

Notary Public

FORMS & PROCEDURES

Form No: F-26 (Rev 00)

ANALYSIS OF UNIT RATES QUOTED

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

Offer Reference No:.....

Date:.....

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

Dear Sir,

Sub : Analysis of Unit Rates Quoted

Ref : Tender Specification No:

Analysis of Unit Rates quoted by us in respect of above Tender is as detailed

SN	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
	TOTAL	100%	

Yours faithfully,

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

FORMS & PROCEDURES

Form WAM 6

BHARAT HEAVY ELECTRICALS LIMITED DIVISION.....

Running Account Bill

(Para 4.31.1 of Works Accounts Manual)

Name of the Contractor:
Name of the Work:
Sanctioned Estimate:
Code No:
Contract Agreement No :

Dated:

Departmental Bill no:
Division:
Date of written order to commence the work :
Date of commencement of the Work:
Due date of completion as per Agreement:

Date:
Sub-Division:

1. ACCOUNT OF WORK EXECUTED

On account payment for work not previously previously measured**			Item No of	Description of Work	Quantity as per agree- ment	Quantity executed up to date	Rate	Unit	Payment on the basis of actual measure- ment up to date	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill	Remarks	
Total As per Running Account bill Rs.	since last running account bill Rs.	Total up to date Rs.					Rs.	P.	Rs.	P.	Rs.	P.	
1	2	3	4	5	6	7	8	9	10	11	12	13	

- * *1. Whenever payment is made on 'on account' basis without actual measurements the amount in whole rupees should be entered in columns 1 to 3 only and not in columns 7 to 12.
2. whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total up to date in column 4 may become nil.

FORMS & PROCEDURES

Form WAM 6 (contd...)

1	2	3	4	5	6	7	8	9	10	11	12	13

Total value of work done up to date (A) ...

Running Account Bill Deduct value of work shown on the last (B) ...

Net value of work done since last (C) ...

Rupees (in words)

.....only.

FORMS & PROCEDURES

Form WAM 6 (contd...)

II.MEMORANDUM OF PAYMENTS

				I		II	
		Rs.	P.	Rs.	P.	Rs.	P.
1.Total value of work actually measured as per Account No. I. Column 10	(A)	.....				.....	
2.Total up to date 'on account' payment for work covered by approximate Or plan measurements as per Account No. I, Column 3	(B)	.....				.....	
3.Total up to date secured advances on security of materials as per column 8 Of the enclosed Account (Form WAM 10)	(C)	.....				.....	
4.Total up to date payments [(A) + (B) + (C)]	(D)	.....				.....	
5.Total amount of payments already made as per Entry (D) of last Running Account Bill No..... Dated.....forwarded to the Accounts Office on	(E)						
6.Balance [(D)-(E)]		.....					
7.Payments now to be made:							
a) by cash/cheque				.....			
b) by deduction for value of materials supplied							
c) by BHEL vide Annexure A attached				.....			
d) by deduction for hire of tools and plant vide							

FORMS & PROCEDURES

Annexure B attached	.....	
e) by deduction for other charges vide Annexure C		
Attached	.....	
f)by deduction on account of security deposit	.....	
h) by deduction on account of Income Tax	.....	.....

Note: Amounts relating to items 4 to 6 above should be entered in column II and those relating to item 7 in column I. The amount shown against item 6 and the total of item 7 should agree with each other.

III.CERTIFICATE OF THE ENGINEER IN CHARGE

Form WAM 6 (contd...)

1. The measurements on which the entries in column 7 to 12 of Part I of this Bill (Account of work executed) are based were made by.....and are recorded at pages.....of
(Name and Designation)

Measurement Book No

2. Certified that the methods of measurement are correct and the work has been carried out in accordance with the terms and conditions, schedules, specifications and drawings etc, forming part of the contract agreement, subject to deviations included in the deviation statement (Annexure D).
3. Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 10 of Part I, some work has actually been done in connection with several items and the value of the such work is, in no case, less than 'on account' payments as per column 3 of Part I, made or proposed to be made, for the convenience of the contractor in anticipation of, and subject to the results of, detailed measurement which will be made as soon as possible.

Signature of Contractor

Signature of Engineer in charge

Date:

Designation:

Date:

FORMS & PROCEDURES

IV. CERTIFICATE OF THE SENIOR ENGINEER

1. Certified that measurements have been check measured to the prescribed extent by at site and also by the undersigned and the relevant entries have been intialled in the Measurement book. (vide pages.....)
(Name and Designation)
2. Certified that all the measurements recorded in the measurement book have been correctly billed for
3. Certified that all recoberable amounts in respect of materials tools and plant etc, and other charges have been correctly made vide Annexures A to C attached.
Certified for payment * of Rs.....(Rupees.....only)
To be paid in cash/by cheque in the presence of

ALLOCATION

The expenditure is chargeable as under and to be included in the accounts for.....20.....

Ledger Head	Debit (Gross amount)	Credit (Deductions)

Rs. P.

Rs. P.

Total

* Here specify the net amount payable.

Signature of Senior Engineer
Date:

Form WAM 6 (contd...)

V.ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Accounts Bill No Dated.....
Entered in Journal Book vide entry No.....Dated.....
Passed for.....Rs.....
Less Deductions.....Rs.....
Net Amount Payable.....Rs.....
(Rupees.....only)
Payable to Shri/M/s.....by cheque/cash
Entered in Contractor's Ledger No.....Page.....

ALLOCATION

Estimate No:

Code no:

Name of the Work:

Ledger Head	Debit (Gross amount)	Credit (Deductions)
	Rs. P.	Rs. P.
-----	-----	-----
-----	-----	-----

FORMS & PROCEDURES

Assistant Date:	Accountant Date:	Account Officer Date:	Total	-----	-----

VI. Received Rs.....(Rupees.....only) as per
Memorandum of Payments on account of this work.

Signature of witness Address : Date:	Revenue	Stamp Signature of Contractor Date:

VII. ENTRIES TO BE MADE BY TREASURY SECTION

Cash Book entry No. and date:	Amount paid	Rs.....
	Amount unpaid	Rs.....
	Total	Rs.....
	Signature of Cashier	
	Date:	

Form WAM 6 (contd...)

ANNEXURE A

FORMS & PROCEDURES

Statement showing details of materials issued to the contractor Shri/M/s.....

In respect of Contract Agreement No Dated.....

Sl. No.	Stores issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from the contractor				R E M A R K S
							Rate at which recoverable	Amount recoverable	Amount recovered up to previous bill	Balance now recovered	
							Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12
Total											

Signature of contractor

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

Date:

FORMS & PROCEDURES

Form WAM 6 (contd...)

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s.....

In respect of Contract Agreement No Dated.....

Sl. No	Description of tools and plant issued	Period for which Issued	Rate at which recovery Is to be Made	Amount recover-able	Amount recovered upto previous bill	Balance now recovered	Remarks
			Rs. P.	Rs. P.	Rs. P.	Rs. P.	

1	2	3	4	5	6	7	8

Total

Signature of contractor

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

Date:

FORMS & PROCEDURES

Form WAM 6 (contd...)

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s.....

In respect of Contract Agreement No Dated.....

Sl. No	Particulars	Unit	Quantity	Rate	Amount recover- able	Amount recovered upto pre- vious bill	Amount now recovered	Remarks
				Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9

1. Water Charges
2. Electricity charges
3. Seignorage charges
4. Medical charges
5. Cost of empty gunny bags and
Empty containers not returned
- 6.
- 7.
- 8.
- 9.

FORMS & PROCEDURES

10.

Total

Signature of contractor

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

Date:

FORMS & PROCEDURES

Form WAM 6 (contd...)

ANNEXURE D

Name of the Contractor:
Name of the Work:

Contract Agreement No:
Date:

Sl. No.	Description of item	Unit	Quantity as per Agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement Rs. P.
1	2	3	4	5	6	7	8

Rate as the executed with any Rs. P.	Amount as per agreement Rs. P.	Amount as executed Rs. P.	Amount further anticipated Rs. P.	Total amount anticipated on completion Rs. P.	Difference Excess savings Rs. P. Rs. P.	Reason for deviation authority, if
9	10	11	12	13	14 15	16

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

FORMS & PROCEDURES

[illegible]

[illegible]

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

II MEMORANDUM OF PAYMENT												
										Rs.	P	
1	Total Value of work actually measured as per Account no I column 10 (A)											
2	Deduct amount of paym,ents already made as per last running account bill No Dated..... Forwarded to the Accounts Office on (B)											
3	Payments now to be made { (A) - (B)} (C)											
4	Deduct ammounts recoverable from the contractor on account of :								Rs	P		
	a	Material suplied by BHEL vide annexure A attached										
	b	Hire of Tools & Plants vide Annexure B attached										
	c	Other charges vide Annexure C attached										
	d	Income Tax										
	Total deduction											
5	Balance											
6	Refund of 50% of security deposite on completion of work											
7	Net amount to be paid to the Contractor											
III. CERTIFICATE OF THE ENGINEER IN CHARGE												
1	The measurement on which the entries in coulmn 7 to 12 of Part I of this bill (Account of work executed) are based were made by (Name and designation)											
2	A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.											
	Date:							Signature of Engineer in charge				
								Designation				

[illegible]

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE												
Account Bill no..... Dated						ALLOCATION						
Entered in Journal book vide entry No.....Dated.....						Estimate No:				Code No		
Passed for.....Rs.....						Name of the Work						
Less Deductions.....Rs.....												
(Rupees.....Only)												
Payable to Shri/M/s..... by cheque/cash												
Entered in contractors' Ledger no..... Page												
Assistant		Accountant		Accounts officer								
Date:		Date:		Date:								
VI. Received Rs.....(Rupees.....Only) in full and final settlement of all moneys due under this contract and I / we have no further claims of this contract.												
Signature of Witness Address												
Revenue Stamp Signature of Contractor Date:												
VII . ENTRIES TO BE MADE BY TREASURY SECTION												
Cash book entry no and date : Amount Paid Rs..... Amount unpaid Rs..... Total Rs.....												
Signature of Cashier Date:												

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

BHARAT HEAVY ELECTRICALS LIMITED DIVISION..... And Final bill (Para 4.3.2 Of Works Accounts Manual)														
Name of Contractor							Departmental Bill no				Date			
Name of the Work							Division				Division			
Sanctioned Estimate							Date of written order to commence the work							
Contract Agreement/work Order No							Date of commencement of work							
							Due date of completion as per agreement							
							Date of actual completion of the work							
I. ACCOUNT OF WORK EXECUTED														
On Account payment for the work not previously measured **			Item No of the agreement/work order	Descripti on of work	Quantity as per agreement	Quantity executed up to date	Rate Rs. P	Unit	Payment on the basis of actual measurement up to date Rs P	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill Rs P	Remarks		
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs												
1	2	3	4	5	6	7	8	9	10	11	12	13		

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:NKP-C1974:19

1	2	3	4	5	6	7	8	9	10	11	12	13

Total Value of Work Done up to date (A)	
Deduct Value of work shown on the last running account bill (B)	
Net value of work done since last running account bill (C)	

Rupees (In Words).....Only

II MEMORANDUM OF PAYMENT

		Rs.	P
1	Total Value of work actually measured as per Account no I coloumn 10	(A)	
	Deduct amount of paym,ents already made as per last running account bill No Dated.....		
2	Forwarded to the Accounts Office on	(B)	
3	Payments now to be made { (A) - (B)}	(C)	
4	Deduct ammounts recoverable from the contractor on account of :	Rs	P
	a Material suplied by BHEL vide annexure A attached		
	b Hire of Tools & Plants vide Annexure B attached		
	c Other charges vide Annexure C attached		
	d Income Tax		
	Total deduction		
5	Balance		
6	Refund of 50% of security deposite on completion of work		
7	Net amount to be paid to the Contractor		

III. CERTIFICATE OF THE ENGINEER IN CHARGE

The measurement on which the entries in coulms 7 to 12 of Part I of this bill (Account of work executed) are based were made by

- 1 (Name and designation)
- 2 A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.

Date:

Signature of Engineer in charge
Designation

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Account Bill no..... Dated
Entered in Journal book vide entry No.....Dated.....
Passed for.....Rs.....
Less Deductions.....Rs.....
(Rupees.....Only)
Payable to Shri/M/s..... by cheque/cash
Entered in contractors' Ledger no..... Page

ALLOCATION		Code No
Estimate No:		
Name of the Work		
Ledger Head	Debit (Gross Amount) Rs P	Credit (Deduction) Rs
.....		
Total	.....	.....

Assistant	Accountant	Accounts officer
Date:	Date:	Date:

VI. Received Rs.....(Rupees.....Only) in full and final settlement of all moneys due under this contract and I / we have no further claims of this contract.

Signature of Witness
Address

Revenue Stamp
Signature of Contractor
Date:

VII . ENTRIES TO BE MADE BY TREASURY SECTION

Cash book entry no and date :

Amount Paid Rs.....
Amount unpaid Rs.....
Total Rs.....

Signature of Cashier
Date:

ANNEXURE A

Part I

Statement showing details of material issued to the contractor Shri/M/s..... In respect of Contract

Agreement/Work Order No..... Dated

SI No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverabl e from the contractor or supplied free	Rate at which recoverable		Amount Recoverabl e		Amount recoverable upto previous bill		Balance Now recovered		Remarks
							Rs	P	Rs	P	Rs	P	Rs	P	
1	2	3	4	5	6	7	8		9		10		11		12

Total

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE A

Part II

Statement showing details of material issued to the contractor Shri/M/s..... in respect of Contract Agreement/Work Order No..... Dated and not covered by the agreement

SI No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate		Amount Recoverabl e		Amount recoverable upto previous bill		Balance Now recovered		Remarks
						Rs	P	Rs	P	Rs	P	Rs	P	
1	2	3	4	5	6	7		8		9		10		11

Total

Add Departmental Charges

Add Sales Tax (wherever applicable)

Total

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE B

Statement showing TOOLS & PLANTS issued to the contractor Shri/M/s..... in respect of Contract Agreement/Work Order No..... Dated and not covered by the agreement

SI No 1	Description of tools & plants issued 2	Period for which issued 3	Rate at which Recivry is to be made 4	Amount recoverabl e Rs P 5		Amount recoverable upto previous bill Rs P 6		Balance Now recovered Rs P 7		Remarks 8

Total

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE C

showing detail of other recoveries to be made from the contractor Shri/M/s.....
nent/Work Order No.....Dated.....

Sr.No	Particulars	Unit	Quantity	Rate Rs. P.	Amount recoverable Rs. P	Amount recovered upto previous bill Rs. P.	Amount now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8	9
	1 Water Charges							
	2 Electricity Charges							
	3 Seignorage Charges							
	4 Medical Charges							
	Cost of empty gunny bags and empty containers not 5 returned							
	6							
	7							
	8							
	9							
	10							
Total								

Signature of Contractor
Date

Signature of Engineer Incharge
Date

Signature of Sr. Engineer
Date

Form WAM 7 (Contd.)

ANNEXURE D -
DEVIATION STATEMENT :

Name of the Contractor :

Contract Agreement/Work Order No. :

Name of the Work :

Date :

Sl. No.	Description of item	Unit	Quantity as per agreement	Quantity as executed	Rate as per agreement Rs. P.	Rate as executed Rs. P.	Amount as per agreement Rs. P.	Amount as executed Rs. P.	Difference		Reason for the deviation with authority, if any
									Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date :

ANNEXURE E

Statement showing the consumption of materials issued to the contractor Shri/M/s.....
in respect of Contract Agreement/Work Order No..... Dated.....

Name of the Work :

ON RECOVERY BASIS

Sl. No.	Description of material	Unit	Quantity actually issued	Quantity actually incorporated in the work	Balance	Particulars of disposal of balance	Quantity to be issued as per approved data for work actually done	Variation in consumption (Difference between column 5 and 8)		Rate chargeable for excess/short consumption, if any	Amount recoverable for excess/short consumption, including materials not returned	
								More	Less	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Cement											
2.	Bricks											
3.	Wood.....											
4.	Asbestos Sheet											
5.	Iron Materials											
6.												
7.												
8.												
9.												
10.												

Signature of Contractor

Date :

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date :

Note : 1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 and 6 respectively of Annexure A (Part I and II).

2. Data statement of theoretical consumption should be attached in support of quantity specified in column 8.

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulars and answers to be recorded)	
Name of the work :	
Name of the Contractor :	
Date of commencement of the work:	
Contract agreement/work ordered no. and date:	
Reference to supplementary agreement no,if any :	
Whether administrative approval and technical sanction has been accorded by the competent authority ? If so ,cite reference	
Whether sanction of the competent authority and financial concurrence of the Accounts Department for award of the work has been accorded ? If so,cite reference.	
Whether the work has been completed in time ? If not ,whether penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Accounts Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter no. and date granting the extension of time should be given)	
(a) Whether the rates allowed in the bill have been checked with the contract agreement ? (b) Whether the rates for extra/supplemental items have been approved by the competent authority and the sanction communicated to the accounts Department together with rate analysis? If so,cite reference.	
Whether deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.	
Whether the rates of recovery of stores issued to the contractor which are not provided for in the Contract Agreement have been settled in consultation with Finance?	
Whether discrepancies pointed out by the Accounts Department in the store statement have been reconciled and accepted by the Accounts Department?	

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulars and answers to be recorded)	
Whether materials issued to the contractor in excess of the theoretical requirements have been returned to the Stores Department and the no. and date of such returned stores vouchers have been shown in stores statement? If not, whether the cost of such excess material has been recovered at the prescribed rate? Whether consumption statements in respect of materials chargeable to the work have been attached to the bill?	
Whether consumption of materials shown has been technically checked by Senior Engineer?	
Whether materials issued and used in the work is not less than that required for consumption in work according to our specification? If consumption is less, whether necessary recovery has been made in the bill?	
Whether measurements have been checked by the Engineer and Sr. Engineer to the extent required and certificates of check recorded in the measurement books?	
Whether contractor has signed the bill and the measurement books without reservations? If not, whether reasons have been intimated to the Accounts Department?	
Whether arithmetical calculations have been checked and certificate recorded in the measurement books by a person other than the one who calculated initially	
Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulars.	
Whether all advance payments on running Accounts have been recovered?	
Whether all the recoveries due to services given to the contractor like rent of accommodation, water charges, electricity charges etc. have been recovered and whether payments made by the company on behalf of the contractor have been adjusted?	
Whether the files containing abstracts from measurement books/ standard measurement books have been completed/ updated?	
Whether hire charges of tools and plant have been recovered and the statement of hire charges with full details attached?	

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulars and answers to be recorded)	
Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer/ Sr. Engineer and whether recoveries have been made for defective works, if any?	
Whether all corrections in the bill/measurement books etc. have been neatly made and attested and there are no overwriting?	
Whether final measurements have been taken as soon as possible after completion of work and the certificate of completion issued? If not, whether reasons for delay have been recorded and communicated to Accounts?	
In respect of Quantities reduced in the final bill as compared to the running payment, whether adequate reasons have been recorded and communicated to Accounts?	
Whether the Expenditure has been classified correctly according to heads of Account recorded in the sanctioned estimate?	
Whether the work has been completed within the estimated cost? If not, what is the percentage of excess over the sanctioned estimate/ administrative approval? In case the excess is beyond the competency of Sr. Engineer, what action has been taken for the obtaining the approval of the authority competent to sanction the excess?	
(a) If the contractor has furnished bank guarantee in lieu of cash security deposit towards proper execution of works and guarantee against defects during the maintenance period, whether the period of currency of the bank guarantee covers the entire maintenance period? (b) If not, whether security deposit has been proposed to be recovered from the final bill?	
Whether all the previous audit objections raised on running Account bills have been settled? If so, cite reference.	
Signature of Engineer in Charge	Signature of Engineer in Charge
Date:	Date:



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 1 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: PLAN/ REVIEW OF WORK FOR THE MONTH OF Date of Plan/ Review.....

SN.	Description of Work	Unit of Measurement	Unit Rate	Planned		Cumulative Shortfall attributable to contractor upto last month (Refer Note 1)		Achieved		Shortfall attributable to BHEL w.r.t Plan (as per Col. 3 of Part-D)		Cumulative Shortfall attributable to Contractor upto & including this month		REMARKS (Reasons for Shortfall attributable to Contractor. Supporting documents to be kept as record.)
				(QTY Planned for the month as per Part –C of last month)										
(a)	(b)	(c)	(d)	A		B		C		D		E=A+B-C-D		
				Phy.	Financial	Phy	Financial	Phy.	Financial	Phy.	Financial	Phy.	Financial	
	Value of Other Items not mentioned above but planned to be executed in this month													
Total					ΣA		ΣB		ΣC		ΣD		ΣE	

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

 PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 2 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: Contd.....

Note 1: **In addition to the work planned as per Col. 'A', Contractor shall also make full efforts to minimize the 'Cumulative shortfall attributable to contractor upto the month' as mentioned in Col. 'B' by enhancing its resources, so as to achieve the completion of activities as per agreed schedule. In case contractor is not able to execute the entire shortfall, then BHEL 'Engineer in-charge', shall decide the priority of work to be executed and it shall be binding on the contractor.**

Note 2: Percentage Shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month = $[(\Sigma E - \Sigma B) / (\Sigma A - \Sigma D)] \times 100$
In case, $(\Sigma E - \Sigma B)$ is negative, then it shall be treated as zero percent."

Note 3: Form 14 should include all items being planned in the current month, and all items against which shortfall was attributable to contractor till previous month. However, for practical reason, if it is not possible to mention some of the items in Form-14 being planned to be executed in this month, then also value of such items shall necessarily be included in calculation of Total Value.

Note 4: In case reason for shortfall attributable to contractor is w.r.t. T&P and Manpower, it should be in conformity with Part B1 and B2.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

 PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 3 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-1: PLAN/REVIEW OF DEPLOYMENT OF MAJOR T&Ps FOR THE MONTH OF

Date of Plan/ Review.....

CONTRACTOR'S SCOPE: -

SN.	PLAN				DEPLOYMENT STATUS			
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Weightage assigned to planned T&P (in fraction such that $\Sigma C = 1$)	Actual Deployed Quantity	Actual Deployment Period (in days)	Weighted T&P Deployed	REMARKS (Works affected due to non-deployment of T&Ps)
		A	B	C	D	E	$F = (C \times D \times E) / (A \times B)$	

Note: In case, $E > B$, it shall be considered as $E = B$. Similarly, in case $D > A$, it shall be considered as $D = A$.
Percentage of T&P Deployed = $\Sigma F \times 100$

BHEL SCOPE: -

SN.	PLAN			DEPLOYMENT STATUS		
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Actual Deployed Quantity	Actual Deployment Period (in days)	REMARKS (Works affected due to non-deployment of T&Ps)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

 PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 4 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-2: PLAN/ REVIEW OF DEPLOYMENT OF MANPOWER FOR THE MONTH OF

Date of Plan/ Review.....

CONTRACTOR'S SCOPE: -

SN.	Area of Work	Category of Labour	No. of Labour required as per category	Deployment Period (in days)	No. of Labour actually deployed	Actual Deployment Period (in days)	REMARKS (Works affected due to non-availability of labour)
			A	B	C	D	

Percentage of Manpower Deployed= $100 \times \frac{\sum(C \times D)}{\sum(A \times B)}$

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

 PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 5 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – C: PLAN(PHYSICAL) FOR THE NEXT MONTH i.e.

Date of Plan

SN.	Description of work	Original Planned Quantity	Planned Quantity (excluding shortfalls attributable to contractor till date)	Unit of Measurement	T&Ps Required				Manpower Required		REMARKS (Reasons for difference in Original Planned Quantity w.r.t. Planned quantity to be given)
					Contractor Scope		BHEL Scope		Category of Labour	No. of Labour required as per Category	
					Major T&P to be deployed as per work planned for the month	Quantity	Major T&P to be deployed as per work planned for the month	Quantity			

Note 1: Planned quantity should be based on available/ expected fronts/ inputs in the next month

Note 2: “Original Planned Quantity” shall be as per latest jointly agreed programme between BHEL and Contractor before commencement of work or at the time of latest Time Extension, as the case may be.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

 PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page 6 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – D: REASONS FOR SHORTFALL ATTRIBUTABLE TO BHEL IN RESPECT OF PLAN FOR THE MONTH.....

SN.	Description of Work (from Part-A)	Quantities Affected		Reasons for Shortfall attributable to BHEL	Agency responsible for reasons for Shortfall	Remarks (Supporting Documents in respect of agency responsible)
		(Physical Quantity)	Unit of Measu- rement			
1	2	3	4	5	6	7

Note1: Reasons for shortfall shall include non-availability of fronts/ drawings/ materials/ T&P (BHEL Scope)/ clearances etc. and other hindrances for which contractor is not responsible.

Note2: Agency responsible may be BHEL Site/ MUs/ Design Centre/ BHEL Customer/ other Contractors etc.

BHEL
(Sign with name, designation and date)

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at _____¹ hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated ² valued at Rs.....² (Rupees -----)for <Nature of Work>³ (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to% (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, ..., (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ----- (Rupees -----)⁴ without any demur, immediately on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including.....⁵ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ⁶ (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, ... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to ⁸
- c) Unless the Bank is served a written claim or demand on or before ⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ DATE OF EXPIRY OF CLAIM PERIOD

⁷ BG AMOUNT IN FIGURES AND WORDS.

⁸ VALIDITY DATE

⁹ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.

2. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

- b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
- b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
- b.2** **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
- b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
- b.4** The BG should clearly specify that the demand or other document can be presented in electronic form.

**BANK GUARANTEE FOR SECURITY DEPOSIT CUM PERFORMANCE BANK GUARANTEE
BOND**

B.G. NO.

Date

This deed of Guarantee made this ----- day of -----two thousand ---- by <Name and Address of Bank> hereinafter called the "The Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) in favour of M/s Bharat Heavy Electrical Limited (A Govt. of India Undertaking) a company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its unit at <Address of Power Sector Region¹> hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns)

WHEREAS < Contractor's Name and Address> (hereinafter referred to as the Contractor) have entered into a contract arising out of Letter of Intent no. < LOI REF & Date > (hereinafter referred to as "the contract") for < Name of Work > with the company.

AND WHEREAS the contract inter-alia provides that the contractor shall furnish to the company a sum of Rs.----- (Rupees-----) towards security deposit for due and faithful performance of the contract in the form and manner specified therein.

AND WHEREAS the contractor has approached the Guarantor and in consideration of the arrangement arrived at between the contractor and the Guarantor, the Guarantor has agreed to give the Guarantee as hereinafter mentioned in favour of the company.

The Guarantor do hereby guarantee to the company the due and faithful performance, observance or discharge of the Contract by the contractor and further unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand, to the extent of Rs.----- (Rupees-----) against any claim by the company on them for any loss, damage, costs, charges and expenses caused to or suffered by the company by reasons of the contractor making any default in the performance, observance or discharge of the terms, conditions, stipulations or undertakings or any of them as contained in the contract.

The decision of the company whether any default has occurred or has been committed by the contractor in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them as contained in the contract and / or as to the extent of loss, damage, costs, charges and expenses caused to or suffered by the company by reason of the contractor making any default in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them shall be conclusive and binding on the Guarantor irrespective of the fact whether the contractor admits or denies the default or questions the correctness of any demand made by the company in any Court, Tribunal or Arbitration proceedings or before any other Authority.

The company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the contract or extend time of performance by the contractor or to postpone for any time and from time to time any of the powers exercisable by it against the contractor and either enforce or forebear from enforcing any of the terms and conditions governing the contract or securities available to the company and the Guarantor shall not be released from its liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reasons of time being given to the contractor or any other forbearance, act or commission on the part of the company or any indulgence by the company to the contractor or any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing the Guarantor from its liability under this guarantee.

The Guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the contract and its claim satisfied or discharged and till the company certifies that the terms and conditions of the contract have been fully and properly carried out by the contractor and accordingly discharges this Guarantee, subject however, that the company shall have no claim under this Guarantee after ----- i.e. (3 months more than the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time, as the case may be) unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor notwithstanding the fact that the same is enforced after the expiry of the said period.

**BANK GUARANTEE FOR SECURITY DEPOSIT CUM PERFORMANCE BANK GUARANTEE
BOND**

The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agrees that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the contractor or the Guarantor shall not discharge the Guarantor's liability hereunder.

It shall not be necessary for the company to proceed against the contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealized.

Notwithstanding anything contained herein before, our liability under the Guarantee is restricted to Rs.-----
- (Rupees-----). Our guarantee shall remain in force until -----, i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time) unless a claim or demand under this guarantee is made against us on or before ----- (3 Months more than the validity date) we shall be discharged from our liabilities under this Guarantee thereafter.

Any claim or dispute arising under the terms of this documents shall only be enforced or settled in the courts of at < **Name of place²** > only.

The Guarantor hereby declares that it has power to execute this guarantee and the executant has full powers to do so on behalf of the Guarantor.

IN WITNESS whereof the ----- (Bank) has hereunto set and subscribed its hand the day, month and year first, above written.

(Name of the Bank)

Signed for and on behalf of the Bank
(Designation of the Authorized Person Signing the Guarantee)

(Signatory No.-----)

DATED:

SEAL

Notes :

1. **Address of Power Sector Regions (inviting the Tender)** is as below:
 - PSNR : Bharat Heavy Electricals Limited, Power Sector Northern Region, HRDI & PSNR Complex, Plot No 25, Sector 16-A, Noida – 201 301 (Uttar Pradesh)
 - PSER : Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700 091
 - PSWR: Bharat Heavy Electricals Limited, Power Sector Western Region, Shree Mohini Complex, 345 Kingsway, Nagpur 440 001
 - PSSR: Bharat Heavy Electricals Limited, Power Sector Southern Region, 690, Anna Salai, Nandanam, Chennai 600 035
2. **Name of place (for jurisdiction of Courts)** is as below:
 - PSNR : Delhi
 - PSER : Kolkata
 - PSWR: Nagpur
 - PSSR : Chennai
3. The BG shall be executed on non-judicial stamp papers of adequate value procured in the name of the Bank in the State where the Bank is located.
4. The BG is required to be sent by the executing Bank directly to BHEL at the address where tender is submitted / accepted under sealed cover.

BANK GUARANTEE FOR RELEASE OF AMOUNTS WITHHELD/LIQUIDATED DAMAGES AMOUNT

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited ¹(hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) incorporated under the having its registered office at _____ ¹(hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated ²valued at Rs.....(Rupees -----) for <Nature of Work>³(hereinafter called the 'Contract')

The Contractor as per Contract should have completed the work/ supplies under the contract by.....(date). As per terms and conditions of the Contract, the Employer is entitled to levy Liquidated Damages (LD) for delays and the Employer has withheld an amount of Rs by way of LD as per the Contract. Now, on the request of the Contractor, the Employer having agreed to release the amount of Rs.....withheld from the Contractor's invoices as Liquidated damages under the terms and conditions of the Contract on production of a Bank Guarantee for Rs. _____ (Rupees.....only) ⁴

We, ..., (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount of Rs ----- (Rupees -----) without any demur, merely on a demand from the Employer

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's/ Supplier's liabilities.

This Guarantee shall remain in force upto and including.....⁵ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ⁶ (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, ... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to ⁸
- c) Unless the Bank is served a written claim or demand on or before ⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, ... Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ *DATE OF EXPIRY OF CLAIM PERIOD*

⁷ *BG AMOUNT IN FIGURES AND WORDS.*

⁸ *VALIDITY DATE*

⁹ *DATE OF EXPIRY OF CLAIM PERIOD*

Note:

- 1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.**
- 2. In Case of Bank Guarantees submitted by Foreign Vendors-**
 - a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
 - b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2** In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4** The BG should clearly specify that the demand or other document can be presented in electronic form.

BANK GUARANTEE FOR SUPPLY FREE ISSUE MATERIAL.

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier).having its registered office at _____¹ (hereinafter referred to as the 'Contractor/Supplier/Fabricator' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref. No.....dated ² valued at Rs.....(Rupees -----) for <Nature of Work>³ (hereinafter called the 'Contract')

and, the Employer having agreed as per the terms and conditions of the Contract to supply free issue material costing Rs._____ for the manufacture/fabrication of the equipment at the Contractor's site on on furnishing a Bank Guarantee for Rs._____ (Rupees.....)⁴ in the manner hereinafter specified for the due safeguard of the free issue material,

we, ..., (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount of Rs ----- (Rupees -----) without any demur, merely on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Contractors/Supplier shall have no claim against us for making such payment.

We the Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor/Supplier/ Fabricator and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's/Supplier's/ Fabricator's liabilities.

This Guarantee shall remain in force upto and including.....⁵ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/ Supplier/ Fabricator but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ⁶ (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, ... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to ⁸
- c) Unless the Bank is served a written claim or demand on or before ⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ DATE OF EXPIRY OF CLAIM PERIOD

⁷ BG AMOUNT IN FIGURES AND WORDS.

⁸ VALIDITY DATE

⁹ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.
2. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
 - b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2 **In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank** (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY
(On non-Judicial paper of appropriate value)

Bank Guarantee No.....

Date.....

To

(Employer's Name and Address)

.....

Dear Sirs,

In accordance with the terms and conditions of your Invitation for Bids/Notice Inviting Tender No.....¹(Tender Conditions) M/s. having its registered office at ² (hereinafter referred to as the '**Tenderer**'), is submitting its bid for the work of..... for.....³. at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091.⁴(name of the Employer)

The Tender Conditions provide that the **Tenderer** shall pay a sum of Rs as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of ⁵ is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,,

we, the[Name & address of the Bank] having our Head Office at(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. ⁵(*).....without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand. Any such demand made by the 'Employer' shall be

conclusive and binding on us irrespective of any dispute or difference raised by the Tenderer.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of bids from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including.....⁶ and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ⁷ we shall be discharged from all liabilities under this Guarantee.

We, ... Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....5.....
- b) This Guarantee shall be valid up to 6
- c) Unless the Bank is served a written claim or demand on or before _____⁷ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date.....

Place of Issue.....

¹ *Details of the Invitation to Bid/Notice Inviting Tender*

² *Name and Address of the Tenderer*

³ *Details of the Work*

⁴ *Name and Address of BHEL Unit/Division/Region (Already filled up)*

⁵ *BG Amount in words and Figures*

⁶ *Validity Date*

⁷ *Date of Expiry of Claim Period*

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date. As per Works Policy, the Bank Guarantee shall be valid for at least six months.

2. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
- b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

 - b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter-Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2** **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
 - b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
 - b.4** The BG should clearly specify that the demand or other document can be presented in electronic form.

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VOLUME -IF

TECHNICAL CONDITIONS OF CONTRACT
(TCC)

FOR

Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)

POWER SECTOR – EASTERN REGION

PLOT NO. – 9 / 1, DJ – BLOCK,

SECTOR – II, KARUNAMOYEE,

SALT LAKE CITY,

KOLKATA – 700091.

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This section of Technical Conditions of Contract (TCC) is applicable for service part of contract. The conditions mentioned inscribed hereunder shall be read along with other volumes of tender, i.e. general conditions of contract (GCC, Volume-IB), Volume-III etc and in case of any conflict or inconsistency, the provision of the TCC, "Volume- IF" shall prevail.

All the tender clauses are individually applicable for respective package unless specifically mentioned separately/differently, as applicable.

CLAUSE NO	DESCRIPTION
1.0	PROJECT SYNOPSIS AND GENERAL INFORMATION Name of the Owner : NTPC Capacity : 3 x 660 MW Nearest Railway Station : Khalaria Railway Station on Ranchi Garhwa section of Eastern Railways (40 km from Project site) Nearest Town : Tandwa in Chatra District Nearest commercial airport : Ranchi (150 km from Project site) The site is located near Tandwa town having latitude and longitude of about 23° 50' N to 23° 52' N and 84°59' E to 85° 2' E respectively. It is essential that the bidder visit site and acquaint with the conditions prevailing at site before submission of the bid. The information given hereunder is for general guidance and shall not be contractually binding on BHEL.
2.0	SITE VISIT The bidder must visit the actual site of North Karanpura STPP, Jharkhand, to acquire full knowledge and information about the conditions prevailing at site as well as, in and around the project site, together with the statutory, obligatory, mandatory requirements of various authorities before submission of the bid.
3.0	SCOPE OF WORK
3.1.1	Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.
3.1.2	Scope of Civil Works of FGD , LSS & GSS system shall include but not limited to the following: • Absorber Tower Foundation along with Elevator Foundation and Truck Hopper, • FGD Control Room Building, MCC Building • Ball Mill Building & Lime Stone Building , Transfer Point (TP's), Conveyor Foundations & Tunnels • Gypsum Dewatering Building , Crusher House (CR) , Gypsum Storage Shed • RC Pump & Oxidation Blower Foundation , Pent House • Misc. Tank Foundation , Transformer Foundations including fencing , Paving • Misc. Pump & Equipment Foundations • Duct Foundation • Pipe & Cable Trestles , Air & Water pipe line pedestal • Limestone Storage Silo • Wet Ball Mill Foundation • Booster Fan Foundation • SO₂ Analyser Room • CW Treatment Building • ECW Pump House • Road - Drains / Paving & Misc. Sumps , Parking area etc. • Plinth Protection, Paving & Underground Works, Laying of Underground Earthing Rod, Sewage Network, Storm Water Drainage System, Plumbing and Sanitary Works, Misc. Structures, etc.
3.2	Mix design (M 15, M 20, M 25, M 30, M 35) for all concreting shall be carried out from customer approved listed institute specially for North Karanpura STPP Project , contractor has to ensure adding of approved brand product of admixture and minimizing of cement content in line with IS 456 as advised by BHEL time to time without any additional cost. Some of the design mixes are available at site. Vendor may adopt the existing design mixes if approved by customer or mix design may be carried out from listed approved laboratory for North

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	Karanpura STPP Project.
3.3	Contractor shall provide temporary barricade all round the working area to avoid any untoward incident.
3.4	The work to be performed under this specification consists of providing all labour, materials, consumables, equipment, temporary works, temporary storage sheds for contractors own use, temporary colony for labour and staff, temporary site offices, constructional plant's transportation / handling and all incidental items not shown or specified but reasonably implied or necessary for the completion of subject scope, all in strict accordance with the specifications including revisions and amendments thereto as may be required during the execution of work.
3.5	The scope shall also include setting up by the bidder a testing laboratory (one AC lab size 4.5mtr x 6mtr and 1 non AC lab 4.5 mtr x 4.5 mtr.) in the field to carry out all relevant tests. Detail of laboratory equipments as per Annexure-A is to be arranged by the contractor within quoted rate. For conducting day to day test, One Qualified quality Manager and One engineer to be deployed as necessary.
3.6	All quality standards, tolerances, welding standards & other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.
3.7	All works under this specification, unless specified otherwise, shall conform to the latest revision and / or replacement of the following or any other Indian Standard Specifications and Codes of Practice. In case any particular aspect of work is not covered specifically by Indian Standard Specification, any other standard practice as may be specified by the Engineer shall be followed.
3.8	The Contractor is to carry out the work as per the drawings issued to him and / or Contractor's drawings which are approved by the Engineer and / or the Engineer's instructions. Drawing showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner as far as possible.
3.9	The contractor shall comply with all state and central laws, various labour laws, statutory rules and regulations, etc.
3.10	The payment of wages act, minimum wages act, workman compensation act, Employers Liability act, Industrial Dispute Act, Employees Provident Fund Scheme, Employees State Insurance, Contract Labour (Regulation and abolition) Act and other acts, rules & regulation for labour as may be enacted by the Government during the tenure of the contract and having force or jurisdiction at site. The contractor shall give to the local government body police and other relevant authorities all such notices as may be required by law.
3.11	The contractor shall comply with all the rules and regulations of the local authorities, all statutory laws including minimum wages, workmen compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by the contractor shall be to his account.
3.12	Contractor's engineer & supervisors shall be adequately qualified and also inclined to do a quality job.
3.13	BHEL will not provide any T&P / instruments / consumables to the party. The work under the scope of the contractor will be deemed to be completed, in all respects, only when so certified by BHEL.
3.14	SPLITTING BHEL reserves the right to split the work and award any part of the work to any agency without assigning any reasons whatsoever.
4.0	DEVIATIONS / CLARIFICATIONS
4.1	The bidder is required to submit with his offer in the relevant schedule / format without any ambiguity. Any assumptions, presumptions, deviations etc. indicated or implied anywhere by the bidder except those indicated in the deviation schedule / format will not be recognized and will not form a part of consideration / offer. In the absence of such filled-up schedule / format it will be understood and agreed that the bidder's offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any / all deviations submitted after opening of the bid.
4.2	Bidders will have to submit "no deviation certificate" as per enclosed format. bidders may please note that, in case of any deviation taken by the bidder from the tender terms, bids are likely to be rejected. Bidders are also required to fill all annexures of tender.
5.0	DEWATERING Contractor shall ensure at all times that his work area & approach / access roads are free from accumulation of water, so that the materials are safe and the erection / progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.
6.0	LAND

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6.1	The contractor has to plan and use the existing land inside the Project Premise considering the use of land by other Civil / Mechanical / Electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erections agencies. Land will be allocated with certain time frame and to the extent available / considered necessary, and will be reviewed by BHEL depending upon the area availability.
6.2	Land for labour colony near Project Premise may be provided free of cost if the same is available from owner / customer. The contractor shall construct labour colony / hutment as per his requirements after obtaining approval of formalities from statutory body. Further, contractor must ensure minimum HSE norms and hygienic sanitary conditions in his labour colony. On shortage of land availability from customer vendor should arrange the accommodation of Labour in his own cost. Approach of Labour colony to be maintained by vendor at all season throughout the year.
6.3	The Contractor shall have total responsibility for all equipment and materials in his custody stores, loose, semi-assembled and / or erected by him at Site. The Contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Contractor shall enter and leave the Employer Site only with the written permission of the Employer in the prescribed manner.
6.4	The contractor will be responsible for handing back all lands, as handed over to him by BHEL / NTPC.
6.5	Area within project premises for batching plant, office, storage area etc. for construction purpose shall be provided as per availability free of cost as per approval of customer. On the shortage of land inside project area vendor will arrange the land / stores / pre-cast factory in his own cost.
7.0	WATER
7.1	BHEL will not provide construction water at given work premises. Contractor will arrange water by installing boring / purchase from out side of project area at his own cost..
7.2	Further necessary drinking water system shall be done by the bidder at his own cost.
7.3	Contractor should arrange on their own, drinking water in their labour colony.
7.4	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water for which no separate payment shall be made by BHEL.
7.5	Contractor will have to arrange for storage of water to meet the day-to-day requirement. Bidder will ensure adequate supply of construction water to meet the requirement of water during major concreting.
7.6	The availability of water (construction as well as drinking) in North Karanpura project may be limited. Contractor shall ensure that no water wastage. In this regard the contractor shall take all necessary measure towards preservation waste of water.
8.0	ELECTRICITY
8.1	CONSTRUCTION POWER & GENERAL ILLUMINATION NETWORK: BHEL Shall Provide Construction Power free of charge at 415V level at two points (within 500 M from his work place), bidder has to make his own distribution arrangement to draw electricity. GENERAL: If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Contractor will have to provide at his own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized / accredited agency for working out the power consumption. In case of recalibration required for any reason the necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.
8.2	The bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives / T&Ps are deployed.
8.3	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply / variation in voltage level and no compensation for delay in work can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
8.4	Bidder will have to arrange sufficient illumination at their own work areas.
8.5	The contractor should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the

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	responsibility of the contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
8.6	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of workmen.
8.7	The contractor shall have to make arrangement at their own cost for illumination etc in labor colony. However there may be provision of Chargeable Power for labor colony for which contractor has to install meters and necessary accessories.
9.0	CONSUMABLE
9.1	All consumables, like gas, electrodes, chemicals, lubricants etc. required for the scope of work, shall be arranged by the contractor at his cost from approved brand / make unless otherwise specifically mentioned in the contract. All consumables to be used for the job shall have to be approved by NTPC / BHEL prior to use.
9.2	In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.
10.0	TEST CERTIFICATES
	Necessary test certificates of all materials supplied by contractor are to be produced to BHEL prior to use of those materials.
11.0	IMTE
	The contractor shall ensure deployment of reliable and calibrated instrument, measuring, and test Equipment (IMTE). The IMTE shall have test calibration certificate from authorized / Govt approved agencies. The contractor shall also keep provision of alternate engagement for such IMTE so that the work does not suffer when a particular IMTE is sent for calibration. Re-testing / re-calibration shall also be arranged by the contractor at their own cost at regular interval during the period of use as advised by BHEL.
12.0	QUALITY CONTROL & QUALITY ASSURANCE
12.1	Contractor's Manager, Engineers and supervisors shall be adequately qualified and also inclined to do a quality job. The quality assurance Engineer shall co-ordinate all aspects of quality control, inspection, implementation of quality assurance procedures laid down in Quality Plan and technical specification by BHEL. He shall fill up quality assurance log sheets / formats and submit to BHEL for joint inspection and acceptance. The contractor shall fill up, maintain & preserve the quality records in computerized media. NTPC / BHEL's authorized representative shall be given free access at all time to such quality related records etc. for inspection, review etc.
12.2	QUALITY ASSURANCE PROGRAMME / OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT
12.2.1	BHEL, Power Sector (ER) is ISO 9002 certified company. Quality of work to customer's satisfaction and system requirements are the essence of ISO 9002 certification. BHEL, PSER has also obtained HSE certification (ISO 14001 & OHSAS 18001). Contractor will organize / plan / perform, all their activities to meet with these standards.
12.2.2	The contractor shall adopt suitable quality assurance program to control activities as necessary. Such program shall be outlined by the contractor and shall be finally accepted by the BHEL/Owner. A quality assurance program of the contractor shall generally cover the following.
12.2.2.1	His organization structure & qualification data of key personnel for the management and implementation of the proposed quality assurance program.
12.2.2.2	System for site erection control including process controls and fabrication and assembly controls.
12.2.2.3	Control of non-conforming items and system for corrective actions.
12.2.2.4	Inspection and test procedure for all site related works.
12.2.2.5	Calibration and testing of measuring and testing equipment (IMTEs) at appropriate intervals.
12.2.2.6	System for quality audit.
12.2.2.7	System for indication and appraisal of inspection status.
12.2.2.8	System for maintenance of records.
12.2.3	Contractor will comply with HSE (Health, Safety & Environment) requirements of BHEL. All applicable OCPs (Operational Control Procedures) will be followed by contractor as per BHEL instructions. This will be done as part of normal scope of work. Applicable OCPs will be made available to the contractor during work execution at site. Contractor will follow these, within quoted rates. Suitable measures will be taken by contractor for waste management and environment related laws / legislation as a part of normal construction activities.
12.2.4	The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the Site. Enough number of Contractor's personnel shall be trained in administering

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	first aid.
12.2.5	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, keeping good relation with local populace etc.
13.0	WORK & SAFETY REGULATIONS
13.1	REFER DOCUMENT NUMBER : HSEP: 14-ER Rev:00, Date : 25.04.19
	DOCUMENT TITLE: Health, Safety and Environment Plan for Site Operations by Subcontractors
14.0	PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT
	To meet the need of construction management at site, contractor shall provide the following services within quoted/ accepted rates.
14.1	PLANNING & MONITORING
14.1.1	The bidder shall prepare detail construction schedule (L-3) as per completion dates given in this document. This schedule must include all milestone and key activities for each sub-system / components in the areas of engineering (wherever applicable), procurement, manufacture (wherever applicable), excavation/ construction/ erection. This network must conform to the overall project schedule. The bidder should also ensure monitoring of these activities at least weekly basis to start with and on daily basis whenever required by BHEL.
14.1.2	The bidder shall also prepare progress report indicating progress on key activities, management summary for critical activities, list of actions requiring attention of BHEL. This schedule is to be preferably made in PRIMAVERA / MS PROJECTS, so that the same is compatible with BHEL's project management software.
14.1.3	The bidder will have to supply & install of 2 Nos. PCs (multimedia PC work station Pentium- Core-i5 / i7, 3.2 GHZ or above, 1000 GB HDD, 8 GB RAM, 100 /1000 MBPS LAN card) of HP / HCL / COMPAQ/ ZENITH or equivalent make with window 10 or higher, 64 bit O/S and required software like MS Office 2010 or higher, AutoCAD 2014 or higher, PageMaker, ADOBE PDF CREATOR with 1 Nos. laser jet printer cum scanner compatible for A3 size printing (ink/ cartridge for which to be supplied as and when required), 1 nos. laser jet Colour printer compatible for A4 size Colour printing (ink / cartridge for which to be supplied as and when required), 1 no. Scanner compatible for A4 size (HP Scanjet Enterprise Flow 7500 or equivalent). All computer with power backup at places, as per instruction of BHEL for exclusive use of BHEL. These computers / printers shall remain contractor's property and they will be allowed to take out the same after closing of contract or during demobilization of T&P which is later. The contractor shall provide data / information etc. in prescribed formats for periodical updating of the progress reports, material management reports, updating of network pertaining to the contractor's scope of work etc. The contractor shall also provide 2 (two) nos computer operators and 3 (three) numbers service staff for miscellaneous service for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation etc. These facilities are to be provided within 30 days from LOI date till closing of contract or demobilization of T & P which is later. If contractor fails to provide computer / printer / personnel as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to deduct the amount as per following rates on prorate basis, from contractor's RA bill or any other dues.
14.1.3.1	@ Rs 25,000/- (Fifteen thousand)/ month for each computer operator or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
14.1.3.2	@ Rs 15,000/- (Twelve thousand) / month for each service staff or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
14.1.3.3	@ Rs 15,000/- (Fifteen thousand)/ month for each set of computer & printer or at actuals (rate +30%) if BHEL arranges this facility, whichever is lower.
14.1.4	The contractor's site office must have facilities of communications like Fax, E-mail, and telephone with STD facility within a month from LOI.
14.2	PROGRESS REPORTING
14.2.1	The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (gases/electrodes) report and other reports as per pro-forma considered necessary by BHEL. In case of any failure on contractor's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.
14.2.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the contractor intends to take to make good the slippage or

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	lost time, so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.	
14.2.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.	
14.2.4	Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, the contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.	
14.2.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Calcutta/site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.	
14.2.6	During construction contractor shall take an average forty colour digital photograph / slides each month (not less than nine per week) of the works during progress. In case of failure in providing such photograph in each month, an amount of Rs. 20,000/- per month shall be deducted from contractor's RA bill.	
14.2.7	Successful bidder has to provide for electronic/ computerized storing and re-production/ printing/ plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.	
14.3	SITE ORGANIZATION	
14.3.1	The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by a competent construction manager for site operations with sufficient level of authority to take site decisions. The vendor will submit organization chart (showing the name of SITE-IN-CHARGE) with individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.	
14.3.2	Following (minimum) engineering manpower with power plant construction background to be deployed at site by the successful vendor for their day to day supervision etc.	
14.3.2.1	Qualified safety officers with assistants (exclusive for safety supervision for project jobs).	Officer – One Assistant- One(Civil)
14.3.2.2	Engineer & Supervisors for quality inspection.	One Engineer Two supervisors (Civil) for field assistance
14.3.2.3	Site supervising engineer and supervisors for civil works in all area.	One Manager , One Sr. Engineers , Two Engineer (Qualified) Three supervisors
14.3.2.4	Quality Engineer /Manager	One Manager (Quality) , One Engineer (QA) for Civil Laboratory & One QA Supervisor for Laboratory assistance.
14.3.2.5	Planning Engineer (exclusively for planning)	One Engineer
14.3.3	Deputation of above man-power shall be jointly decided at site in line with construction schedule.	
14.3.4	Engineer / supervisor for other functions like store & purchase, material management, fin, admn etc are to be provided as per site requirement and not considered above.	
14.3.5	In the event of non deputation of engineer / supervisor by the bidder as per above agreed schedule, BHEL shall reserve the right to deduct Rs 60,000.00 per man-month for engineer, Rs 35,000.00 per man-month for the supervisor / safety officer and Rs. 40,000 per man-month for safety supervisor from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement without any financial implication.	
14.3.6	BHEL reserves the right to reject or approve the list of personnel proposed by the contractor. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made.	
14.3.7	In addition to above, a well experienced qualified engineer to be designated, as 'Project Co-coordinator', shall be deployed by the contractor. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc to contractor's own team during the complete execution period of contract.	
14.3.8	The contractor should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without written permission of BHEL.	

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14.3.9	The contractor should also submit network programs for the erection of various items. These networks shall show the NTPC / BHEL hold points, which have to be cleared by NTPC / BHEL, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of the contractor and NTPC/ BHEL. It is the responsibility of the contractor to get the Networks approved by BHEL within four weeks of the date of finalization of award of work / placement of LOI.
14.4	CONSTRUCTION MANAGEMENT
14.4.1	Based on the approved program, the contractor shall submit a program of construction / erection / commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three monthly rolling program with the first month's program being tentative based on the site condition would be prepared based on these programs. The contractor shall also be involved along with NTPC / BHEL to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
14.4.2	The program would be jointly finalized by the site in-charge of the contractor with BHEL / NTPC's project coordinator as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.
14.4.3	The contractor is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
15.0	TEST CERTIFICATE FOR T&P
	All T&P, lifting tackles and pulling devices to be deployed by the contractor must bear valid / latest test certificates for their suitability, and the documents shall be preserved at site.
16.0	T&P TO BE PROVIDED BY BHEL
16.1	No T & P is envisaged to be issued by BHEL for this package
17.0	MATERIAL HANDLING (BHEL ISSUED MATERIAL)
17.1	Cement, reinforcement (TMT bar) earthing MS rod, structural steel (MS plate / ISMB / channel / angle / chequered plate / stainless steel plate / liner in case of site fabrication) only will be issued free of cost by BHEL for use in the work covered in this contract. All other materials required for proper completion of job shall be provided by contractor and quoted rates shall be inclusive of this.
17.2	Consignment of cement & steel will be directly issued to the contractor as received by BHEL, on weight basis from its supplier, as per delivery challan of supplier.
17.3	Handling of steel and cement of total project including its unloading will be in vendor's scope for which no separate payment will be given by BHEL.
17.4	It would be the responsibility of the contractor to keep in constant contact with BHEL / site to find out the delivery status, arrival of the consignments and arrange for escort to accompany the truck/ trailer for transportation of above materials by BHEL'S supplier, as necessary. The lorry, truck way bill for the consignment as shall be received by BHEL would be handed over to the contractor immediately for unloading of materials including all arrangement for necessary gate passes etc. All arrangement for necessary gate passes etc shall be the responsibility of contractor.
17.5	Payment of all demurrages that may result due to contractor's fault / delay would be the responsibility of the contractor. If BHEL have to make payment of demurrage together with freight, the amount so paid as demurrages for the reasons stated above, shall be recovered from the bills of the contractor. The decision of BHEL's engineer in this regard will be final and binding on the contractor. However the contractor has to clear all such charges, if any in this regard and complete the job without waiting for BHEL's decision.
17.6	It would be the responsibility of the contractor to sign on the delivery book acknowledgement slip of supplier / transport authorities etc.
17.7	Consignments coming on Sundays and holidays are also required to be handled/ unloaded by the contractor. Since the offices and stores will probably remain closed on such days, it will be the responsibility of the contractor to contact BHEL engineers at their residence and obtain instructions.
17.8	Since the consignments are expected to arrive during any time of the day or night, contractor shall have, his workmen round the clock at site as well as other places as required to unload the materials immediately on arrival.
17.9	Unloading of materials at the storage yard or at places designated by BHEL, stacking & restacking, shifting & reshifting, using contractor's own cranes, trailers and other equipments with the valid road permit for their operation, unloading and stacking etc shall be responsibility of the contractor under this contract. All materials/equipments 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 sleepers required for stacking the materials shall be arranged by contractor (successful bidder of this package). All other material handling equipments like winches, d-shackles, slings of various sizes, max puller, pulley blocks,

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	jacks, trucks, trailers etc required for such material handling of steel, cements etc shall be arranged by contractor within quoted / accepted rates.
17.10	It will be the responsibility of the contractor to submit computerized account of all such consignments of materials received by them, daily to BHEL.
17.11	BHEL reserve the right to recover from the contractor any loss arising out of damage/ theft or any other causes of the materials issued to him at any point.
17.12	Open land (very limited space) for storage shall be provided by BHEL on free of cost basis. You shall maintain one centralized fenced store cum bar bending yard. Hard surfacing of this yard and all round drain shall be carried out by you at your own cost within the accepted rate. Batching plant area shall be provided within plant premises on availability and you shall make use of the area for installation and operation of the Batching Plant at your own cost. You shall make complete arrangement of necessary security personnel, to safeguard all such materials in your custody. Materials issued will be used only for construction of permanent work. You shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. Barbed wire fencing of the steel storage yard, batching plant area, reinforcement bending yard area etc. are to be done by the contractor at his own cost. Contractor shall also remove grass, bushes, trees etc. wherever required off the land provided to him and shall make proper continuous up-keepment 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.
17.13	The contractor shall construct waterproof cement store (capacity minimum 700 MT) for storing and stacking of cement, CGI / asbestos roofing (slope) with brick masonry wall, PCC flooring. Materials required for the same shall be provided by contractor at his own cost. Cement has to be kept over wooden raised platform. Stacking of cement is to be done as per IS codes with proper illumination and locking arrangements.
17.14	The contractor shall in no case be entitled for any compensation or damages on account of any delay in supply or non-supply thereof for all or any such material.
17.15	Clotting of cement and excessive rusting of steel must be avoided. In case, due to any cause attributable to the contractor, such clotting of and / or rusting of steel occur rendering the same unusable, then such quantity of cement / steel shall be recovered from the interim payment at the penal rate specified in the tender.
17.16	No material shall be issued to the contractor except as those indicated above, i.e. cement and steel unless otherwise expressly provided for in the contract. Contractor will have to make his own arrangement at his own cost for procurement of any other material as required for the works and of such quality as acceptable to BHEL.
17.17	The contractor shall maintain proper store account for all the BHEL issued materials and shall give three copies of monthly computerised reconciliation statement of such account to the BHEL.
17.18	Contractor shall carry out in complete association with BHEL, 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 computerised system utilizing suitable software. Contractor shall provide experienced software personnel to associate on dedicated basis for efficient discharge of the same.
17.19	The contractor shall solely be responsible for the safety & quality of material after it is handed over and issued to contractor by BHEL.
17.20	BHEL issued materials shall not under any circumstances be taken out of the project site unless otherwise permitted by BHEL.
17.21	All the necessary lifting tackles, cranes, hydra, tools & plants including tractors, trailers, trucks, pulley blocks, jacks, winches, wire ropes etc, of suitable capacities and other equipments incidental to carry out this work shall have to be arranged by the contractor at his cost. BHEL engineer reserves the right to inspect lifting tackles and equipment before allowing their use. Such approval however shall not relieve the responsibility of the contractor to ensure safe handling of equipment taking the precautions to avoid any accident and damage to other equipment and personnel.
17.22	No separate rate will be applicable for the above job. The contractor will quote the rate for the items inclusive of all charges for the above job.
17.23	Bidder's scope of handling of steel under the scope of this tender includes stacking/ storing of materials over concrete sleepers. Bidder scope shall include provision of concrete sleepers for this purpose and no separate payment against the same will be made by BHEL. After completion of the job bidder shall take

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	back the sleepers. Bidder's quoted rate/ price shall be in consideration to this.
18.0	ISSUE OF MATERIALS
18.1	ISSUE OF CEMENT
18.1.1	Cement as received from the manufacturer/ stockiest will be issued free of cost to the contractor. The theoretical weight of each bag of cement for issued purposes will be considered as 50 kg, the contractor shall be accountable for the cement issued to him on this notional weight only. No claim whatsoever will be entertained because of difference between theoretical and actual weight of the bags of cement.
18.1.2	The empty cement bags duly accounted for against issue shall be the property of the bidder and the same shall be disposed by the bidder as per statutory regulation prevailing in the project.
18.2	ISSUE OF STEEL
18.2.1	The steel shall be issued to the contractor free of cost on the following basis.
18.2.1.1	If required for Civil Work , Structural steel (MS plate, angle, channel, ISMB, Stainless steel plate / Liner, chequered plate in case of site fabrication) – Weighment basis (unit – MT) .
18.2.1.2	Reinforcement steel (TMT) and earthing rod (MS round) – Weighment basis (unit – MT).
18.2.2	All the steel (structural steel, reinforcement, earthing MS rod) 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. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the following IS specifications. IS: 808-1989 - Beams, channels and angles IS: 1730-1961 - Plates Reinforcements - Fe-500 confirming to IS: 1786. or grade-1 of IS:432 (part-I)
18.2.3	In case any such sectional weights are not available in the above documents, the manufacturer recommendation shall be binding.
18.2.4	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.
18.2.5	In case MS flats as required in the fabrication of structures are not available, you shall cut such width out of the available MS plates to make flats at no extra cost till such material is available and procured by BHEL.
18.3	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 contractor from BHEL stores.
18.4	Quarterly requirement of steel and cement must be positively submitted by the contractor at the last month of the previous quarter, However, the contractor shall submit to the engineer, a statement indicating estimated quantity of cement and steel required at least two months in advance . In addition, the contractor shall also furnish the estimated requirement of cement and steel during a month by the third week of the previous month indicating his requirement.
18.5	Bidders to ensure that no lamination materials are taken over by them from BHEL. Fabrication wastage, if any due to above, shall not be compensated by BHEL.
18.6	Bidder to note that all fasteners like MS / HT / HSFG bolts / nuts, lock nuts, washers etc shall be supplied by the contractor as per applicable item of Price Schedule.
18.7	Bidder to note that cement and steel required for his enabling job like store/ site office etc shall be arranged at his own cost. All TG staging material shall be arranged by contractor at his own cost. Bidder shall do the design for its structure immediately after receipt of TG deck drawing and obtain approval from BHEL.
19.0	RETURN OF MATERIALS
19.1	RETURN OF CEMENT
19.1.1	Sealed cement bags remaining unused and in perfectly good condition at the time of completion or termination of the contract shall be returned promptly, (within 15 days from assessment) if BHEL / engineer is satisfied of the physical condition of the cement. Return of such cement to the project stores / place as identified within the project area by engineer / BHEL will not be entitled to handling and incidental charges. Surplus sealed and good conditioned cement bags will be taken back on weighment basis.
19.2	RETURN OF STEEL INCLUDING SCRAP
19.2.1	All surplus steel and all wastage materials will be taken back on weighment basis.
19.2.2	Surplus, unused and un-tampered steel shall be sorted section-wise and returned separately for a place directed by BHEL / engineer within the project area. Return of such materials will not be entitled to any

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	handling and incidental charges.		
19.2.3	All wastage / scrap (including wastage, unusable scrap) shall be returned to the stores on weighment basis and a receipt obtained for material accounting purposes. Return of such material will not be entitled to any additional cost due to handling and transportation and incidental charge.		
19.2.4	Scrap for reinforcement steel and structural steel shall be returned separately		
20.0	CEMENT AND STEEL CONSUMPTION AND WASTAGE		
20.1	CEMENT CONSUMPTION		
20.1.1	The theoretical consumption of cement shall be based on the following.		
20.1.1.1	For design mix concrete as per approved design mix.		
20.1.1.2	For nominal mix concrete work, as per minimum cement as specified or as approved by Engineer-in-charge.		
20.1.2	For item of works, where volume mix is permitted in writing by the BHEL, for masonry works, plaster other miscellaneous items, the cement consumption shall be governed by the "Statement of Cement Consumption" attached to Delhi schedule of Rates of CPWD-DSR- 2018 unless otherwise specified in the specifications or the drawing of contract or mutually agreed by Engineer-in-charge and contractor.		
20.1.3	Actual consumption = Issue – Surplus / unused quantity of cement returned in good condition by contractor to store. (No sweep cement will be taken back by BHEL).		
20.2	CEMENT WASTAGE		
20.2.1	Allowable wastage – One and half (+1.5%) of theoretical consumption of cement unless specified otherwise in the technical specification.		
20.2.2	For any material issued by BHEL to the contractor free of cost, and which is not accounted for by the contractor to BHEL, then recovery for such material shall be affected at penal rates.		
20.2.3	Sl no	Cement consumption	Basis of issue & penal recovery
	C-1	Theoretical consumption (without considering any wastage or loss).	Free
	C-2	Actual consumption being Limited to plus one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.	Free
	C-3	Actual consumption beyond one and half percent (+1.5%) of above (C-1).	Penal rate
20.3	REINFORCEMENT STEEL & EARTHING MS ROUND CONSUMPTION		
20.3.1	The theoretical consumption of various diameters of reinforcement and earthing MS round 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 deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.		
20.3.2	Actual consumption = Issue – Surplus.		
20.3.3	Surplus = Un-tampered and unused quantity of steel returned by the contractor to BHEL store along-with relevant documents. However, cutpieces of length greater than or equal to 6.0 m in good condition as per judgement of the engineer will also be treated as surplus steel.		
20.3.4	Wastage = Actual consumption – Theoretical consumption.		
20.4	REINFORCEMENT STEEL & EARTHING MS ROUND WASTAGE		
20.4.1	Allowable wastage – Three Percent (+3%) of the theoretical consumption shall be considered as allowable wastage.		
20.4.2	Wastage and scrap shall be as per actual weighment basis.		
20.4.3	Sl no	Reinforcement steel & earthing rod 40 mm ms round	Basis of issue & penal recovery
	R-1	Theoretical consumption (without considering wastage and scrap or loss)	Free
	R-2a	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R-1) towards allowable wastage and return to BHEL Store.	Free
	R-2b	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R-1) towards allowable wastage but not returned to BHEL Store.	Penal rate
	R-3	Wastage beyond three percent (+3%) of the theoretical consumption above (R-1).	Penal rate
20.5	STRUCTURAL STEEL CONSUMPTION		

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20.5.1	The theoretical consumption of various sections shall be based on approved drawings. Weights shall be calculated considering the sectional weights as per Indian standard as mentioned in relevant clause. No extra shall be payable to the contractor for any deviation in weights for the two different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.		
20.5.2	Actual consumption = Issue – Surplus.		
20.5.3	Surplus = Untempered, unused, uncut quantity of steel returned by the contractor to BHEL store.		
20.5.4	Wastage = Actual consumption – Theoretical consumption.		
20.6	STRUCTURAL STEEL WASTAGE		
20.6.1	Allowable wastage = 4 % (four percent) of the theoretical consumption shall be considered. Wastage is further classified as cut pieces and scrap measured as per actual weightment basis. Invisible wastage (loss of materials due to gas cutting, straightening of edges etc) shall be limited to 0.5 % (zero point five percent) of theoretical consumption and shall be considered for reconciliation purposes only. But this invisible wastage shall be considered to be included in allowable wastage (i.e. four percent). However, cutpieces of length greater than or equal to 6.0 m for Rolled Section in good condition and 2.25 sqm (min 1.5 m x1.5m size) for structural plate as per judgement of the engineer will also be treated as surplus steel.		
20.6.2	Sl no	Structural steel materials	Basis of issue & penal recovery
	S-1	Theoretical consumption (without considering any wastage, scrap or loss) as per specification & drg.	Free
	S-2a	Wastage limited to plus four percent (+4%) of the aforesaid theoretical consumption (S-1) towards allowable wastage and return to BHEL Store.	Free
	S-2b	Wastage limited to plus four percent (+4%) of the aforesaid theoretical consumption (S-1) towards allowable wastage but not returned to BHEL Store.	Penal rate
	S-3	Wastage beyond four percent (4%) of the aforesaid theoretical consumption (S-1).	Penal rate
20.7	All wastage reinforcement, MS round (for earthing), structural steel shall be returned to BHEL.		
21.0	RECONCILIATION OF BHEL ISSUED MATERIALS		
21.1	The contractor shall submit a reconciliation statement of cement and steel issued to him once in two months. The same may be submitted along with each RA bill.		
21.2	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 materials are available with contractor's custody at site.		
21.3	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.		
21.4	The approved drawings/ bar bending schedules are to be considered for the purpose of reconciliation of materials.		
22.0	RECOVERY OF MATERIAL		
22.1	If wastage exceeds the specified limit, the recovery of excess wastage shall be made from monthly RA bill at the penal rate stipulated below.		
22.2	PENAL RATE OF MATERIALS		
	Item	Penal rate (Rs)	
22.2.1	Cement (OPC/ PPC/ PSC).	9,000/- per MT.	
22.2.2	Reinforcement steel and earthing rod etc.	75,000/- per MT.	
22.2.3	Stainless steel plate / Liner	6,00,000/- per MT	
22.2.4	Structural steel materials	80,000/- per MT.	
23.0	CONSTRUCTION OF TEMPORARY OFFICE, STORES ETC		
23.1	The contractor shall arrange at his own cost cleaning of area allotted, construction of his temporary office, stores, cement godown etc. and also the watch and ward of all the above. Materials required for the same shall be provided by contractor at his own cost.		
24.0	TOOLS & PLANTS (TO BE PROVIDED BY CONTRACTOR)		
24.1	Tentative list of T&P to be deployed by contractor for successful completion of work is detailed below.		
24.2	It may be noted that the list is not exhaustive and is only for general guidance. The contractor is required to provide all necessary T&P (other than those specified to be provided by BHEL, if any) measuring (calibrated) instruments & handing equipments to maintain work progress for timely completion of total work as per contract. In case of project requirement, some activities may have to pre-pone. In such cases the contractor may have to deploy additional T&P. Quoted rate shall be inclusive of such emerging		

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	requirements. However, contractor shall submit deployment plan of all T&P along with tender bid.	
24.3	In the event of any failure on the part of the contractor to deploy T & P to sustain desired work progress, BHEL may at his discretion also terminate the contract on this ground and take out any or whole amount of the contract from the scope of the contractor. In the event of failure of contractor to deploy necessary and sufficient T&P/ IMTEs to maintain work progress, BHEL will be at liberty to arrange the same at the risk & cost of contractor including transportation cost of same from any of BHEL site/ other agency & charges as applicable shall be deducted from contractor's RA bill. Decision of BHEL in this regard will be final & binding on contractor.	
24.4	Following Major T&Ps to be arranged by contractor within the time as indicated For	
	Major T&P items	Broad Mobilizing time from date of start of work
24.4.1 A	2 No. hydraulic excavator / Poclain (one no. with rock breaker attachment)	1st – at the day start of work 2nd – As per site requirement within 30 days from start of work till 06 months.
24.4.1 B	1 No. JCB / Pay Loader with Normal & small size () bucket	at the day start of work
24.4.2	1 no. dozer.	Within 30 days.
24.4.3	8 nos. dumper	4 nos. at the day start of Work. Balance As per site requirement
24.4.4	1 no total station with adequate arrangement for Surveyors.	Within 25 days.
24.4.5	1 nos auto level & staff	Within 25 days.
24.4.6	2 nos. reinforcement bending machine	Within 30 days.
24.4.7	2 nos. reinforcement cutting machine	Within 30 days.
24.4.9	1 no. vibromax (earth compacter)	Within 45 days.
24.4.10	1 no. automatic concrete batching plant with printing facility Output 30 cum/ hr) – to be commissioned at site including material feeding equipment like JCB, Loader or Scraber.	To be commissioned Within 50 days from start of work including material feeding equipment .
24.4.11	4 nos. transit mixer (5 / 6 Cum capacity)	1st 2 no. within 40 days. Balance 2 nos. within 70 days.
24.4.12	1 nos. concrete pump (20 cum/ hr min capacity)	1st - Within 40 days
24.4.13	1 no. Truck mounted concrete mixer cum pump alongwith placing boom minimum 36 m	Within 120 days.
24.4.14	1 nos. hydra (10/ 12 T cap)	as per site requirement
24.4.15	3 nos. welding rectifier	As per site requirement.
24.4.16	1 no. trailer – suitable capacity	As per site requirement.
24.4.17	2 No. jack hammers / pavement breakers.	As per site requirement
24.4.18	Paint Thickness on concrete / plasterd surface measuring instrument	As per site requirement
24.4.19	1 no. Concrete cutting power tools (DD2E of HILTI/BOSCH make)	As per site requirement
24.4.20	1 no. Concrete core Cutting machine for drilling in concrete upto 300 mm dia alongwith diamond bits	As per site requirement.
24.4.21	2 nos. self priming dewatering pump 5 HP (diesel/ electric)	Within 30 days.
24.4.22	2 Nos. 10 HP submersible mono-block electric pump (KOS-1040+ of Kirloskar or equivalent),	Within 60 days.
24.4.23	1 nos. self priming dewatering pump 2 HP (diesel/ electric)	Within 30 days.
24.4.24	2 nos. curing pump – 1.5 / 2 HP (pump for curing at heights)	Within 30 days.
24.4.25	50 nos concrete cube moulds	Within 35 days.
24.4.26	Plate Compactor for earth compaction	Within 120 days.
24.4.27	Concrete Cutter for Road Pavement	As per site requirement.
24.4.28	1 No. Mechanical Paver with sensor for PQC	As per site requirement.
24.4.29	1 No. Mechanical Paver for DLC	As per site requirement.
24.4.30	Civil laboratory equipments as per list attached in ANNEX 'A' with temporary building one AC lab size 4.5mtrx6mtr and 1 non AC lab 4.5 mtrx4.5 mtr	Within 50 days.
24.4.31	2 nos. electric winch with building hoist	As per requirement
24.4.32	Two nos drinking water tank – 1000 lit. (PVC – SINTEX or approved equivalent)	Within 30 days.
24.4.33	1 nos truck mounted water tank (minimum 3000 lit) capacity	Within 30 days.

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	with sprinkler arrangement.	
24.4.34	1 No. 125KVA Electric Generator at batching plant and 1 No. 65 KVA Electric Generator site	125KVA EG within 30 days and 65 KVA within 90 Days
24.4.35	8 Nos. Concrete vibrator with adequate needle (2 Nos. diesel driven +6 Nos. electric driven)	2 Nos (at least 1no diesel driven) within 30 Days. Balance diesel / electric driven by 60 to 75 days
24.4.36	Portable fire extinguishers as below: Soda acid – 3 sets. Dry chemical powder – 3 sets CO2 – 2 sets. Water & sand bucket (4 buckets in one stand) – 2 sets. Fire hose with nozzle (50 M length) – 2 sets. Fire – Jacket ELCB Test kit – 1 No. Earth Resistance Test Kit – 1 set	Within 30 days
24.4.37	Air Compressor	As per requirement
24.5	T&P shown in the above mentioned list are tentative based on planned progress requirement. Actual Mobilisation schedule, based on front availability, drawings and material availability at site is to be reviewed and mutually agreed with BHEL site periodically from time to time for mobilisation of major T&Ps, and the same have to be adhered to. No change will be permitted without written approval of BHEL site. Further requirement will be reviewed time to time at site and contractor will provide additional T&P / equipments to ensure completion of entire work within schedule time without any financial implication to BHEL. All other T&Ps shall be provided by the contractor without any extra cost to BHEL. Vendor will give advance intimation & certification regarding capacity etc prior to dispatch of heavy equipments.	
24.6	All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition.	
24.7	In the event of non mobilisation of any T&P by the successful bidder and as a result progress of work suffered, BHEL reserves the right to deduct suitable amount from the dues of the bidder, with assigning reasons thereof at the following rates	
	Major T&P items	Recovery rates
24.7.1	2 No. hydraulic excavator / Poclain (one no. with rock breaker attachment)	Rs. 25000/- per week or part thereof
24.7.2	1 No. JCB / Pay Loader with Normal & small size () bucket	Rs. 15000/- per week or part thereof
24.7.3	1 no. dozer.	Rs. 15000/- per week or part thereof
24.7.4	8 nos. dumper	Rs. 10000/- per week or part thereof
24.7.5	1 no total station with adequate arrangement for Surveyors.	Rs. 1000/- per week or part thereof
24.7.6	1 no. auto level & staff	Rs. 1000/- per week or part thereof
24.7.7	2 nos. reinforcement bending machine	Rs. 2500/- per week or part thereof
24.7.8	2 nos. reinforcement cutting machine	Rs. 2500/- per week or part thereof
24.7.9	1 no. vibromax (earth compacter)	Rs. 15000/- per week or part thereof
24.7.10	1 no. automatic concrete batching plant with printing facility (Output 30 cum/ hr)	Rs. 50000/- per week or part thereof
24.7.11	4 nos. transit mixer (5 / 6 Cum capacity)	Rs. 10000/- per week or part thereof
24.7.12	1 nos. concrete pump (20 cum/ hr min capacity)	Rs. 20000/- per week or part thereof
24.7.13	1 no. Truck mounted concrete mixer cum pump alongwith placing boom minimum 36 m	Rs. 30000/- per week or part thereof
24.7.14	1 nos. hydra (10/ 12 T cap)	Rs. 25000/- per week or part thereof
24.7.15	Civil laboratory equipments as per list attached in ANNEX 'A' with temporary building one AC lab size 4.5mtrx6mtr and 1 non AC lab 4.5 mtrx4.5 mtr	Rs. 5000/- per week or part thereof
24.7.16	Any other instrument	As per discretion of the engineer
25.0	CIVIL LABORATORY	
	Contractor shall establish and maintain civil laboratory with necessary equipment (as per Annexure-A) for conducting relevant tests at site, as required. Also the Laboratory shall be well equipped as desired by customer as per BHEL-NTPC contract requirement.	

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26.0	CONSTRUCTION SCHEDULE	
26.1	The bidder shall strictly adhere to the time schedule furnished below and mobilise resources accordingly so as to complete the entire scope of the work under this contract within the stipulated time of 14 months for each unit from date of start of work of respective unit, as per intimation of BHEL (to be issued by Project Manager, BHEL or Construction Manager, BHEL).	
26.2	Intermediate Mile stone Schedule	
	Sl	Milestone
	26.2.1	Civil Works for Absorber
	26.2.2	Foundation for Misc tanks
	26.2.3	Foundation for Wet Limestone Ball Mill
	26.2.4	Ball mill Building/Limestone grinding house
	26.2.5	Roads,Drains and Pavings
	26.2.6	FGD Control Room Building
	26.2.7	Lime Stone Storage Silo
	26.2.8	All Civil Work
	Time	
		5 months
		9 months
		8 months
		10 months
		11 months
		9 months
		10 months
		14 months
	The above schedule is for Unit 1. Unit 2 & Unit 3 will have phase difference of 6 month respectively	
26.3	Contractor shall establish mix design for all concreting either by taking trial mix at site or from a reputed institution (As per BHEL's approval). Contractor shall ensure adding of admixture and minimizing of cement content in line with IS:456.	
26.4	The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL / NTPC engineer.	
26.5	Contractor shall submit daily work program based on above construction schedule. Defferement of above schedule is not acceptable. Contractor will adhere to schedule and resource planning to be augmented to ensure completion as per schedule.	
26.6	Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of contractor will be held once in a month at Kolkata/ site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.	
26.7	Above schedule is indicative. The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL/NTPC Engineer.	
26.8	Contractor shall submit daily work program based on above construction schedule.	
27.0	COMPLETION PERIOD	
27.1	The entire work under this scope shall be successfully completed in all respect within 26 (Twenty Six) months from the date of start of work as certified by Construction Manager, BHEL.	
27.2	Contractor shall mobilise resources to start the work within 15 days from date of intimation of BHEL.	
27.3	However, actual date of start of work shall be reckoned based on certification of Construction manager,	
28.0	CERTIFICATE TOWARDS COMPLETION	
	The work under the scope of the contractor shall be deemed to have been completed in all respects only when so certified by BHEL/ NTPC. The decision of BHEL in this regard shall be final and binding on the contractor.	
29.0	EXTENSION OF TIME FOR COMPLETION	
29.1	If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the contract.	
29.2	Based on the reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.	
29.3	However, if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/ LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.	
29.4	A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources to be deployed by the contractor as per specified format. Review of the programme and record of shortfall shall be done.	
29.5	During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed	

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	program.
29.6	At the end of total work completion as certified by BHEL engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.
30.0	MOBILIZATION ADVANCE/ INTEREST BEARING RECOVERABLE ADVANCE
	Not applicable for this tender.
31.0	SECURITY DEPOSIT & PERFORMANCE BOND
31.1	Security deposit shall be applicable as per relevant clause of GCC (Volume-IB).
31.2	Performance bond is not applicable for the tender.
32.0	REVISION ON ACCEPTED CONTRACT RATE
32.1	Not applicable in this tender.
33.0	LIQUIDATED DAMAGES/PENALTY
33.1	Intermediate Milestone & Overall completion of work for U#1
33.1.1	In case delay in achieving the Milestone as mentioned in Clause 26.2.1 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.
33.1.2	In case delay in achieving the Milestone as mentioned in Clause 26.2.6 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.
33.1.3	Amount already withheld, if any against slippage of clause 26.2.1 & 26.2.6 above, shall be released only if there is no delay attributable to contractor in achievement of Milestone as mentioned in clause 26.2.8 above.
33.1.4	If the completion of work is delayed beyond the completion period referred above due to reasons attributable to the contractor, they shall pay to BHEL as penalty a sum @ 0.5% of contract prices per week of delay or part thereof subject to a maximum of 3.5%(including the amount of LD withheld against delay of intermediate milestone at 26.2.1 & 26.2.6 as per clause no 33.1.1 & 33.1.2 respectively) delay of the total contract value.
33.1.5	Amount 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.
33.2	Intermediate Milestone & Overall completion of work for U#2
33.2.1	In case delay in achieving the Milestone as mentioned in Clause 26.2.1 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.
33.2.2	In case delay in achieving the Milestone as mentioned in Clause 26.2.6 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.
33.2.3	Amount already withheld, if any against slippage of clause 26.2.1 & 26.2.6 above, shall be released only if there is no delay attributable to contractor in achievement of Milestone as mentioned in clause 26.2.8 above.
33.2.4	If the completion of work is delayed beyond the completion period referred above due to reasons attributable to the contractor, they shall pay to BHEL as penalty a sum @ 0.5% of contract prices per week of delay or part thereof subject to a maximum of 3.5%(including the amount of LD withheld against delay of intermediate milestone at 26.2.1 & 26.2.6 as per clause no 33.2.1 & 33.2.2 respectively) delay of the total contract value.
33.2.5	Amount 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.
33.3	Intermediate Milestone & Overall completion of work for U#3
33.3.1	In case delay in achieving the Milestone as mentioned in Clause 26.2.1 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.
33.3.2	In case delay in achieving the Milestone as mentioned in Clause 26.2.6 above, is solely attributable to the contractor, 0.5% per week of executable contract value, limited to maximum 1% of executable contract value, will be withheld.

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33.3.3	Amount already withheld, if any against slippage of clause 26.2.1 & 26.2.6 above, shall be released only if there is no delay attributable to contractor in achievement of Milestone as mentioned in clause 26.2.8 above.
33.3.4	If the completion of work is delayed beyond the completion period referred above due to reasons attributable to the contractor, they shall pay to BHEL as penalty a sum @ 0.5% of contract prices per week of delay or part thereof subject to a maximum of 3%(including the amount of LD withheld against delay of intermediate milestone at 26.2.1 & 26.2.6 as per clause no 33.3.1 & 33.3.2 respectively) delay of the total contract value.
33.3.5	Amount 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.
33.4	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.
33.5	All other terms shall be as per the provision of GCC in this regard.
33.6	In case of LD recovery, the applicable GST shall also be recovered from the contractor.
34.0	CONTRACT PRICE
34.1	The bidder shall quote their rates strictly in accordance with prescribed Price schedule of Volume-III
34.2	The quantities of the various items mentioned in the respective Price schedules, Volume-III are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of the work executed under any part of this contract including extra items, if any, but excluding any price variation, remains within +/- 15 % (plus/minus fifteen percent) of the awarded price (as per LOI / WO).
34.3	The unit rate quoted for various items of BOQ shall include all the stipulation mentioned in the tender documents and nothing extra over BOQ rates shall be payable.
35.0	TAXES AND DUTIES
35.1	All taxes excluding GST & BOCW Cess (as specified elsewhere in the tender) but including, Charges, Royalties, any State or Central Levy and other taxes for materials if any obtained for the work and for execution of the contract shall be borne by successful bidder and shall not be payable extra by BHEL. Any increase of above at any stage during execution of contract, including extension of the contract, shall have to be borne by successful bidder contractor. Bidder's quoted/ accepted rates/ price shall be inclusive of all such requirements.
35.2	GST along with Cess (as applicable) legally leviable & payable by successful bidder as per GST Law shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.
35.3	Successful bidder shall furnish proof of GST registration with GSTN Portal covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by successful bidder on BHEL for this project / work.
35.4	Since GST on output will be paid by BHEL separately as enumerated above, bidder's your quoted rates / price should be after considering the Input Credit under GST law at bidder's end.
35.5	TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills (RA bills) unless exemption certificate from the appropriate authority / authorities is furnished.
35.6	TDS under GST (if / as & when applicable later) shall be deducted at applicable rates on gross invoice value from the running bills (RA bills). However, as on date no TDS under GST is applicable.
35.7	Bidder shall note that GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder) wherein the 'Bill To' details shall encompass following. BHEL GSTN – 20AAACB4146P5ZP. Name - BHARAT HEAVY ELECTRICALS LIMITED Address - Shall be intimated later. Specific details of BHEL GSTN, Name and Address as stated above, have been specified elsewhere in the tender.
35.8	Successful bidder to intimate immediately on the day of removal of goods (in case of any supply of goods) to BHEL along with all relevant details and send a scanned copy of Tax Invoice to BHEL through following communication mode for enabling BHEL to meet its GST related compliances. Portal address. and Email address – Shall be intimated later. Specific details of above shall be intimated to successful bidder by BHEL at appropriate juncture.
35.9	In case of delay in submission of above mentioned documents on the date of despatch, BHEL may incur penalty / interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from successful bidder, in case such delay is not attributable to BHEL.
35.10	In case of raising any Supplementary Tax Invoice (Debit / Credit Note), successful bidder shall issue the

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	same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
35.11	Successful bidder shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising of the Tax Invoice. If any supply of goods is applicable, successful bidder shall also ensure prompt delivery of goods after despatch.
35.12	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 successful bidder along with interest levied/ leviable on BHEL, as the case may be.
35.13	Successful 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 successful bidder along with interest levied / leviable on BHEL.
35.14	Way Bill: Successful bidder to arrange for way bill / e-waybill for any transfer of goods for the execution of the contract. Successful 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 successful bidder and BHEL will not supply any Road Permit/ Way Bill for this purpose.
35.15	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.
35.16	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.
36.0	INTERIM PAYMENTS
36.1	For all items of works, as per the the Price schedule, Vol-III, billing shall be on item rate basis. However, Interim Payment shall be limited to 95% of gross bill amount.
36.2	All admissible recovered/ adjustments etc. shall be made from the interim payable amount.
36.3	Balance 5 % retained from each RA bill will be released on completion of guarantee period. However, this 5 % payment can be released against submission of bank guarantee valid for the guarantee period as stated above in Proforma / Format of performance bank guarantee, subject to receipt of certificate that all works are completed in all respects. Submission of bank guarantee towards retention is separate and other bank guarantee(s) cannot be utilized for this purpose. This retention bank guarantee will be refunded after guarantee period.
36.4	1.5 % of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by vendor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.
36.4.1	0.7 % shall be paid on compliance of housekeeping of vendor's working area and store/ office areas.
36.4.2	0.3 % shall be paid on compliance of general illumination of vendor's working area and stores, office area.
36.4.3	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.
36.4.4	0.3 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.
36.5	Contractor's RA bill, complete & correct in all respects, certified by BHEL engineer, shall be paid with in 45 days of receipt of bill with all supporting documents.
36.6	BHEL site at its discretion, may further split up the above percentages of break up and effect payment to suit the site condition, cash flow requirement, according to the progress of work.
36.7	Such payment as above shall be effected only on certification by BHEL against completion of each stage.
36.8	Applicable GST, which can be claimed at any point, shall be released to you upon compliance of following:
36.8.1	You declaring such Invoice in his GSTR-1
36.8.2	Receipt of Goods / services and Tax Invoice by BHEL
36.8.3	Confirmation of payment of GST thereon by you on GSTN Portal
37.0	PRICE VARIATION CLAUSE(PVC)
37.1	In case of extension of the contract for reasons not attributable to the contractor, PVC shall be applicable during the extended period (i.e. after expiry of the original contract period), PVC shall be applicable as per

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	relevant clause of GCC with base date as end date of original contract period i.e. contract completion date. However, the total amount of PVC shall be limited to 10% of executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Extra works
37.2	For SUPPLY part of VOL-III PVC is Not applicable
38.0	OVER RUN CHARGES (ORC) Not applicable for this tender.
39.0	METHOD OF MEASUREMENT Mode of measurement shall be as per relevant clauses of technical specification of this tender. In case the same is not available the relevant IS 1200 in conjunction of IS code 3385 shall be adopted. In case the same is also not available, the standard procedure adopted in CPWD (latest edition) shall be adopted. In case the same is also not available in CPWD, the measurement of the work done will be based on the mutual agreement between BHEL and contractor. In all the above cases, the interpretation of BHEL will be final and binding to the contractor.
40.0	EXTRA/ ADDITIONAL ITEMS OF WORK It shall be as per relevant clause of GCC.
41.0	INSURANCE
41.1	BHEL shall arrange comprehensive MCE (marine cum erection) Insurance Policy for total project supply & services including balance of plant package covering transit risks & loss, destruction or damage during handling at Site, Storage, civil works ,erection, testing and commissioning up to trial operation completion of unit including theft, sabotage, fire, lightning and other natural calamities.
41.2	Contractor shall report to BHEL in writing any damages to equipment/components on receipt, storing, and during withdrawal of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning till trial operation completion including handing over. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.
41.3	The contractor will take necessary precautions/ due care to protect the material at Project site, while in his custody from any damage/ loss till the same is handed over to BHEL/ customer at Project site. For lodging/ processing of insurance claim the contractor will submit necessary documents. BHEL will reserve the right to recover the loss from the contractor as detailed below in case the damage/loss is due to negligence/ carelessness on the part of the contractor. In case of theft of material under contractor's custody, the same shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL/ customer for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the materials in his custody.
41.4	In case the damage/loss/theft of materials are attributable to negligence/failure in discharging the duties and obligations of the contractor, the expenses incurred for repair/replacement of such components in excess of the amount realized from the underwriters, limited to Normal Excess (Deductible Franchise) shall be recovered from the contractor.
41.5	Other conditions of Insurance shall be as per relevant clause of GCC/SCC.
42.0	GUARANTEE Guarantee period shall be 12 months from the date start of guarantee period as per relevant clause of GCC. Commencement of guarantee period shall be from the date completion of work under the contract as certified by BHEL
43.0	IDLE CHARGES Not applicable for this contract.
44.0	DESIGN OFFICE AND FABRICATION DRAWING FOR STRUCTURAL STEEL WORKS
44.1	Structures which are not pre-fabricated, design drawings shall be issued to the contractor time to time by BHEL, contractor will prepare & submit the detail fabrication / shop drawing including tabulated form of bill of materials (BOM), joint calculations, for comments / approval of BHEL at the office of BHEL / PEM, Noida or BHEL / ISG Bangalore within 15 days of receipt. BHEL reserves the right to assess the capability of the agency to be deployed by contractor for preparation of such fabrication drawing, and prior approval from BHEL Engineering office at Noida, is required for appointment of such agency.
44.2	Since time is the essence of the contract, the contractor must indicate the location of their design office where from such detailed activities will be made operative.
44.3	Contractor shall submit progress report pertaining to fabrication drawing, section-wise cumulative bill of materials for which engineering drawing has been issued to them and status of fabrication drawing.
44.4	Bidder, at his own cost, shall supply electrodes required for fabrication, erection of structural steel as per

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	specification and approval of BHEL.
44.5	Above mentioned clauses pertaining to consumption and wastage of structural steel applies to those materials issued by BHEL for site fabrication.
45.0	OTHER TERMS
	All other term & conditions of this specification shall be governed by the pertinent provisions of GCC and other volumes of this tender, as applicable.

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ANNEXURE- A
LIST OF EQUIPMENTS FOR CIVIL SITE LABORATORY

CONCRETE TESTING EQUIPMENT				
SL NO.	NAME OF TEST	NAME OF EQUIPMENT	SIZE OF EQUIPMENT	IS REF.
1	Initial & final setting time, Consistency of cement	Vicat Apparatus with desk pot	Standard	IS 5513
2	Shrinkage of cement, Auto Clave Test	Le Chatelier's apparatus Auto Clave Equipment	Standard	IS 5514
3	Abrasion value test	Los Angles Abrasion testing machine	Standard	IS 2386
4	Aggregate Impact value test	Aggregate Impact value testing machine with blow counter	Standard	IS 9377
5	Aggregate crushing value test	Crushing value apparatus	Standard	IS 2386
6	Flakiness index	Thickness gauge for measuring flakiness index	Standard	IS 2386
7	Elongation Index	Elongation guage	Standard	IS 2386
8	Bulk density, voids and bulking appratus	Measuring cylinders	3, 5,10 & 15 liters cylinders	
9	Concrete Compressive test	Digital Compressive Testing Machine with 2000 KN capacity.	2000KN capacity	IS 2505
10	Cement motor cube casting	Mortor Cube mould	70.6 x 70.6 x 70.6 mm, minimum 06 sets desired.	IS 10086
11	Concrete Cube casting	Concrete Cube Mould	150x150x150mm, minimum 20 sets desired considering major concereting activity.	IS 10086
12	Workability of concrete	Slump cone	Standard, atleast 04 nos	IS 456
13	Specific gravity of aggregates	Pycnometer	Standard, atleast 02 nos	IS 383
14	Cement mortor cube vibrating	Motorised vibration machine for cement testing	Standard	IS 4031
15	Coarse agregate Sieve analysis (Concrete & Road Works)	Sieve set	450mm dia GI Frames Size: 125 mm, 90 mm, 75 mm, 63 mm, 53 mm, 40 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 4.75 mm, Pan and cover	IS 383
16	Fine agregate sieve analysis	Sieve set	200 mm dia Brass sieves; Size 4.75 mm, 2.36 mm, 1.18 mm 600 micron, 300 micron, 150 micron, 75 micron, 75 micron, Pan and cover	IS 383
17	Seive Shaker	Motorised Sieve shaker	Mfg. Catalogue	
18	Silt content check	Sand silt content beaker	Standard	
19	Ultrasonic pulse velocity test	UPV appratus for concrete	Standard / To be arranged through customer approved Institute/agency for NKSTPP.	

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Soil Testing Equipment (Levelling & Grading)				
1	Liquid limit test	Liquid limit apparatus	Standard	IS 2720
2	Core Cutter test	core cutter apparatus	Rammer, 6 nos of std core cutter mould, dolly	IS 2720
3	Proctor density test	Std proctor Compaction apparatus	Standard	IS 2720
4	Moisture Content	Rapid moisture meter	Standard, atleast 04 nos	IS 2720
5	Potable concrete mixure machine for Trial-Mix	Concrete Mixure machine	Standard	

Process Control Accessories				
1	Hot air oven	Temperature range 50° C to 300° C	600x600x600mm (min.size)	
2	Electronic balance	3 nos	600gx0.01g, 10g and 50 kg	
3	Physical balance	5 kg capacity	Weights upto 5 kg	
4	Thermometer	Temperature range 0° C to 150° C	Digital	
5	Poker Thermometer (Concrete Road)	Temperature range 0° C to 50° C & 150° C	02 nos each required	
6	Measuring jars	2 nos set of each size	100ml, 200ml, 500ml & 1000 ml	
7	Gauging trowlers	4 nos	100mm & 200 mm with wooden handle	
8	Spatula	2 nos each size	100mm & 200 mm with long blade wooden handle	
9	Stainless steel scoop	2 nos each	2 kg and 5 kg	
10	Vernier calipers	2 nos each	12" and 6" Sizes	
11	Digital pH meter	01 nos	.01 mm least count	
12	Digital micrometer	01 nos	0.01 mm least count	
13	Digital paint thickness meter for steel	02 nos	500 micron Range	
14	GI tray	02 nos each	600x450x50mm, 450x300x40mm, 300x250x40mm	
15	Electric mortar mixer	01 nos	0.25 CUM capacity	
16	Rebound hammer test	01 nos	Digital Rebound hammer	IS 13311
17	Screw Gauge	02 nos	0.1 mm-10mm, Least count 0.05	
18	Digital paint thickness meter for masanory/concrete painting measurement	02 nos	150 micron range	

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ANNEXURE B

LIST OF TENTATIVELY APPROVED SUPPLIERS / DESIGNERS IS PROVIDED HEREUNDER. HOWEVER, IN CASE THE BIDDER PROPOSES TO PROCURE ITEMS FROM OTHER SUPPLIERS, SPECIFIC APPROVAL SHALL BE REQUIRED TO BE TAKEN FROM BHEL / NTPC AS PER APPROVED QP. FURTHER BIDDER MAY NOTE THAT LIST CONSISTS OF ONLY TENTATIVELY APPROVED VENDORS. SPECIFIC APPROVAL MUST BE TAKEN FROM BHEL / NTPC PRIOR TO EXECUTION AT SITE.

SL. NO.	ITEM	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	REMARKS
1	CONSTRUCTION CHEMICALS - ADMIXTURES, PLASTISIZERS, RETARDERS WATER PROOFING COMPOUNDS GROUTS	SIKA INDIA LTO	-	
		CICO TECHNOLOGIES LTD	-	
		FOSROC CHEMICALS (I) PVT LTD	-	
		BASF	-	
2.	FALSE CEILING- GLASS REINFORCED GYPSUM SYSTEM, MINERAL FIBRE BOARD SYSTEM,PREPAINTED COIL COATED STEEL SYSTEM	SAINT GOBAIN	NEW DELHI	
		HUNTER DOUGLOUS	MUMBAI	
		TIGER STEEL	PUNE/MUMBAI	
		INTERARCH	NOIDA	
		LLOYD INSULATION	-	
		MG INDUSTRIES	FARIDABAD	
		ARM STRONG	NEW DELHI	
3	PAINT AND PAINTING SYSTEM	BERGER	-	
		SHALIMAR PAINTS	-	
		JENSON AND NICHOLSON	-	
		KANSAI NEROLAC	-	
		AKZO NOBEL	-	
		ASIAN PAINTS	-	
4	COLOUR COATED SHEET (FOR COIL)	UNION STEEL	KOREA	
		DONGBU STEEL	KOREA	
		BHUSHAN STEEL AND STRIPS LTD.	RAIGAD	
		ESSAR STEEL LTD	PUNE	
		NATIONAL STEEL AND AGRO	DHAR	
		JSW STEEL COATED PRODUCTS LTD	KAMLESHWAR	Formerly JSW ISPAT Steel Ltd
		BHUSHAN STEEL LTD.	SAHIBABAD	
		JSW LTD	THANE	
		TATA BLUESCOPE STEEL LTD	JAMSHEDPUR	*AL-ZN COIL FOR CLADDING

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5	PROFILERS FOR DECKING SHEETS	UNIMET PROFILES LIMITED	DHARUHERA	
		MULTICOLOUR STEEL INDIA LIMITED	GURGAON	
		ISOLLOYD	SOLAN	
		NATIONAL STEEL AND AGRO	DHAR	
		ERA BUILD SYS	RUDRAPUR	
		TATA BLUE SCOPE	PUNE	HINJEWARI WORKS
		TATA BLUE SCOPE	BHIWADI	
		PENNNAR INDUSTRIES	HYDERABAD	
		ALFA STEEL BUILDING SOLUTIONS	HOSUR	
6	PROFILERS FOR CLADDING SHEETS	MULTICOLOUR STEEL INDIA LIMITED	GURGAON	
		UNIMET PROFILES LIMITED	DHARUHERA-HARYANA	
		ERA BUILD SYS	RUDRAPUR	
		TATA BLUE SCOPE	PUNE	HINJEWARI WORKS
		TATA BLUE SCOPE	BHIWADI	
		PENNNAR INDUSTRIES	HYDERABAD	
		ALFA STEEL BUILDING SOLUTIONS	HOSUR	
		ISOLLOYD	SOLAN	
		NATIONAL STEEL AND AGRO	DHAR	
7	ELECTROFORGED GRATING	INDIANA GRATING	PUNE	
		PREMIER POWER PRODUCTS (CALCUTTA) PVT LTD	HOWRAH	
		GREATWELD	PUNE	
		BHOLA RAM STEELS	PATNA	
		KANADE ANAND UDYOG	THANE	
		PINAX STEEL INDUSTRIES	PATNA	
8	GI PIPES	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	

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9	PVC WATER STOP	DURON POLYVINYLS PVT. LTD	GURGAON	
		KANTA RUBBER	HYDERABAD	
		MARUTI RUBBER	NOIDA	
		JYOTI POLYVINYL	VADODARA	
		DEEP-JYOTI RUBBER PVT LTD	NOIDA	
10	BITUMEN ASPHALT	ALL GOVERNMENT REFINARIES	–	
11	PLASTIC, PVC PIPES	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	
12	BITUMEN IMPREGNATED FIBER BOARD JOINT FILLER , BITUMEN SEALING COMPOUND	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	
13	ALUMINUM COMPOSITE CLADDING	INDOMAX	ROORKEE	
		ALSTONE	DEHRADUN	
14	CERAMIC / VITRIFIED TILES	KAJARIA	-	
		SOMANY		
		SPARTEK INDIA	-	
		NITCO	-	
		ORIENT BELL	-	
		MARBITO		
		RESTILE	-	
		JOHNSON	.	
15.	ACID I ALKALI RESISTANCE TILES, AR BRICKS, ARCEMENT (POTASSIUM SILICATE BASED CEMENT MORTAR, PHENOLIC BASED RESIN CEMENT) AR BITUMASTIC	CARBORANDUM UNIVERSAL	CHENNAI	
		PELICAN	BHIWADI	
		CAMBRIAN	ALWAR	
		KERATECH	VADODARA	
		CHAMPION CERAMICS	CHAMPA	
		SUNSHINE CERAMICS	CHAMPA	
		MAHAKOSHAL POTTRIES	KATNI	
		PERFECT ACID WARE	JABALPUR	
		BABA BAIDNATH REFRACTORIES	PURULIA	

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16.	FIRE PROOF DOORS	NAVAIR INTERNATIONAL LTD.	NEW DELHI	
		SHAKTI MET DOOR	HYDERABAD	
		SUPER STEEL	DELHI	FOR SINGLE LEAF ONLY
		SIGNUM FIRE PROTECTION	NAGPUR	
		RADIANT SAFE DOORS	AHMEDABAD	
17	PARTICLE BOARDS, PLYWOOD, MDF	NOVAPAN	-	
		ECOBORD	-	
		BHUTAN BOARD	-	
		KITPLY	-	
		CENTURY	-	
		GREEN PLY	-	
		DUROPLY	-	
		MERINO	-	\
18	ALUMINUM SECTIONS	HINDALCO	-	
		INDALCO		
		BALCO (VEDANTA)	-	
		NALCO	-	
		J1NDAL	-	
19	HIGH SOLID CONTENT LIQUID APPLIED URETHANE BASED ELASTOMERIC MEMBRANE FOR WATER PROOFING	STP	-	
		IWL INDIA LTD	-	
		LLOYDS	-	
		CICO TECHONOLOGIES LTD		
		MK PETRO	-	
20	SANITARY ITEMS	PARRYWARE	-	
		HINDWARE	-	
		SEABIRD		
		ORIENT		
		HINDUSTAN		
		CERA		
21	CP BRASS TAP AND OTHER SANITARY FITTINGS	GEM	-	
		PARKO	-	
		JAQUAR	-	
		MARC	-	
22	POLYTHENE WATER STORAGE TANKS	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	
23	NEOPRENE BELLOW STRAPS	CORI	CHENNAI	
		RESISTOFLEX	NOIDA	
		DWREN	KOLKATA	

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24	RCC PIPES	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	
25	POLYCARBONATE SHEETS	GE PLASTIC (SABIC)	-	
		BAYER (MAKROLON)	-	
26	ELECTRICALLY OPERATED HOIST (5T/2T)	CONSOLIDATED HOIST	SATARA	
		HERCULES HOIST	RA1GARH	
		GRIP ENGG	FARIDABAD	
		EDDY CRANE	PUNE	
		ARMSHEL	BANGLORE	
		CENTURY CRANE	PALWAL	
		ELECTROTHERAPY	HOWRAH	
		TRACTEL TRIFFER	PALWAL	
		ALFA CRANES	ALWAR	
		REVA HOIST	FARIDABAD	
27	STOP LOG GATES, TRASH RACK AND LIFTING BEAM	GENERAL MECHANICAL WORKS	BARODA	
		TRIVENI	NOIDA	
		MACMET	KOLKATA	
		PRADEEP STRUCTURES	HOWRAH	
		RED FAG	HYDERABAD	
		BSBK ENGG	NOIDA	
28	PTFE BEARING ELASTOMERIC BEARING	ALL CURRENT MORTH/RDSO APPROVED VENDORS		
29	FABRIC EXPANSION COMPENSATOR	KELD ELLENTOFT INDIA LTD	CHENNAI	
		EAGLE BURGMANN KE PRIVATE LTD	CHENNAI	
30	MINERAL WOOL FOR THERMAL INSULATION	ROCKWOOL INDIA LTD.	HYDERABAD	Subject to. carrying out K-value test at CBRI Roorkee / NTPC approved lab.
		ROCKWOOL INDUSTRIES	BHILA1	
		LAP INUS	MALANPUR (MP)	
		M1NWOOL	RAJANANDGAON	
		LLOYD INSULATION	BHILAI	
		U.P. TWIGA	BULEND SHAHAR	
31	GEOTEXTILE	GARWARE WALL ROPES Ltd	PUNE	
		TENCATE GEOSYNTHETICS ASIA	MALAYSIA	NON WOVEN
32	GEOMEMBRANE (HDPE LINER)	D P WIRES PVT. LTD	RATLAM	

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33	CI PIPES	BIS APPROVED SOURCES HAVING VALID BIS LICENCE		
34	COAL TAR ANTICORROSIVE COATING	RUSTECH	KOLKATA	
		PORWAL INDUSTRIES	RAIPUR	
		MP TAR	BHILAI	
		STP UMIED	JAMSHEDPUR	
35	ELASTOMERIC POLYURETHANE COATING	CIPY	PUNE	
		AMCHEM	NOIDA	
		E. WOOD. (APPLICATOR: PSL HOLDING, INDIA)	UK	
		CICO TECHONOLOGIES LTD	GURGAON	
36	HIGH PERFORMANCE MOISTURE COMPATIBLE CORROSION RESISTANT COATING SYSTEM	CECRI LICENSED SOURCES		
37	MS PIPES (IS:3589, WELDED PIPES)	BIS APPROVED SOURCES HAVING VALID BIS LICENCE		
38	PVC COATED CHAIN LINK FENCING & REINFORCED BARBED TAPE	SAUDAGAR MAC MAMMANLAL PVT LTD		
		MECAFERRI		



**SPECIFIC TECHNICAL REQUIREMENT
FOR CIVIL, STRUCTURAL &
ARCHITECTURAL WORKS FOR FLUE
GAS DESULPHURISATION (FGD) SYSTEM
PACKAGE FOR NORTH KARANPURA
STPP (3X660 MW)**

SPECIFICATION NO. PE-TS-441-600-001

VOLUME - IIB

SECTION - C

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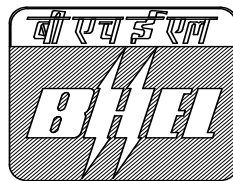
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**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE FOR NORTH
KARANPURA STPP (3X660 MW)**

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**SPECIFIC TECHNICAL REQUIREMENTS FOR CIVIL,
STRUCTURAL & ARCHITECTURAL WORKS**



Bharat Heavy Electricals Limited

**Project Engineering Management
Power Sector, BHEL**



**SPECIFIC TECHNICAL REQUIREMENT
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**SPECIFIC TECHNICAL REQUIREMENT
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PART-I

GENERAL CIVIL REQUIREMENT



**SPECIFIC TECHNICAL REQUIREMENT
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1. GENERAL

Two Volumes-Section C & Section D of this specification cover site survey, soil investigation, site development works, design and construction of Civil, Structural and Architectural works. The scope of works covers complete Civil, Structural and Architectural Works including supply of all materials, labour, tools and plants as required for successful execution of the packages. This Part-I of Section-C Lists Codes and Standards to be adopted and the principal structures of the plant, and briefly describes the basic concept, requirements and features pertinent to each. **If there is any ambiguity and/or contradiction between Section C and Section D, the provisions / requirements laid in Section C shall prevail. In case of ambiguity between BOQ and Part C former shall prevail.**

(Contractor shall read the parts of the specification relevant to the contract and shall ignore the other parts of the specification. Relevant clauses of this section as applicable for respective package to be followed.)

2. CODES AND STANDARDS

Following is a general listing of Codes and Standards to be used in the design of the Plant. Specific applicable codes and standards will be identified in System Design Descriptions/ Technical Specifications as appropriate. The latest editions/ revision of following codes and standards along with addendums/ amendments, if any, shall be followed:

2.1. Earthwork

- a) IS-1498: Classification and identification of soils for General Engineering purposes.
- b) IS-3764: Safety Code for excavation work.
- c) IS-7293: Safety Code for working with construction machinery.
- d) IS-4701: Code of practice for earth work on canals.
- e) IS-9759: Guide lines for dewatering during construction.
- f) IS-10379: Code of practice for field control of moisture and compaction of soils for embankment and sub-grade.

2.2. Concrete

- a) IS-269: Ordinary and low heat Portland cement.
- b) IS-383: Coarse and fine aggregate from natural sources for concrete.
- c) IS-432: Mild Steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
- (Part I & II)
- d) IS-455: Portland Slag Cement.
- e) IS-456: Code of Practice for Plain and reinforced concrete.
- f) IS-457: Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
- g) IS-460: Test Sieves (all parts).
- h) IS-516: Methods of test for strength of concrete.
- i) IS-1199: Methods of sampling and analysis of concrete.
- j) IS-1566: Hard drawn steel wire fabric for concrete Reinforcement.
- k) IS-1786: High strength deformed steel bars and wires for concrete Reinforcement.
- l) IS-1791: General requirement for batch type concrete mixers.
- m) IS-1834: Hot applied sealing compounds for joints in concrete.
- n) IS-1838: Preformed fillers for expansion joints in concrete pavement and structures.



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- o) IS-2386: Methods of test for aggregates for concrete (all parts).
(Part I-VIII)
- p) IS-2438: Specification for roller pan mixers.
- q) IS-2502: Code of practice for bending and fixing of bars for concrete Reinforcement.
- r) IS-2505: Concrete vibrators - immersion type.
- s) IS-2506: General requirements for screed board concrete vibrators.
- t) IS-2722: Specification for Portable Swing weigh batchers for concrete (single and double bucket type).
- u) IS-2750: Steel scaffoldings.
- v) IS-2751: Recommended practice for welding of mild steel plain and deformed bars for reinforced construction.
- w) IS-3150: Hexagonal wire netting for general purposes.
- x) IS-3366: Specification for pan vibrators.
- y) IS-3370: Code of practice for concrete structures for storage of liquids (all parts).
(Part I-IV)
- z) IS-3414: Code of practice for design and installation of joints in buildings.
- aa) IS-3558: Code of practice for use of immersion vibrators for consolidating concrete.
- bb) IS-4014: Code of practice for steel tubular scaffolding.
(Part I & II)
- cc) IS-4656: Form vibrators for concrete.
- dd) IS-4925: Concrete batching and mixing plant.
- ee) IS-4948: Welded steel wire fabrics for general use.
- ff) IS-4990: Plywood for concrete shuttering work.
- gg) IS-5256: Code of practice for sealing expansion joints in concrete lining on canals.
- hh) IS-6452: High Alumina Cement for Structural use.
- ii) IS-6461: Glossary of terms relating to cement concrete.
- jj) IS-6494: Code of practice for water proofing of underground reservoir and swimming pools.
- kk) IS-6509: Code of practice for installation of joints in concrete pavements.
- ll) IS-7320: Concrete slump test apparatus.
- mm) IS-7861: Code of practice for extreme weather concreting.
(Part I & II)
- nn) IS-8041: Rapid Hardening Portland Cement.
- oo) IS-8112: High strength ordinary Portland Cement.
- pp) IS-9012: Recommended practice for shotcreting.
- qq) IS-9103: Admixtures for concrete.
- rr) IS-9417: Recommendations for welding cold worked bars for reinforced concrete construction.
- ss) IS-10262: Recommended guidelines for concrete mix design.
- tt) IS-458: Specification for precast concrete pipes.
- uu) IS-3935: Code of practice for composite construction.
- vv) IS-4995: Criteria for design of reinforced concrete bins for storage of granular (all parts) and powdery materials.
- ww) IS-5525: Recommendation for detailing of reinforced concrete works.
- xx) IS-11384: Code of practice for composite construction in structural steel and concrete.
- yy) IS-11682: Criteria for design of RCC staging for overhead water tanks.
- zz) IS-12118: Two parts polysulphide based sealants.
- aaa) IS-12200: Code of practice for provision of water stops at transverse construction joints in masonry and concrete dams.
- bbb) IS-13311: Non-destructive testing of concrete - methods of test.
Part I - Ultrasonic pulse velocity.
Part II - Rebound hammer.
- ccc) IS-13920: Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.



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- ddd) SP-16: Design codes for reinforced concrete to IS:456-1978.
 eee) SP-23: Hand book of concrete mixes.
 fff) SP-24: Explanatory handbook on Indian standards code for plain and reinforced concrete. (IS: 456)
 ggg) SP-34: Hand book on concrete reinforcement and detailing.
 hhh) ACI-318: American Concrete Institute code for structural concrete.
 iii) IS-280: Mild steel wire for general engineering purpose.
 jjj) IS-10297: Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units.
 kkk) IS-10505: Code of practice for construction of floors and roofs using pre-cast reinforced concrete waffle units.
 llj) IS-15658: Pre-cast concrete block for paving.

2.3. Foundations

- a) IS-1080: Code of practice for Design and Construction of shallow foundations on soils (other than raft, ring and shell)
 b) IS-1904: Code of practice for Design and Construction of foundations in soils: General Requirements
 c) IS-2314: Steel sheet piling sections.
 d) IS-2911: Code of practice for Design and Construction of Pile foundations (all parts).
 e) IS-2950: Code of practice for design and construction of raft foundations.
 f) IS-2974: Code of practice for design and construction of machine foundations.
 g) IS-4091: Code of practice for Design and Construction of foundations for transmission line towers and poles
 h) IS-6403: Code of practice for determination of Bearing capacity of Shallow foundations.
 i) IS-8009: Code of practice for calculation of settlement of foundations: (all parts)
 j) IS-9556: Code of practice for Design and Construction of diaphragm walls.
 k) IS-11089: Code of practice for Design and Construction of ring foundation.
 l) IS-12070: Code of practice for design and construction of shallow foundations on rocks.
 m) IS-13301: Guidelines for vibration isolation for machine foundation.
 n) ISO 10816: Criteria for assessing mechanical vibrations of machines.
 o) ISO 1940: Criteria for assessing the st of balance of rotating rigid bodies.
 p) DIN: EN13906-1: Helical compression spring made of round wire and rod: calculation and design of compression.
 q) DIN: 2096 Helical compression spring out of round wire and rod: Quality requirements for hot formed compression spring.
 r) DIN: 4024 Flexible supporting structures for machine with rotating machines.

2.4. Loading

- a) IS-875: Code of practice for Structural safety of buildings - loading standards.
 b) IS-1911: Schedule of unit weights of building materials.
 c) IRC-6: Standard specifications & Code of practice for road bridges.

2.5.Masonry

- a) IS-712: Building limes.
 b) IS-1077: Common Burnt Clay Building Bricks.
 c) IS-1127: Recommendations for dimensions and workmanship of natural building stones for masonry work.
 d) IS-1528: Methods of sampling and physical tests for refractory materials.



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- e) IS-1597: Code of practice for construction of stone masonry (all parts).
- f) IS-2212: Code of practice for brickwork.
- g) IS-2116: Sand for masonry mortars
- h) IS-2185: Concrete masonry units. (all parts - Hollow and Solid concrete blocks).
- i) IS-2250: Code of practice for preparation and use of masonry mortars.
- j) IS-2572: Code of practice for construction of hollow concrete block masonry.
- k) IS-2691: Burnt clay facing bricks.
- l) IS-3414: Code of practice for design and installation of joints in buildings.
- m) IS-3495: Methods of tests of burnt clay building bricks.
- n) IS-4441: Code of practice for use of Silicate type chemical resistant mortars.
- o) IS-4860: Acid Resistant Bricks.
- p) IS-1905: Code of practice for structural use of unreinforced masonry.
- q) IS-10440: Code of practice for construction of reinforced brick and reinforced brick concrete floors and roofs.
- r) SP-20: Hand book on masonry design and construction.
- s) IS-1489: Portland-pozzolana cement.
- t) IS-1542: Sand for Plaster.
- u) IS-12269: 53 grade ordinary Portland cement.
- v) IS-12894: Specification for fly ash lime bricks.
- w) IS-13757: Burnt clay fly ash building bricks.

2.6.Doors, Windows and Ventilators

- a) IS-399: Classification of commercial timbers and their zonal distribution.
- b) IS-883: Code of practice for design of structural timber in building.
- c) IS-1003: Timber panelled and glazed shutters (all parts).
- d) IS-1038: Steel doors, windows and ventilators.
- e) IS-1081: Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
- f) IS-1361: Steel windows for industrial buildings.
- g) IS-2835: Transparent sheet glass for glazing and framing purposes.
- h) IS-1948: Aluminium doors windows and ventilators.
- i) IS-1949: Aluminium windows for industrial building.
- j) IS-2191: Wooden flush door shutters (Cellular and hollow core type).
- k) IS-2202: Wooden flush door shutters (solid core type).
- l) IS-3103: Code of practice for Industrial ventilation.
- m) IS-3548: Code of practice for glazing in buildings.
- n) IS-3614: Fire check doors.
- o) IS-4021: Timber door, windows and ventilator frames.
- p) IS-4351: Steel door frames.
- q) IS-6248: Metal rolling shutters and rolling grills.
- r) IS-208: Door Handles.
- s) IS:281: Mild steel sliding door bolts for use with padlocks.
- t) IS-362: Parliament Hinges.
- u) IS-419: Putty, for use on window frames.
- v) IS-451: Technical supply conditions for wood screws.
- w) IS-733: Wrought aluminium and aluminium alloy bars, rods and sections for general engineering purposes.
- x) IS-1285: Wrought aluminium and aluminium alloy extruded round tube & hollow section (for general engineering purposes).
- y) IS-1341: Steel butt hinges.
- z) IS-1823: Floor door stoppers.
- aa) IS-1868: Anodic coatings on Aluminium and its alloys.



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- bb) IS-2209: Mortice locks (vertical type)
- cc) IS-2553: Safety glass.
- dd) IS-3564: Door closers (Hydraulically regulated).
- ee) IS-5187: Flush bolts.
- ff) IS-5437: Figured, rolled and wired glass.
- gg) IS-6315: Specification for floor springs (Hydraulically regulated) for heavy doors.
- hh) IS-7196: Hold fast.
- ii) IS-7452: Hot rolled steel sections for doors, windows and ventilators.
- jj) IS-10019: Mild steel stays and fasteners.
- kk) IS-10451: Steel sliding shutters (top hung type)
- ll) IS-12823: Prelaminated particle boards.

2.7.Roof and Flooring

- a) IS-2204: Code of practice for construction of reinforced concrete shell roof.
- b) IS-3201: Criteria for the design and construction of precast concrete trusses.
- c) IS-2210: Criteria for Design of R.C. shell structures and folded plates.
- d) IS-809: Rubber flooring materials for general purposes.
- e) IS-1195: Bitumen mastic for flooring.
- f) IS-1196: Code of practice for laying bitumen mastic flooring.
- g) IS-1198: Code of practice for laying, fixing and maintenance of linoleum floors.
- h) IS-1237: Cement concrete flooring tiles.
- i) IS-1443: Code of practice for laying and finishing of cement concrete flooring tiles.
- j) IS-2114: Code of practice for laying in situ terrazzo floor finish.
- k) IS-2571: Code of practice for laying in situ cement concrete flooring.
- l) IS-5491: Code of practice for laying in situ granolithic concrete floor topping.
- m) IS-5766: Code of practice for laying burnt clay brick flooring.
- n) IS-1197: Code of practice for laying of rubber floors.
- o) IS-2441: Code of practice for fixing ceiling coverings.

2.8.Waterproofing

- a) IS-1322: Bitumen felts for waterproofing and damp proofing.
- b) IS-1346: Code of practice for waterproofing of roofs with bitumen felts.
- c) IS-1609: Code of practice for laying damp proof treatment using bituminous felts.
- d) IS-3036: Code of practice for laying lime concrete for a waterproofed roof finish.
- e) IS-3037: Bitumen mastic for use in waterproofing of roofs.
- f) IS-3067: Code of practice for general design, details and preparatory work for damp proofing and water proofing of buildings.
- g) IS-3384: Bitumen primer for use in water proofing and damp proofing.
- h) IS-4365: Code of practice for application of bitumen mastic for waterproofing of roofs.
- i) IS-5318: Code of practice for laying of flexible PVC sheet and tile flooring.
- j) IS-8042: White Portland cement.
- k) IS-13755: Dust pressed ceramic tiles with water absorption of 3%, E 6% (Group B11a).
- l) IS-13801: Chequered cement concrete tiles.

2.9.Soil Engineering

- a) IS-1498: Classification and identification of soils for general engineering purposes.
- b) IS-1892: Code of practice for sub-surface investigation for foundations.
- c) IS-2131: Method for standard penetration test for soils.
- d) IS-2720: Methods of test for soils (all parts).



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2.10. Water Supply, Drainage and Sewerage

- a) IS-404: Lead pipes
- b) IS-458: Concrete pipes
- c) IS-651: Salt glazed stoneware pipes and fittings.
- d) IS-771: Glazed fire-clay sanitary appliances (all parts).
- e) IS-774: Flushing cisterns for water closets and urinals other than plastic cisterns.
- f) IS-783: Code of practice for laying of concrete pipes.
- g) IS-1172: Code of basic requirements for water supply, drainage and sanitation.
- h) IS-1626: Asbestos cement building pipes, gutters and fittings (all parts).
- i) IS-1742: Code of practice for building drainage.
- j) IS-2064: Code of practice for selection, installation and maintenance of sanitary appliances.
- k) IS-2065: Code of practice for water supply in buildings.
- l) IS-2470: Code of practice for installation of septic tanks (all parts).
- m) IS-3114: Code of practice for laying of Cast Iron pipes.
- n) IS-4127: Code of practice for laying of glazed stoneware pipes.
- o) IS-12251: Code of practice for Drainage of Building Basement.
- p) IS-1200: Method of measurement: Laying of water and [Part- XVI] sewer lines including appurtenant items.
- q) IS-1536: Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
- r) IS-1537: Vertically cast iron pressure pipe for water, gas and sewage.
- s) IS-3486: Cast iron spigot and socket drain pipes.
- t) IS-5329: Code of practice for sanitary pipe work above ground for buildings.
- u) IS-3076: Low density polyethylene pipes for potable water supplies.
- v) IS-1538: Cast iron fittings for pressure pipes for water, gas and sewage.
- w) IS-1230: Cast iron rainwater pipes and fittings.
- x) IS-1729: Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- y) IS-784: Prestressed concrete pipes.
- z) IS-1726: Cast iron manhole covers and frames.
- aa) IS-5961: Cast iron grating for drainage purposes.
- bb) IS-5219: "P" and "S" traps.
- (Part-I)
- cc) IS-772: General requirements for enamelled cast iron sanitary appliances.
- dd) IS-775: Cast iron brackets and supports for wash basins and sinks.
- ee) IS-777: Glazed earthenware wall tiles.
- ff) IS-2548: Plastic water closet seats and covers (all parts).
- gg) IS-2527: Code of practice for fixing rainwater gutters and downpipes for roof drainage.
- hh) IS-554: Pipe threads where pressure tight joints are made on the threads – dimensions, tolerances and designation.
- ii) IS-778: Copper alloy gate, globe and check valves for water works purposes.
- jj) IS-781: Cast copper alloy screw down bib taps & stop valves for water services.
- kk) IS-782: Caulking lead.
- ll) IS-1703: Copper alloy float valve for water supply fitting.
- mm) IS-2326: Automatic flushing cisterns for urinals.
- nn) IS-2556: Vitreous sanitary appliances (vitreous china).
- oo) IS-3311: Waste plug and its accessories for sinks and wash basins.
- pp) IS-3438: Silvered glass mirrors for general purposes.
- qq) IS-3589: Steel pipe for water and sewage (168.3 to 2540mm outside diameter)
- rr) IS-3989: Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- ss) IS-4111: Code of practice for ancillary structure in sewerage system.
- (Part I to V)



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- tt) IS-4733: Methods of sampling and testing sewage effluents.
 uu) IS-4764: Tolerance limits for sewage effluents discharged into inland surface waters.
 vv) IS-1068: Electroplated coating of nickel plus chromium and copper plus nickel plus chromium.
 ww) IS-5382: Rubber sealing rings for gas mains, water mains and sewer
 xx) IS-5822: Code of practice for laying of electrically welded steel pipes for water supply.
 yy) IS-7740: Code of practice for construction and maintenance of road gullies.
 zz) IS-8931: Copper alloy fancy single taps combination tap assembly and stop valves for water services.
 aaa) IS-9762: Polyethylene floats for float valves.
 bbb) IS-10592: Industrial emergency showers, eye and face fountains and combination units.
 ccc) IS-12592: Specification for precast concrete manhole covers and frames.
 ddd) IS-12701: Rotational moulded polyethylene water storage tanks.
 eee) IS-13983: Stainless steel sinks for domestic purposes.
 fff) SP-35: Hand book on water supply and drainage with special emphasis on plumbing.

2.11. Paving and Road works

- a) IS-73: Paving bitumen
 b) IS-702: Industrial Bitumen
 c) IS-1201: Method of testing tar and bituminous materials. thru' 1220
 d) : Practice followed by Indian Road Congress (all parts).

2.12. Earthquake Resistant Design

- a) IS-1893: Criteria for earthquake resistant design of structures.
 b) IS-4326: Code of practice for earthquake resistant design and construction of buildings.

2.13. Chimney

- a) IS-4998: Criteria for Design of R.C. Chimneys (all parts).
 b) IS-6533: Code of practice for design and construction of steel chimneys
 c) ACI-307: Specification for the design and construction of reinforced concrete chimneys
 d) BS-4076: Specification for steel chimneys
 e) CICIND: Model Code for concrete chimneys / Model code for steel chimneys

2.14. Cooling Tower

- a) BS-4485: Structural design of cooling towers.
 (Part 4)

2.15. Structural Steelwork

- a) IS-800: Code of practice for general construction in steel.
 b) IS-802: Code of practice for use of structural steel in Overhead Transmission Line (All Parts).
 c) IS-806: Code of practice for use of steel tubes in general building construction.
 d) IS-808: Rolled steel beams, channels and angle sections.
 e) IS-813: Scheme of symbols for welding.
 f) IS-814: Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
 g) IS-816: Code of practice for use of metal arc welding for general construction in mild steel.



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- h) IS-817: Code of practice for training and testing of metal arc welders.
- i) IS-818: Code of practice for safety and health requirements in electric and gas welding and cutting operation.
- j) IS-819: Code of practice for Resistance spot welding for light assemblies in Mild Steel.
- k) IS-919: Recommendations for limits and fits for engineering.
- l) IS-1024: Code of practice for use of welding in Bridges and Structures subjected to Dynamic loading.
- m) IS-1161: Steel tubes for structural purposes.
- n) IS-1182: Recommended practice for Radiographic Examination of Fusion Welded Butt joints in steel plates.
- o) IS-1200: Method of measurement of steelwork and ironwork.
(Part-VIII)
- p) IS-1239: Mild steel tubes, tubulars and other wrought steel fittings (all parts).
- q) IS-1363: Black hexagonal bolts, nuts and locknuts (Dia. 6 to 39 mm) and black hexagon screws (Dia.6 to 24 mm). [all parts]
- r) IS-1364: Precision and semi-precision hexagon bolts, screws, nuts and locknuts (Dia. range 6 to 39 mm). [all parts]
- s) IS-1365: Slotted counter sunk head screws (Dia. range 1.6 to 20 mm).
- t) IS-1367: Technical supply conditions for threaded steel fasteners. (Part 1 to 18)
- u) IS-1443: Code of practice for laying and finishing of cement concrete flooring tiles.
- v) IS-1608: Method for tensile testing of steel products.
- w) IS-1730: Dimensions for steel plate, sheet and strip for structural and general engineering purpose.
- x) IS-1731: Dimensions for steel flats for structural and general engineering purposes.
- y) IS-1852: Rolling and cutting tolerances for hot rolled steel products.
- z) IS-1977: Structural steel (Ordinary quality)
- aa) IS-2016: Plain Washers
- bb) IS-2062: Steel for General structural purposes.
- cc) IS-2074: Ready mixed paint, air drying, red oxide zinc-chrome, priming.
- dd) IS-2633: Methods of testing uniformity of coating of zinc coated articles.
- ee) IS-3613: Acceptance tests for wire-flux combinations for submerged-arc welding of structural steels.
- ff) IS-3664: Code of practice for Ultrasonic Pulse echo testing by contact and immersions methods.
- gg) IS-3757: High strength structural bolts.
- hh) IS-4000: High strength bolts in steel structures.
- ii) IS-4759: Hot dip zinc coatings on structural steel and other allied products.
- jj) IS-5334: Code of practice for Magnetic Particle Flaw detection of welds.
- kk) IS-7215: Tolerances for fabrication of steel structures.
- ll) IS-7280: Base-wire electrodes for sub-merged arc welding of structural steels.
- mm) IS-7318: Approval test for welders when welding procedure approval is not required.
(Part-I)
- nn) IS-8500: Structural steel - micro alloyed (medium and high strength qualities).
- oo) IS-9595: Recommendation for metal arc welding of carbon and carbon manganese steels.
- pp) AWS D.1.1 Structural Welding Code.
- qq) IS-8640: Recommendations for dimensional parameters for industrial building.
- rr) IS-9178: Criteria for design of steel bins for storage of bulk material (all parts).
- ss) IS-12843: Tolerances for erection of steel structures.
- tt) IS-1181: Qualifying tests for Metal Arc welders (engaged in welding structures other than pipes).
- uu) IS-2595: Code of practice for Radiographic testing
- vv) IS-2629: Hot dip galvanising of iron and steel
- ww) IS-3502: Steel chequered plate.



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- xx) IS-3658: Code of practice for liquid penetrant flaw detection.
 yy) IS-4353: Sub merged arc welding of mild steel and low alloy steel Recommendation.
 zz) IS-5369: General requirements for plain washers and lock washer.
 aaa) IS-6623: High strength structural nuts.
 bbb) IS-6649: Hardened and tampered washers for high strength structural bolts & nuts.
 ccc) IS-6911: Stainless steel plate, sheet and strip.
 ddd) IS-7205: Safety code for erection of structural steel.
 eee) IS-7307: Approved test for welding procedures
 (Part I) Fusion welding of Steel
 fff) IS-7310: Approval test for welders working to approval welding procedure.
 (Part I) Fusion welding of Steel
 ggg) SP-6: IS Handbook for structural engineers.

2.16. Painting

- a) IS-348: Specification for French Polish.
 b) IS-427: Specification for Distemper, dry colour as required.
 c) IS-428: Specification for Distemper, oil emulsion, colour as required.
 d) IS-1477: Code of practice for painting of ferrous metal in buildings.
 (Part I & II)
 e) IS-2338: Code of practice for finishing of wood and wood based materials.
 (Part I & II)
 f) IS-2339: Specification for Aluminium Paints for general purposes in dual containers.
 g) IS-2395: Code of practice for painting concrete, masonry and plaster surface.
 h) IS-2932: Specification for enamel, synthetic, exterior - a) undercoating, b) finishing.
 i) IS-2933: Specification for enamel, exterior - a) undercoating, b) finishing.
 j) IS-5410: Specification for cement paint.
 k) IS-162: Ready mixed paint, brushing fire resisting, silicate type for use on wood, colour as required.
 l) IS-1650: Specification for colours for building and decorative materials.
 m) IS-2395: Code of practice for painting concrete, masonry and plaster surfaces.
 (Part I) Operations and Workmanship.
 (Part II) Schedule.
 n) IS-2524: Code of practice for painting of nonferrous metals in buildings.
 (Part I) Pre-treatment.
 (Part II) Painting.
 o) IS-15489: Plastic emulsion paint.
 p) IS-6278: Code of practice for white washing and Colour washing.
 q) IS-10403: Glossary of term related to building finish.
 r) IS-12027: Silicone based water repellent.
 s) IS-13238: Epoxy based zinc phosphate primer (2 pack).
 t) IS-13239: Epoxy surface (2 pack).
 u) IS-13467: Chlorinated rubber for paints
 v) IS-14209: Epoxy enamel, two component glossy.
 w) BS-5493: Code of practice for protective coating of iron and steel structures against corrosion.

2.17. Sheetting

- a) IS-277: Galvanised steel sheets (Plan & corrugated).
 b) IS-513: Cold-rolled low carbon steel sheets & strips.
 c) IS-730: Hook bolts for corrugated sheet roofing.
 d) IS-801: Code of practice for use of cold formed light gauge steel structural members in general building construction.



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- e) IS-7178: Technical supply condition for tapping screw.
- f) IS-8183: Bonded mineral wool.
- g) IS-8869: Washers for corrugated sheet roofing.
- h) IS-12093: Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanized steel sheets.
- i) IS-12436: Preformed rigid Polyurethane (PUR) and Polyisocyanurate (PIR) foams for thermal insulation.
- j) IS-12866: Plastic translucent sheets made from thermosetting polyester resin (glass fiber reinforced).
- k) IS-14246: Continuously pre-painted galvanized steel sheets and coils.
- l) BS-5950: Code of practice for design of light gauge profiled steel sheeting (Part VI)

2.18. Plastering

- a) IS-1661: Code of practice for application of cement and cement lime plaster finishes.
- b) IS-2402: Code of practice for external rendered finishes.
- c) IS-2547: Gypsum building plaster.

2.19. Acid / Alkali Resistant Tiling

- a) IS-158: Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting.
- b) IS-412: Expanded metal steel sheets for general purpose.
- c) IS-4443: Code of practice for use of resin type chemical resistant mortars.
- d) IS-4456: Method of Test for chemical resistant tiles.
(Part I & II)
- e) IS-4457: Ceramic unglazed vitreous acid resisting tiles.
- f) IS-4832: Specification for chemical resistant mortars.
(Part I) Silicon Type
(Part II) Resin Type
(Part III) Sulphur Type
- g) IS-9510: Bitumastic acid resisting grade.

2.20. Safety

- a) IS-1641: Code of practice for fire safety of buildings - General principles of fire grading and classification.
- b) IS-1642: Code of practice for fire safety of buildings - Details of construction.
- c) IS-3696: Safety code for scaffolds and ladders.
(Part I & II)
- d) IS-4081: Safety code for blasting and related drilling operations.
- e) IS-4130: Demolition of buildings - code of safety.
- f) IS-5121: Safety code for piling and other deep foundations.
- g) IS-5916: Safety code for construction involving use of hot bituminous materials.
- h) IS-7205: Safety code for erection of structural steel work.
- i) IS-7969: Safety code for handling and storage of building materials.



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2.21. Architectural Design of Buildings

- a) SP-7: National Building Code of India.
- b) SP-41: Hand book on functional requirements of buildings (other than industrial buildings).
- c) ECBC: Energy Conservation Building Code
- d) GRIHA: Green Rating for Integrated Habitat Assessment.

2.22. Other

- a) Indian Road Congress (IRC) Bridge Codes
- b) Indian Railway Standard Bridge Rules

3. GENERAL

All the quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications. In case of any conflict between stipulations in various portions of the specification, most stringent stipulation would be applicable for implementation by the Bidder without any extra cost to the Employer.

4. LAYOUT

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and bench mark. **If the Contractor uses the grid, bench mark and reference pillar made by other Contractors, he shall coordinate with the Contractor and shall satisfy himself of the accuracy of the reference marks.** If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and bench

mark which has been followed by other agency at the instruction of the Engineer. In case any discrepancy is found, it shall be immediately brought to the notice of the Engineer for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts.

If required, in the opinion of the Engineer, he shall construct and maintain pillars for grid, references and bench marks and maintain them till the completion of the construction. He shall also help the Engineer with instruments, materials and labours for checking the detailed layouts and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and Engineer's approval shall not be deemed to imply any warranty in carrying out the works correctly. The Tenderer's shall take into account the cost of these in quoting their price.

5. WORKMANSHIP

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrication shall be done in shops having proper equipment for accurate edge and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various trades, the Contractor shall arrange to have the work done by such registered or



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licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost to the Owner, the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

6. TEMPORARY WORK

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re erection, if required, shall be carried out by the Contractor at the direction of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

7. INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.

8. SEQUENCE OF WORK AND PROGRESS REPORT

The sequence in which the works are to be carried out shall be as approved by the Engineer in accordance with the construction method accepted by the Engineer and to be followed by the Contractor. A programme of work is to be submitted for the Engineer's review and approval and this has to be periodically updated and modified as per actual progress to enable timely completion.

The Contractor shall regularly submit to the Engineer progress reports for periods of working as specified by the Engineer showing up to date progress on all important items of work.

9. CONSTRUCTION METHODOLOGY

Construction and erection activities shall be fully mechanized from the start of the work. All excavation and backfilling work shall be done using excavators, loaders, dumpers, dozers, porcelains, excavator mounted rock breakers, rollers, sprinklers, water tankers, etc. Manual excavation can be done only on isolated places with specific approval of engineer.

Dewatering shall be done using the combination of electrical and standby diesel pumps.

For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.

All handling of materials shall be with cranes.

Heavy trailers shall be used for transportation.



**SPECIFIC TECHNICAL REQUIREMENT
FOR CIVIL, STRUCTURAL &
ARCHITECTURAL WORKS FOR FLUE
GAS DESULPHURISATION (FGD) SYSTEM
PACKAGE FOR NORTH KARANPURA
STPP (3X660 MW)**

SPECIFICATION NO. PE-TS-441-600-001

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SECTION - C

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SHEET 16 OF 17

Mechanized modular units of scaffolding and shuttering shall be used.

Grouting shall be carried out using hydraulically controlled grouting equipment.

All finishing items shall be installed using appropriate modern mechanical tools. Manual punching etc. shall not be permitted.

Heavy duty hoists for lifting of construction materials shall be deployed.

Compressors for cleaning of foundations and other surfaces shall be used.

Field laboratory shall be provided with all modern equipment for survey, testing of soil, aggregates, concrete, welding, etc.

All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/ erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.



**SPECIFIC TECHNICAL REQUIREMENT
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PART-II

SPECIFIC TECHNICAL REQUIREMNT

NTPC Limited

(A Government of India Enterprise)



**NORTH KARANPURA SUPER THERMAL
POWER PROJECT (3x660MW)**

PART – A

TECHNICAL SPECIFICATIONS

SECTION – VI

FOR

**FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE**

BIDDING DOCUMENT NO.: CS-4410-109-2

NTPC Limited

(A Government of India Enterprise)



**NORTH KARANPURA SUPER THERMAL
POWER PROJECT (3x660MW)**

PART - A

TECHNICAL SPECIFICATIONS

SECTION – VI

FOR

**FLUE GAS DESULPHURISATION (FGD)
SYSTEM PACKAGE**

BIDDING DOCUMENT NO.: CS-4410-109-2

(This document is meant for the exclusive purpose of bidding against this Package and shall not be transferred, reproduced or otherwise used for purposes other than that for which it is specifically issued).

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PART - A

**NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2**

SUB-SECTION-I

INTENT OF SPECIFICATION

**NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2**

CLAUSE NO.	INTENT OF SPECIFICATION			
1.00.00	INTENT OF SPECIFICATION			
1.01.00	Scope of the proposal The scope of the proposal for Engineering, Supply, Construction, Erection, Testing & Commissioning works of Flue Gas Desulphurisation (FGD) System Package for Northkaranpura Super Thermal Power Project (3 x 660 MW) shall be on the basis of a single point responsibility, completely covering the following activities and services in respect of all the equipment specified and covered under the specifications and read in conjunction with “Scope of Supply & Services”, Sub-section-III, Part-A, Section – VI of Technical Specification. a) Basic Engineering of the plant including preparation of Plant Definition Manuals; b) Detailed design of all the equipment and system(s) including civil, structure steel works included in bidder's scope. c) Providing engineering drawings, equipment sizing & performance data, instruction manuals, as built drawings and other information; d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required; e) Complete manufacturing including shop testing/type testing; f) Complete Civil, Structural and Architectural works, including survey, providing construction offices, field laboratory and construction equipments; g) Packing and transportation from the manufacturer's works to the site including customs clearance & port clearance, port charges, if any. h) Receipt, storage, preservation, handling and conservation of equipment at the site; i) Fabrication, pre-assembly, if any, erection, testing, commissioning and completion of facilities including putting into satisfactory operation all the equipment including successful completion of initial operation; j) Reliability tests, performance and guarantee tests after successful completion of facilities; k) Furnishing of spares on FOR site basis; l) Reconciliation with customs authorities, as required.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 1 OF 18

CLAUSE NO.	INTENT OF SPECIFICATION			
1.02.00	m) Satisfactory conclusion of the contract. n) Insurance and other requirements for the complete FGD package in accordance with the provisions of general conditions of contract (Section-IV) of the bidding document. The requirements, conditions, appendices etc. given in Technical Specifications (Section-VI, Parts A, B, C, D, E & F and shall apply to and shall be considered as a part of this volume as completely as if bound here with. The work to be carried out as per the above scope shall be all in accordance with the requirements, conditions, appendices, etc., stated in Section GCC, which shall be considered as a part of the Technical Specification (Section VI) as completely as if bound herewith. The Contractor shall be responsible for providing all material, equipment and service, which are required to fulfill the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. It is not the intent to specify completely herein, all aspects of design and construction of equipment, nevertheless, the equipment shall conform in all aspects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the Employer, who will interpret the meaning of the specification, drawings and shall have a right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specification and/or applicable international standards mentioned elsewhere in the specification. Bidders are requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specification. The Bidder's offer should not carry any sections like clarifications, interpretations and/or assumptions. In the event of conflict between the Technical Specifications and the Conditions of Contract, the requirements as indicated in the technical specification shall govern, unless confirmed otherwise by the Employer in writing before the award of this contract, based on a written request from the Bidder for such a clarification. However, if the Bidder feels that, in his opinion, certain features brought out in his offer are superior to what has been specified, these may be highlighted separately. The Bidder may also make alternate offers provided, such offers are superior in his opinion, to the requirements of these specifications in which case, adequate technical information, operating feed back, etc., are to be enclosed with the offer, to enable the Employer to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumption etc., shall be clearly brought out for the Employer to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications. Under no circumstances the specified equipment and services shall be brought out as an alternative offer.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 2 OF 18

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	In case, all the above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.			
1.03.00	The following are the equipment's covered in this specification:			
1.03.01	Wet limestone based Flue gas desulphurization(FGD) for 2X 800 MW unit, capable of reducing to the specified limits the emissions of Sulphur Dioxide in flue gas produced by specified coal being fired in boiler, complete with all accessories and auxiliary equipment's as per specification requirements including Absorber for each unit with Slurry re-circulation pumps & Oxidation blowers, common Limestone Grinding system, common Gypsum dewatering system.			
1.03.02	~~One (1) number of elevator for each absorber and One (1) numbers of elevator for Limestone Grinding System building.~~			
1.03.03	Buildings for Slurry re-circulation pumps/Oxidation blowers, Limestone Grinding System, Gypsum dewatering system & FGD control Room.			
1.03.03	~~All motors, HT & LT Switchgears, DC System, Transformers, Electrical Actuators, HT & LT power & control cables, DG set (if applicable), cabling, lighting etc.~~			
1.03.03	~~Associated Control & Instrumentation (C&I) equipments.~~			
1.03.04	Associated Civil, Structural and Architectural works including foundation as specified in Technical Specification.			
1.04.00	Wherever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific items mentioned shall be understood to be descriptive only and not restrictive. Such description indicates the equipment type, function and quality desired. Other manufacturer's products may be considered provided sufficient information so as to enable the Employer to determine that the products proposed are equivalent to those named.			
2.00.00	Additional Requirements (a) Before submitting his bid, the Bidder should inspect and examine the site and its surroundings and should satisfy himself as to the nature of the ground and subsoil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer. (b) Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the contractor on account of			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 3 OF 18

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3.00.00	negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the contractor at his own cost to the satisfaction of the Employer. The contractor shall also take all necessary safety measures with specific reference to excavation in rock, at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power plant. (c) For his site office and covered store buildings, the contractor shall adopt pre-engineered / pre-fabricated constructions made of steel with single / double skin, insulated or uninsulated roof and wall coverings (fabricated out of permanently color coated metal sheets). Alternatively, contractor can adopt readymade 'Porta cabin' or similar construction. Contractor shall ensure that all such constructions are well engineered, neatly constructed and overall present a pleasing look. (d) In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, contractor shall use ash and ash based products in works as specified in these specifications, drawings and as per instructions of the Engineer. He shall also use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. (e) Contractor shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like piling rigs, cranes batching plant, dewatering pumps etc.) In case of piling rigs, cranes, batching plant etc. he will also make arrangements / tie up with equipment manufacturers / suppliers for periodic overhaul/maintenance and for major breakdown, if any. He shall also keep adequate stock of spares at site for various plant, equipment and machinery to meet day to day requirements as recommended by the equipment manufacturer/suppliers or as instructed by the Engineer. Contractor shall deploy dedicated qualified, full time mechanical/electrical foreman/supervisors for manning the repair facilities as specified above.			
	APPLICABLE DRAWINGS The drawings listed below and forming part of the specification (Refer Part-E) shall supplement the requirements specified herein. The scope and terminal points of the equipment to be furnished under this steam generator package shall be as identified in these drawings and read in conjunction with text of the specification: (A) LAYOUT & CIVIL DRAWINGS (1) Layout Plan of FGD System :Drg No.: 4410-999-POC-F-001 (2) Equipment layout Plan : Drg No. : 4410-999-POM-F-001			
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	(D) ELECTRICAL (1) Electrical single line diagram for FGD Package : Drg No. 4410-109-POE-J-004 (2) Ladder type Cable Tray : Drg No. 0000-211-POE-A-001 (3) Perforated type Cable Tray : Drg No. 0000-211-POE-A-002 (4) Cable tray details Horizontal TEE : Drg No. 0000-211-POE-A-004 (5) Cable tray 90 bends : Drg No. 0000-211-POE-A-005 (6) Cable Tray 90 Vertical elbow (outside) 90 vertical elbow (inside) : Drg No. 0000-211-POE-A-006 (7) Cable tray details cross : Drg No. 0000-211-POE-A-008 (8) C1 & C2 Channel, Cable Tray Support System : Drg No. 0000-211-POE-A-013 (9) Typical Details of Cable Tray Support System : Drg No. 0000-211-POE-A-014 (10) Typical Details of Cable Tray Support System : Drg No. 0000-211-POE-A-015 (11) Cantilever Arms : Drg No. 0000-211-POE-A-016 (12) Typical Details of Cable Tray Support System : Drg No. 0000-211-POE-A-017 (13) Typical Details of Cable Tray Support System : Drg No. 0000-211-POE-A-018 (14) Fixing of Channel in Trench Wall : Drg No. 0000-211-POE-A-019 (15) Bracket Floor Plate Light Duty : Drg No. 0000-211-POE-A-020 (16) Bracket Floor Plate Heavy Duty : Drg No. 0000-211-POE-A-021 (17) Bracket C1 Channel Clamp Heavy Duty & Bracket C2 Channel : Drg No. 0000-211-POE-A-022 (18) Fixing of channel for trestle and trestle Bracket : Drg No. 0000-211-POE-A-022A (19) Bracket Right Angle & Bracket Right Angle Heavy Duty : Drg No. 0000-211-POE-A-023 (20) Beam Clamp : Drg No. 0000-211-POE-A-024			
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	(21) Bracket C1 Channel Clamp : Drg No. 0000-211-POE-A-025 (22) Bracket Beam Clamp : Drg No. 0000-211-POE-A-026 (23) Standard cable support assembly : Drg No. 0000-211-POE-A-030 (24) Standard cable support assembly : Drg No. 0000-211-POE-A-031 (25) Standard cable support assembly : Drg No. 0000-211-POE-A-032 (26) Standard cable support assembly : Drg No. 0000-211-POE-A-033 (27) Standard cable support assembly : Drg No. 0000-211-POE-A-034 (28) Standard cable support assembly : Drg No. 0000-211-POE-A-035 (29) Typical interconnection details between two perpendicular trestles : Drg No. 0000-211-POE-A-035A (30) Typical details of structure for testing: Drg No. 0000-211-POE-A-036 (31) Typical details of structure for testing: Drg No. 0000-211-POE-A-037 (32) Typical details of structure for testing: Drg No. 0000-211-POE-A-039 (33) Typical drawing for junction box : Drg No. 0000-211-POE-A-040 (34) Earthing details : Drg No. 0000-211-POE-A-041 (35) Earthing details : Drg No. 0000-211-POE-A-042 (36) Earthing details : Drg No. 0000-211-POE-A-043 (37) Earthing details : Drg No. 0000-211-POE-A-044 (38) Earthing details : Drg No. 0000-211-POE-A-045 (39) Lightning Protection details : Drg No. 0000-211-POE-A-047 (40) Lightning Protection details : Drg No. 0000-211-POE-A-048 (41) Adaptor box for LT cables : Drg No. 0000-211-POE-A-048A (42) Buried cable trench details for lightning: Drg No. 0000-211-POE-A-049 (43) Buried cable trenches for HT and LT cables : Drg No. 0000-211-POE-A-050 (44) Typical Section of Cable Tray Arrangement in Trestle : Drg No. 9591-999-POE-J-004 (45) MV busduct support structure types : Drg No. 0000-000-207-E-002 (46) Interfacing of Actuators : Drg No. 0000-999-POI-A-063	
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	Note : All the above drawings are indicative of Employer’s requirements to enable the Bidder to make a suitable offer. All variations/alternations shall be clearly brought out in the technical deviation schedule with implications, if any. Such variations may be acceptable, after assessment of its implication and shall be subjected to the Employer’s approval. However, the flexibility of operation and maintenance desired by the schemes and layouts shall be binding. Electrical drawings (except Electrical single line diagram) are attached with respective Electrical Chapters in Part b, Section VI.																		
4.00.00	QUALIFYING REQUIREMENTS FOR EQUIPMENTS/SYSTEMS																		
4.01.01	Provenness criteria for critical equipment, auxiliaries, systems and bought out items: The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:																		
4.01.02	Booster Fans, Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators & Vacuum Belt Filters for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder: <u>Type and Rating for Qualification</u> <table><tr><th>Sl. No.</th><th>Name of Equipment</th><th>Type of Equipment</th><th>Application</th><th>Equipment Rating</th></tr><tr><td>(a)</td><td>Booster Fans</td><td>Axial type with variable pitch control</td><td>Coal fired power plant</td><td>80% of the flow & 100% of the head of the offered Booster Fan with Fan Speed 900 rpm (maximum)</td></tr><tr><td>(b)</td><td>Slurry Recirculation Pumps</td><td>Centrifugal type</td><td>Wet Limestone based FGD application in Coal fired power plant</td><td>80% of the flow & 100% of the head of the offered Slurry Recirculation Pump</td></tr></table>	Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating	(a)	Booster Fans	Axial type with variable pitch control	Coal fired power plant	80% of the flow & 100% of the head of the offered Booster Fan with Fan Speed 900 rpm (maximum)	(b)	Slurry Recirculation Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Recirculation Pump			
Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating															
(a)	Booster Fans	Axial type with variable pitch control	Coal fired power plant	80% of the flow & 100% of the head of the offered Booster Fan with Fan Speed 900 rpm (maximum)															
(b)	Slurry Recirculation Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Recirculation Pump															
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	~~Sl. No.~~	~~Name of Equipment~~	~~Type of Equipment~~	~~Application~~	~~Equipment Rating~~	
	(c)	Oxidation Blowers	Centrifugal/ positive displacement type blower	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Oxidation Blower	
	(d)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru 325 mesh	
	(e)	Slurry Pumps	Centrifugal type	Wet Limestone based FGD application or ash slurry application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Pump(s)	
	(f)	Agitators	Vertical/Horizontal	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application	
	(g)	Vacuum Belt filters	Belt type	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Vacuum Belt filter capacity	
4.01.03	Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified. The provenness criteria for equipment (Booster Fans) stipulated at Sl. No. 4.01.02(a) above shall also be considered acceptable provided the rating parameters (i.e., flow, head and rated rpm) is covered within the operating regime of the respective fan performance curve of the reference plant equipment. In case the Bidder or the proposed sub-vendor is not manufacturer of proven Booster Fans as per clause 1.2(a) above but is a manufacturer of such equipment for units of at least 500 MW rating, the Bidder or the proposed sub vendor can manufacture such equipment for 660 MW units also, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such					
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4.01.04	equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(a) above for the Booster Fans. A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.01.02 above in India, can also manufacture such equipment(s), provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.01.02 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). However, in this case, the proposed JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.01.02 above by himself should have sourced / shall source such proven equipment(s) for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for a particular equipment. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only) for each equipment.			
4.01.05	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Oxidation Blowers as per clause 4.01.02(c) above but is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity, the Bidder or the proposed sub-vendor can also manufacture Oxidation Blowers, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Oxidation Blowers in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(c) above for the Oxidation Blowers. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.			
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4.01.06	In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Oxidation Blowers. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only). In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.02(d) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(d) above for the Wet limestone Grinding mills. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Wet limestone Grinding mills. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).			
4.01.07	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.01.02(f) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor can also manufacture Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(f) above for the Agitators. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the			
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4.01.08	successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Agitators. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only). In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(e) above for the Slurry Recirculation Pumps. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment. In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Slurry Recirculation Pumps. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).			
4.01.09	Before taking up the manufacturing of such equipment(s) as per clause 4.01.03, 4.01.04,4.01.05,4.01.06, 4.01.07 & 4.01.08 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licenser's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.			
4.01.10	Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licenser(s) proposed by the Bidder for the above equipment(s) is qualified.			
4.01.11	The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.			
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4.02.00 4.02.01 4.02.02 4.02.03 4.02.04 4.02.05	Note to clause 4.01.02 (1) Whenever the term 'coal fired' is appearing above, "Coal" shall be deemed to also include bituminous coal/brown coal/lignite. Sub QR for Civil Works: Bidder or its agency should have in past executed civil and structural works for 500 MW or higher capacity coal based/Lignite based power plant including earthwork in filling involving mechanical compaction and cutting in hard rock, foundations, Bulk material handling plant involving underground storage hopper and underground tunnels. Bidder can engage more than one agency, in case the Bidder itself is not able to meet the requirement at 4.02.01. The agency being engaged for a particular work should have in the past executed such works of 500 MW or higher capacity plant. For Chimney, Bidder or its agency should have in the past built atleast one (1) reinforced concrete chimney of minimum 100m height. In case Bidder or its agency do not meet the requirements at 2.1 and the Bidder proposes to engage agency (ies) for civil & structural works on work volume basis (except for Chimney), Bidder or its agency (ies) should have executed such works in the past and the annual rate of execution in the reference works should not be less than eighty percent (80%) of the asking rate of such works, (structural steel fabrication & erection, RCC, earthwork in filling involving mechanical compaction and cutting in hard rock, RCC in underground storage hopper and underground tunnels) for which it is being engaged. Successful Bidder shall finalize the agency (ies) for each work in consultation with Engineer-in-charge at site before engaging them. Design agency for Civil & Steel Structural Works: Bidder or its agency (ies) should have carried out the design and detailed engineering of following works: (i) Civil & Structural works associated with at least one bulk material handling plant for 500 MW or higher capacity coal based/Lignite based power plant. (ii) For Chimney, Bidder or its design agency (ies) should have carried out design & detailed engineering of at least one reinforced concrete chimney with steel flues, of minimum 100m height. (iii) Machine foundations such as Mill foundations/ Block foundations.			
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4.02.06	Bidder can engage more than one agency (of repute), in case the Bidder itself is not able to meet the requirement at 4.02.05. The design agency (ies) proposed by the Bidder shall be subject to Employer's approval.			
4.03.00	PROVENNESS CRITERIA FOR ELECTRICAL EQUIPMENTS			
4.03.01	HT MOTORS			
4.03.01.1	BOOSTER FAN MOTOR The offered Squirrel cage Induction motor shall be from such a Manufacturer who has manufactured and supplied motor of 4MW or above rating, which should have been in successful operation for at least one (1) plant for a period not less than one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02	LT SWITCHGEAR			
4.03.02.1	ROUTE 1			
4.03.02.1(i)	Bidder/ Sub Vendor should have manufactured and supplied at least a total of four hundred & fifty (450) nos. draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for 1 second and 105kA peak under a single order and these panels should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.1(ii)	Bidder/ Sub Vendor should have manufactured and supplied at least one hundred & fifty (150) nos. of Air Circuit Breakers having fault rating of at least 105kA MAKING and 45kA BREAKING, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for 1 Second and 105kA peak, which should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.2	ROUTE 2			
4.03.02.2(i)	Bidder/Sub-vendor should have manufactured and supplied at least a total of two hundred & twenty five (225) nos. draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for 1 second and 105kA peak under a single order and these panels should have been in			
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4.03.02.2(ii)	successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder. Bidder/Sub-vendor should have manufactured and supplied at least seventy five (75) nos. of draw out type Air Circuit Breaker panels having fault rating of at least 45kA for 1 second and 105kA peak, which should have been in successful operation for a period of not less than two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.02.2(iii)	Bidder/Sub-vendor shall Associate/Collaborate with a manufacturer who meets the requirements stipulated in Route 1. In such a case, Bidder/Sub-vendor should furnish a Deed of Joint Undertaking executed by Bidder/Sub-vendor and its Associate/Collaborator as per the format enclosed in the bidding document in which the Bidder/Sub-vendor and its Associate/Collaborator are jointly and severally liable to the Employer for successful performance of the LT Switchgears under this package. This Deed of Joint Undertaking should be submitted prior to the placement of order on approved Sub Vendor. In case of award, the Associate or Collaborator of the Bidder / Sub Vendor (as applicable) will be required to furnish an on-demand Bank Guarantee for INR 1 Million (Indian Rupees One Million only). Note: Each Single Front Panel shall be counted as one (1) Panel, Double Front Panel as one (1) Panel and Air Circuit Breaker Panel as one (1) Panel.			
4.03.03	11 KV / 3.3 KV SWITCHGEARS Route 1			
4.03.03.1	The Bidder/ Sub Vendor should have manufactured and supplied on an average one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels per annum during the last three years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.2	The Bidder/ Sub Vendor should have designed, manufactured and supplied at least one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels complete in all respects with fault rating of at least 40kA for one (1) second and 100kA (peak), which should have been in successful operation for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
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4.03.03.3	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit Breakers for 11kV and /or 6.6kV panels with a rating of 40kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second, which should have been in successful operation in 6.6kV or higher voltage application for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder. Route 2 Bidder/ Sub Vendor based on technological support of its Associate or Collaborator, can also participate provided			
4.03.03.4	The Bidder/ Sub Vendor should have manufactured and supplied on an average one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels per annum during the last three years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.5	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of 11kV and /or 6.6kV Switchgear panels complete in all respects with fault rating of at least 40kA for one (1) second and 100kA (peak). The Bidder/ Sub Vendor should have type tested the offered type of panels as specified.			
4.03.03.6	The Bidder/ Sub Vendor should have manufactured and supplied at least one hundred (100) numbers of Vacuum Circuit Breakers for 11kV and /or 6.6kV panels with a rating of 40kA rms BREAKING, 100kA peak MAKING and 40kA withstand for one (1) second,reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.03.7	Bidder's/ Sub Vendor's Associate or Collaborator meets the qualifying requirement stipulated at 4.03.03.2 & 4.03.03.3 stipulated under Route 1.			
4.03.03.8	Bidder/ Sub Vendor furnishes a Deed of Joint Undertaking jointly executed by it and its Associate/ Collaborator as per format enclosed in the bidding document in which the Bidder/ Sub Vendor and its Associate/ Collaborator are jointly and severally liable to the Employer for successful performance of the MV Switchgears. This Deed of Joint Undertaking should be submitted prior to the placement of order on approved Sub Vendor. In case of award, the Associate or Collaborator of the Bidder / Sub Vendor (as applicable) will be required to furnish an on-demand Bank Guarantee for INR1 Million(Indian Rupees One Million only). Note: Equipment designed by the Bidder itself or through its Collaborator/Associate for reference plant, shall also be considered meeting the requirement of design.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 16 OF 18

CLAUSE NO.	INTENT OF SPECIFICATION	एनटीपीसी NTPC		
4.03.04	NUMERICAL RELAYS & NETWORKING			
4.03.04.1	Numerical Relays shall be offered from a Manufacturer who has manufactured and supplied and successfully configured at least 100 No's of Numerical Relays with IEC 61850 used for application in Feeder Protections/Transformer Protections/Motor Protections. These relays should have been in successful operation for at least one (1) year reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.04.2	The Numerical Relay Network system shall be offered from an Integrator /Manufacturer who has designed and successfully done FAT for a network on IEC 61850 with at least 100 no's of Communicable Numerical Relays reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
4.03.05	AUXILIARY OIL FILLED TRANSFORMERS			
4.03.05.1	The Bidder/ Sub-Vendor should have manufactured & supplied at least two numbers (one each at two different installations) of 16 MVA, 11KV or higher rating oil filled transformers which should have been in successful operation for a period of at least two (2) years reckoned as on the date of consideration for approval but not later than six months after award date of contract to the Main bidder.			
	And			
4.03.05.2	Bidder/ Sub-Vendor should have his own facilities for conducting all routine and type tests as per IS: 2026 (except short circuit test).			
	And			
4.03.05.3	16 MVA, 11 KV Class or higher rated oil filled transformer manufactured by Bidder/ Sub-Vendor should have been successfully short circuit tested.			
	Note: i) Two different installations mean two different project sites or two different contracts. ii) Equipment designed by the Bidder/Sub-vendor by itself or through its Collaborator/Associate for reference plant, shall also be considered meeting the requirement of design.			
4.04.00	Balance equipments/ systems The Bidder at his option can source the balance of plant equipment/systems not covered in clause 4.01.00 & 4.02.00 above. However for such balance of plant equipment/systems, the Employer reserves the rights to satisfy himself on the provenness of the equipment and capability and capacity of the manufacturers.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2		SUB-SECTION-I INTENT OF SPECIFICATION PAGE 17 OF 18

CLAUSE NO.	INTENT OF SPECIFICATION		
4.05.00 4.06.00	Notwithstanding anything stated above, the Employer reserves the right to assess the capabilities and capacity of the Bidder/his collaborators/ licenser/ his sub-contractors to perform the contract, should the circumstances warrant such assessment in the overall interest of the Employer. To enable the approval of sub-vendors, the Bidder shall provide all necessary data such as type, design, make, capacity, duty conditions, date of commissioning/ operation etc.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-I INTENT OF SPECIFICATION	PAGE 18 OF 18

SUB-SECTION-II

PROJECT INFORMATION

**NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2**

CLAUSE NO.	PROJECT INFORMATION															
1.00.00	BACKGROUND North Karanpura Super Thermal Power Project (3x660 MW), a pit head coal based thermal power project, is located in Hazaribagh and Chatra districts of Jharkhand State. Basic inputs i.e. coal, water and land have already been tied up. The project is proposed for the States & Union Territories of Northern, Western and Eastern Regions and the State of Jharkhand. The capacity of the project is 1980 MW comprising of three (3) units of 660 MW each.															
1.01.00	Location and Approach The power project is proposed to be located near Tandwa town in Chatra districts in the state of Jharkhand on Hazaribagh-Chatra State highway at a distance of about 50 kms from Hazaribagh city. The nearest commercial airport is Ranchi at a distance of 100 kms from project site. The nearest railhead Khalari Railway Station on Ranchi-Garhwa section of Eastern Railways is about 25 kms from project site. Major rail/road distances from the project site are as under: <table><tr><td>City</td><td></td><td>Distance Approx. (kms)</td></tr><tr><td>Ranchi</td><td>:</td><td>80</td></tr><tr><td></td><td>:</td><td>25</td></tr><tr><td>Khalari</td><td></td><td></td></tr></table> The site is located near Tandwa town having latitude and longitude of about 23° 50' N to 23° 52' N and 84° 59' E to 85° 2' E respectively. The Vicinity Plan of the project is placed at Annexure-I . Further to the information given in this sub-section, Bidders are also advised to visit the project site and collect data on local site conditions.				City		Distance Approx. (kms)	Ranchi	:	80		:	25	Khalari		
City		Distance Approx. (kms)														
Ranchi	:	80														
	:	25														
Khalari																
1.02.00	Land The plant layout was readjusted and total land requirement was reduced from 2330 acres to about 970 acres. Out of 2277 acres of land the plant, ash dyke and transit camp is being suitably adjusted. No additional land is envisaged to be acquired in plant area. About 15 acres of land is envisaged to be acquired in Hazaribagh city for Township. Commissioner, Chatra vide dated 25.05.1999 and 14.06.2000 has given in-principle clearance for NKSTPP.															
1.03.00	Water Make up water requirement for this project would be about 20 cusec. Make up water requirement shall be met by raw water reservoir. Intake water pumps shall pump water to reservoir during the rainy season only from Garhi barrage.															
1.04.00	Fuel (Coal)															
1.04.01	Coal Requirement, Availability and Linkage Coal requirement for the project is estimated as 10.60 Million Tonne/Annum (MTPA), considering a GCV of 3800 kcal/kg. Ministry of Coal vide letter dated 21.10.99 accorded inprinciple coal linkage of 10.00 MTPA subject to ratification by Standing Linkage Committee-Long Term (SLC (LT)), of MOC. SLC (LT) in its meeting held on 15.12.2000 firmed up the															
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-II PROJECT INFORMATION	PAGE 1 OF 10												

CLAUSE NO.	PROJECT INFORMATION			
1.07.00	Criteria for Earthquake Resistant Design of Structures and Equipment All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in the Part - B of this section.			
1.08.00	Criteria for Wind Resistant Design of Structures and Equipment All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part B of this section.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-4410-109-2	SUB-SECTION-II PROJECT INFORMATION	PAGE 3 OF 10

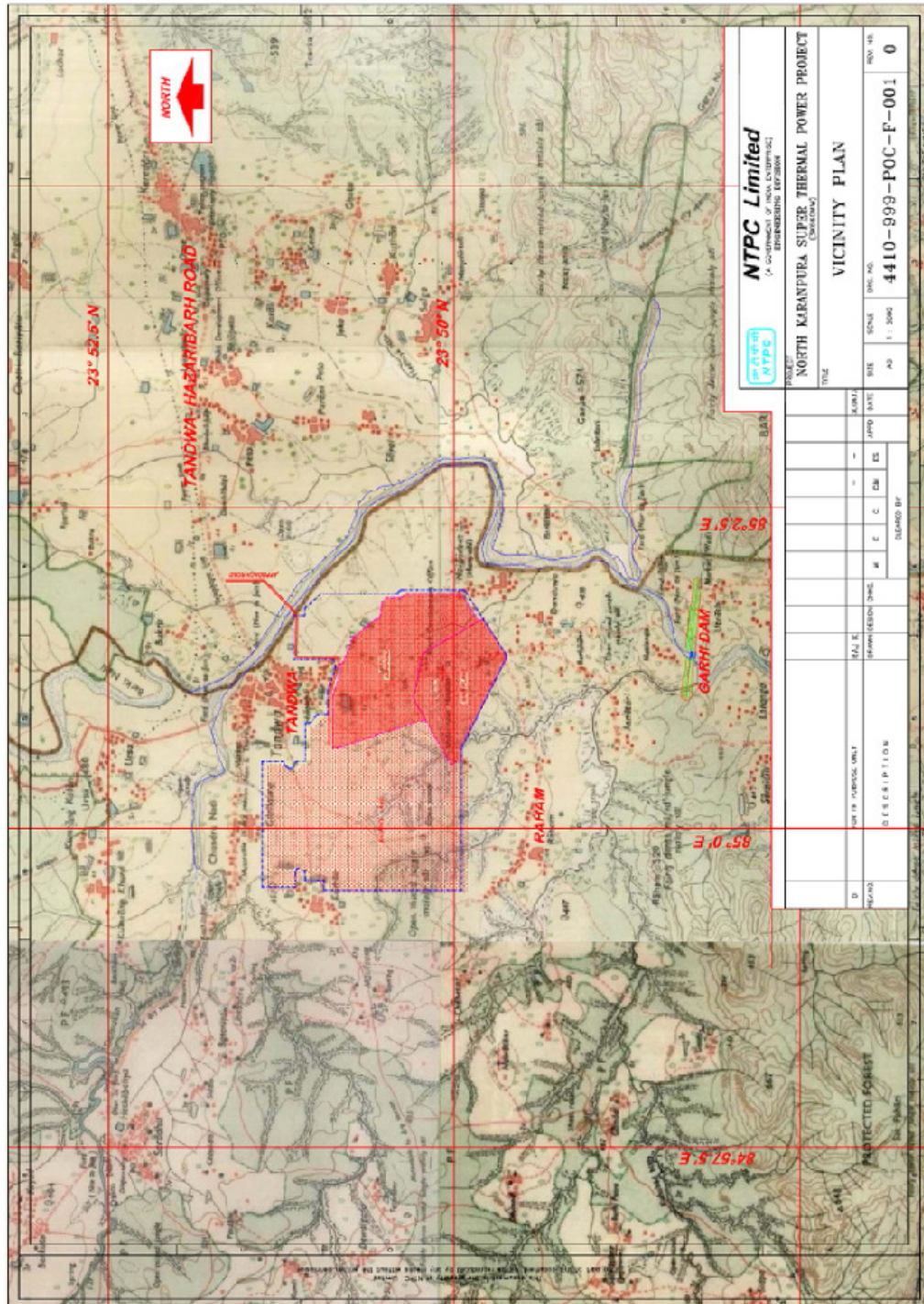
CLAUSE NO.

PROJECT INFORMATION



ANNEXURE – I

VICINITY PLAN



**NORTH KARANPURA SUPER THERMAL
POWER PROJECT (3X660 MW)
FLUE GAS DESULPHURISATION
SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION – VI, PART-A
BID DOC. NO CS-4410-109-2**

**SUB-SECTION-II
PROJECT INFORMATION**

**PAGE
4 OF 10**

CLIMATOLOGICAL TABLE

[illegible]



CLAUSE NO.

PROJECT INFORMATION

ANNEXURE-III

RAW WATER ANALYSIS

Sl. No	Constituent	as	mg per litre
1.	Calcium	CaCO ₃	65
2.	Magnesium	CaCO ₃	41
3.	Sodium	CaCO ₃	98
4.	Potassium	CaCO ₃	5
5.	Total Cations	CaCO ₃	209
6.	Total Alkalinity	CaCO ₃	150
7.	Chloride	CaCO ₃	25
8.	Sulphate	CaCO ₃	34
9.	Total Anions	CaCO ₃	209
9.	Silica (Reactive)	SiO ₂	9
11.	Iron	Fe	1.2
12.	pH Value	-	7.6-8.2
13.	Turbidity	NTU	200
14.	Organics(As per KMnO ₄ method)	Number	2

CLARIFIED WATER ANALYSIS

Sl. No.	Constituent	Value	Unit
1	Iron	<0.3	mg/L as Fe
2	Turbidity	<10	NTU
3	Organics (as per KMnO ₄ method)	<0.05	mg/L
4	Gravity Filter Outlet (Effluent Turbidity)	<2	NTU
5	Gravity Filter Inlet (Turbidity)	10	NTU



CLAUSE NO.

PROJECT INFORMATION

ANNEXURE-IV-1

TABLE-1
LIGHT DIESEL OIL CHARACTERISTICS
(AS PER IS 15770-2008)

Characteristics		LDO
1.	Pour Point (max)	21 °C & 12°C for Summer and Winter respectively
2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0
3.	Sediment percent by mass (max)	0.10
4.	Total sulphur percent by mass (max)	1.5
5.	Ash percentage by mass (max)	0.02
6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50
7.	Acidity inorganic	Nil
8.	Flash point (Min.) -Pensky Martens	66 deg.C
9.	Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2
10.	Water content, % by volume (max)	0.25
11.	GCV(kcal/kg)	10,000

CLAUSE NO.

PROJECT INFORMATION



TABLE-2

ANNEXURE-IV-2

HIGH SPEED DIESEL OIL CHARACTERISTICS

[AS PER IS 1460-2005 (BS-II)]

S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES		
	a. Distillation volume recovery @ 350 ⁰ C	% vol. (min)	85
	b. Distillation volume recovery @ 370 ⁰ C	% vol. (min)	95
	c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0
	d. Density @ 15 Degree C	kg/m ³	820 – 860
	e. Pour Point		
	- Summer	Degree C (max)	15
	- Winter	Degree C (max)	03
	f. Cold Filter Plugging Point		
	- Summer	Degree C (max)	18
	- Winter	Degree C (max)	06
	g. Flash Point (Abal)	Degree C (max)	35
	h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460
2.	HEATING VALUE		
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300
3.	ACIDITY		
	a. Inorganic	mg KOH/g	Nil
	b. Total	mg KOH/g	0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100 ⁰ C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS		
	a. Ash	ppm (wt.)	100 (max)
	b. Sediments	% wt	0.05 (max)
	c. Total Sulphur	% wt	0.05 (max)
	d. Water Content	% volume	0.05 (max)
	e. Trace Metals		
	- Na + K	ppm (wt)	0.30 (max)
	- Vanadium	ppm (wt)	0.50 (max)
	- Lead	ppm (wt)	0.50 (max)
	- Calcium	ppm (wt)	2.0
	- Ni + Zn	ppm (wt)	Nil
7.	Nitrogen content (FBN)	% wt.	0.015

CLAUSE NO.

PROJECT INFORMATION



TABLE-3

ANNEXURE-IV-3

PROPOSED COAL CHARACTERISTICS FOR NORTH KARANPURA				
STPP (3 x 660 MW)				
S.No.	Characteristics (as received basis)	Range of 95 % coal supplies		
		Column - 1	Column - 2	Column - 3
1.0	PROXIMATE ANALYSIS	Design	Worst	Best
1.1	Total Moisture (%)	15	18	12
1.2	Ash (%)	40	46	36
1.3	Volatile Matter (%)	19	18	22
1.4	Fixed Carbon (%)	26	18	30
1.5	Total (%)	100	100	100
2.0	ULTIMATE ANALYSIS			
2.1	Carbon (%)	29.73	23.08	37.32
2.2	Hydrogen (%)	3.7	3.54	3.92
2.3	Sulphur (%)	0.5	0.6	0.4
2.4	Nitrogen(%)	1.8	1.45	1.6
2.5	Oxygen(%) (By difference)	8.66	6.7	8.32
2.6	Carbonates (%)	0.58	0.6	0.4
2.7	Phosphorous(%)	0.03	0.03	0.04
2.8	Total Moisture (%)	15	18	12
2.9	Ash (%)	40	46	36
	Total	100	100	100
2.10	GCV (Kcal/Kg)	3300	2800	4000
2.11	Hard Grove Index	55	50	60
3.0	ASH ANALYSIS			
3.1	Silica (%)	59.79	61.3	56.7
3.2	Alumina(%)	25.36	28	23.5
3.3	Iron Oxide (%)	7.2	6	10
3.4	Titania	1.2	1	1.5
3.5	Phosphoric Anhydride (%)	2.6	1.5	3
3.6	Lime (%)	0.88	0.5	1.5
3.7	Magnesia (%)	0.55	0.4	1
3.8	Sulphuric Anhydride (%)	1.2	0.5	1.4
3.9	Alkalies (by difference)	1.22	0.8	1.4
	Total	100	100	100
4.0	ASH FUSION RANGE			
	REDUCING ATMOSPHERE			
4.1	Initial Deformation Temp.(oC)	1100	1100	1100
4.2	Hemispherical Temp. (oC)	1300	1250	1350
4.3	Fusion Temperature (oC)	1400	1400	1400

CLAUSE NO.

PROJECT INFORMATION

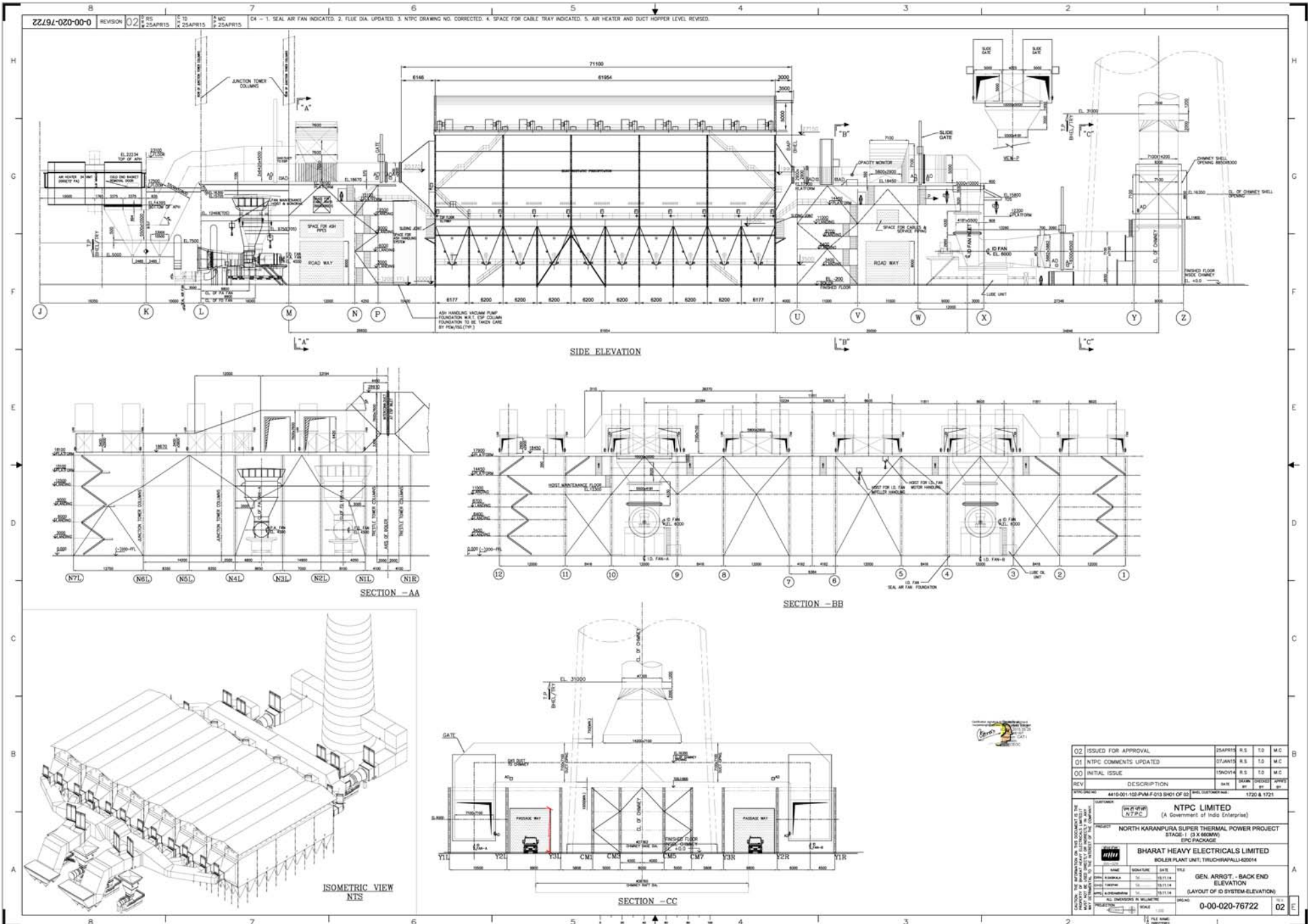


ANNEXURE-IV-4

TABLE – 4

TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS

Sl.No.	Characteristics (as received basis)	Imported Coal	
		Worst	Best
1.0	Proximate Analysis		
1.1	Total Moisture (%)	20	16
1.2	Ash (%)	10	10
1.3	Volatile Matter (%)	30	45
1.4	Fixed Carbon (%)	40	29
1.5	Total (%)	100	100
2.0	Ultimate Analysis		
2.1	Carbon (%)	56.4	62.4
2.2	Hydrogen (%)	4.5	4.9
2.3	Sulphur (%)	0.9	0.8
2.4	Nitrogen (%)	0.9	0.5
2.5	Oxygen (%) (By difference)	7.3	5.4
2.6	Carbonates (%)	0	0
2.7	Phosphorous (%)	0	0
2.8	Total Moisture (%)	20	16
2.9	Ash (%)	10	10
	Total	100	100
2.10	GCV (Kcal/Kg)	5800	6500
2.11	Hard Grove Index	45	60
2.12	YGP (mg/kg)	100	70
3.0	Ash Analysis		
3.1	Silica (SiO ₂) (%)	32.74	34.94
3.2	Alumina(Al ₂ O ₃) (%)	30.5	28.43
3.3	Iron Oxides(Fe ₂ O ₃) (%)	18.2	15.2
3.4	Titania (TiO ₂)	1.56	1.76
3.5	Phosphoric Anhydride(P ₂ O ₅) (%)	0.44	0.54
3.6	Lime (CaO) (%)	6.12	7.62
3.7	Magnesia (MgO) (%)	1.83	1.93
3.8	Sulphuric Anhydride (%)	6.95	7.65
3.9	Sodium Oxide (Na ₂ O) (%)	0.3	0.4
3.10	Balance alkalis (by difference)	1.36	1.56
	Total	100	100
4.0	Ash Fusion Temperature reducing temperature		
4.1	Initial deformation Temp (°C)	1100	1250
4.2	Hemispherical Temp. (°C)	1300	1350
4.3	Flow Temp. (°C)	1400	1400





02	ISSUED FOR APPROVAL	25APR15	R.S.	T.D.	M.C.												
01	NTPC COMMENTS UPDATED	27JAN15	R.S.	T.D.	M.C.												
00	INITIAL ISSUE	19NOV04	R.S.	T.D.	M.C.												
REV	DESCRIPTION	DATE	DESIGN BY	DESIGNED BY	APPROVED BY												
00	4410-001-102-P&M-F-013 SHEET OF 02	02 APR 1970	1720	1721													
CONTENTS NTPC LIMITED (A Government of India Enterprise) PROJECT NORTH KARANPURA SUPERHEATED STEAM POWER PROJECT STAGE-I (3 X 660MW) EPC PACKAGE  BHARAT HEAVY ELECTRICALS LIMITED BOILER PLANT UNIT, TROICR(HAPAL)-420014																	
REVISIONS <table> <tr> <th>NO.</th><th>DATE</th><th>DESCRIPTION</th></tr> <tr> <td>1</td><td>15.11.14</td><td></td></tr> <tr> <td>2</td><td>15.11.14</td><td></td></tr> <tr> <td>3</td><td>15.11.14</td><td></td></tr> </table>		NO.	DATE	DESCRIPTION	1	15.11.14		2	15.11.14		3	15.11.14		GEN. ARGT. - BACK END PLAN (LAYOUT OF ID SYSTEM PLAN)			
NO.	DATE	DESCRIPTION															
1	15.11.14																
2	15.11.14																
3	15.11.14																
ALL DIMENSIONS IN MILLIMETRE SCALE 1:200		0-00-020-76723		REV 02													

SUB-SECTION-IIID

CIVIL WORKS

NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
1.00.00	SCOPE OF CIVIL WORKS Scope of Bidder shall include all Civil, Structural, Architectural works including underground facilities like drainage, sewerage, trenches, earthing mat/ grounding associated with complete Flue gas desulfurization (FGD) package covering but not be limited to the following: a) ~~Truck hopper (if applicable)~~ b) ~~Limestone storage hopper with shed~~ c) ~~Transfer points, Conveyor Galleries & Tunnels~~ d) ~~Crusher House~~ e) Ball Mill Foundation f) Ball Mill building g) FGD Control Room building, MCC Buildings h) Gypsum dewatering building i) ~~Gypsum storage shed~~ j) ~~Pent house~~ k) ~~Chimney including elevator, electrical works, aviation obstruction lighting~~ l) Absorber Tower foundations m) Tank Foundations n) Pump & Fan Foundations o) Transformer foundations including Fencing, Paving etc. p) Pipe and cable Trestles Foundations q) Site levelling in Lime & Gypsum Handling area, as shown in tender drawing. r) Roads Lime & Gypsum Handling area, as shown in tender drawing. s) Fencing in Lime & Gypsum Handling area, as shown in tender drawing t) Storm water drainage network for all areas in bidder's scope and its connection with the nearest owner's drain. u) Sewerage network for all buildings and facilities and connection with the nearest owner's sewerage system.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI , PART-A BID DOC. NO.:CS-4410-109-2	SUB SECTION:IIID CIVIL WORKS	PAGE 1 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 			
2.00.00	v) Paving in entire FGD absorber area and parking block of Lime & Gypsum Handling area. w) Any other miscellaneous building or facility required for FGD system. The work to be performed under this specification consists of providing all labour, materials, construction equipment, tools and plant, scaffolding, supplies, transportation, all incidental items not shown or specified, but reasonably implied or necessary for successful completion of the work including Bidder's supervision and in strict accordance with the drawings and specifications. The nature of work shall generally involve earthwork in excavation & deep underground excavation, extensive de-watering, shoring and strutting, sheet piling, back filling around completed structures and plinth protection, paving, disposal of surplus excavated materials, piling, concreting including reinforcement and form work, brick work, fabrication and erection of structural / miscellaneous steel works, inserts, architectural items & finishes such as plastering, painting, flooring, doors, windows & ventilators, glass and glazing, rolling shutters etc., permanently colour coated profiled steel sheeting, anchor bolts, R. C. C. trenches with covers, laying and testing of water pipes, sanitation, water supply, drainage, damp proofing, water proofing and other ancillary items. The work shall have to be carried out both below and above ground level and shall be involving, basements, equipment foundations, grounding, slabs, beams, columns, footings, rafts, walls, steel frames, brick walls, stairs, trenches, pits, access roads, culverts, trestles, finishes, false ceiling and complete architectural works, etc. Analysis, design and preparation of construction drawings for all structure/facilities under the scope of this package and getting the same approved from the owner. Uniform Finished ground level (FGL) in FGD absorber area shall be made available by the owner at a level specified in "Layout plan of FGD system". Refer Tender drawing no. 4410-999-POC-F-001. Terminal points for site levelling, roads, drainage network & fencing shall be as indicated in "Layout plan of FGD system". Refer Tender drawing no. 4410-999-POC-F-001.			
	CONSTRUCTION FACILITIES The following are also in the Bidder's scope of work: 1. Providing drinking and service water for Bidder's labour, staff and other personnel working for Bidder at the work site and in his staff/ labour colony. He shall install necessary bore wells with associated pumping or water tankers and treatment facilities to supply quality water as per standards. 2. Developing temporary staff colony and labour colony along with fencing etc. Land if required shall be arranged by the Bidder himself.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.:CS-4410-109-2	SUB SECTION:IIID CIVIL WORKS	PAGE 2 OF 4

TENDER NO.:PSER/SC/1/NKP-C/19/4-19			
CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	However space required for bidder's office, storage, pre assembly and fabrication areas shall be provided by owner free of charge within the plant premises. The area to be allocated to the Bidder shall be discussed & finalized with the bidder after the award, keeping in view the availability of free space & similar requirement of other agencies. 3. Providing all arrangements for distribution of construction power at various locations as per his requirements from the supply point of Owner. 4. Providing all arrangements for the supply of construction water including borewells, water tankers etc. 5. Providing temporary construction office, construction stores (open / covered), workshops, material / field testing laboratory, any other temporary buildings 6. Providing all construction equipment, labour and materials. The Bidder shall provide all the tools and tackles required for the work. 7. Development of the pre-assembly and storage yard with fencing, drainage, internal roads, boulder soling, etc. 8. Approach road to project site is available. Further, Owner intends to construct the roads as per the layout shown in the General Layout plan in a progressive manner. Some of these roads may not be available to the bidder for his use. Similarly the drainage network for the plant site being constructed by the owner may not be available to full extent. The bidder shall plan his work within the plant area considering the above constraints of roads and drains. Access roads to his work sites, offices, stores, preassembly / fabrication yard, etc. as required for providing approach/access for men, materials, equipment, cranes, trailer, construction/erection activities etc., what so ever are required by the bidder, shall be constructed and maintained by the bidder. Bidder shall provide permanent access to all facilities/ structures from the nearby existing roads of the owner. Roads shall be in concrete (M-35 grade) as per IRC standards, with minimum thickness of pavement (PQC) as 250mm. Width of all such roads shall be 7.5M concrete pavement. 9. Area lighting at the construction / erection site, pre-assembly and storage yard, office areas and labour / staff colony. 10. Providing all necessary fire-fighting devices / equipment / fire tender etc. required during the project execution stage. He shall maintain all such equipment / devices in proper working conditions throughout the period of work. 11. Providing first aid facilities at the construction / erection sites, workshops, laboratories, pre-assembly and storage yard and other places of work as per the requirement. 12. The Bidder shall arrange skilled / semiskilled / unskilled manpower from local source(s) as far as available in this country. He shall also arrange supervisory staff for quality execution of all works in his scope.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI , PART-A BID DOC. NO.:CS-4410-109-2	SUB SECTION:IIID CIVIL WORKS	PAGE 3 OF 4

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES 		
	13. Bidder's office, store, workshop, laboratory or any other temporary buildings: The Bidder shall adopt pre-engineered/ pre-fabricated constructions made of steel with single / double skin, insulated for un-insulated roof and wall coverings (fabricated out of permanently color coated metal sheets) for his site office, covered store workshop, laboratory or any other temporary buildings. Alternatively, bidder can adopt readymade 'Portacabin' or similar construction. Bidder shall ensure that all such constructions are well-engineered, neatly constructed and overall present a pleasing look. The above requirements shall be applicable to his sub-vendors also and bidder shall be responsible for enforcing the same on his sub-vendors. Any other type of construction if proposed by the bidder shall be subject to approval of the owner. However, such construction shall be based on proper design and shall have aesthetic look. 14. Use of ash and ash based products: In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, Bidder shall use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. The above requirements shall be applicable to his sub-vendors also and Bidder shall be responsible for enforcing the same on his sub-vendors. 15. Repair & Maintenance Facilities by the Bidder: Bidder shall establish/set up at site suitable repair facilities for construction plant, equipment and machinery (like cranes, hydra, forklifts, welding equipments, etc.) He will also make arrangements/tie up with manufacturers/ suppliers of such construction plant, equipment & machinery, for periodic overhaul/maintenance and for major breakdown, if any. He shall also keep adequate stock of spares at site for various construction plant, equipment and machinery to meet day to day requirements as recommended by the equipment manufacturer/suppliers or as instructed by the Engineer. Bidder shall deploy dedicated qualified, full time mechanical/electrical foreman/supervisors for manning the repair facilities as specified above.		
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SUB-SECTION-IV-D

CIVIL WORKS

**NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2**

CLAUSE NO.		TECHNICAL REQUIREMENTS	
1.00.00		GENERAL	
1.01.00		This section of the bidding document deals mainly with the technical specification for the design and preparation of detailed drawings, getting the design and drawings approved by the Employer, fabrication, erection and construction of the necessary civil, structural and architectural works associated with the FGD package for North Karanpura STPP (3x660 MW). The work shall have to be carried out both below and above ground level and shall be involving, basements, equipment foundations, grounding, slabs, beams, columns, footings, rafts, walls, steel frames, brick walls, stairs, trenches, pits, access roads, culverts, trestles, silos, sumps, Limestone storage hopper & shed, Crusher House, Transfer points, Conveyor Galleries, Tunnels, Gypsum storage shed, Chimney, Gypsum dewatering building, Ball Mill building, FGD control room building, Tank Foundations, absorber tower foundation, transformer foundation, MCC Building, finishes, complete architectural aspects, drainage, sanitation, water supply (from terminal points to various buildings/facilities) and all other civil, structural and architectural works associated with the complete FGD package.	
1.02.00		The specifications are intended for the general description of the work, quality and workmanship. The specifications are not, however, intended to cover minutest details and the work shall be executed according to the relevant latest Indian Standard Codes / I. R. S. / I. R. C. specifications. ~~In absence of the above, the work shall be executed according to the best prevailing local Public Works Department practices or to the recommendations of relevant American and British Standards or to the instructions of the Engineer.~~ Some of the relevent I. S. Codes to be followed is mentioned in the Technical Specifications. The Contractor is expected to get clarified on any doubts about the specifications, etc. before bidding, in writing with the Employer in respect of interpretation of any portions of this document.	
1.03.00		Bidder or his agencies engaged as detailer for fabrication drawings should have the experience of detailing for power plant structures or steel plant or Industrial structures like Petro/ Chemical/ Refinery/ Cement/FGD Plant/Coal Handling Plant/Ash Handling Plant etc. The designer responsible for preparation of scope drawings shall review and approve the fabrication drawings prepared by the detailer before releasing them for fabrication.	
2.00.00		Sub QR for Civil Works: CLAUSE DELETED AMDT 8 SL 179 PAGE 69	
2.01.00		Bidder or its agency should have in past executed civil and structural works for 500 MW or higher capacity coal based/Lignite based power plant including earthwork in filling involving mechanical compaction and cutting in hard rock, foundations, Bulk material handling plant involving underground storage hopper and underground tunnels.	
2.02.00		Bidder can engage more than one agency, in case the Bidder itself is not able to meet the requirement at 2.01.00. The agency being engaged for a particular work should have in the past executed such works of 500 MW or higher capacity plant.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
2.03.00	For Chimney, Bidder or its agency should have in the past built at least one (1) reinforced concrete chimney of minimum 100m height.		
2.04.00	In case Bidder or its agency do not meet the requirements at 2.01.00 and the Bidder proposes to engage agency (ies) for civil & structural works on work volume basis (except for Chimney), Bidder or its agency (ies) should have executed such works in the past and the annual rate of execution in the reference works should not be less than eighty percent (80%) of the asking rate of such works, (structural steel fabrication & erection, RCC, earthwork in filling involving mechanical compaction and cutting in hard rock, RCC in underground storage hopper and underground tunnels) for which it is being engaged. Successful Bidder shall finalize the agency (ies) for each work in consultation with Engineer-in-charge at site before engaging them. Design agency for Civil & Steel Structural Works:		
2.05.00	Bidder or its agency (ies) should have carried out the design and detailed engineering of following works: (i) Civil & Structural works associated with at least one bulk material handling plant for 500 MW or higher capacity coal based/Lignite based power plant. (ii) For Chimney, Bidder or its design agency (ies) should have carried out design & detailed engineering of at least one reinforced concrete chimney with steel flues, of minimum 100m height. (iii) Machine foundations such as Mill foundations/ Block foundations.		
2.06.00	Bidder can engage more than one agency (of repute), in case the Bidder itself is not able to meet the requirement at 2.05.00. The design agency (ies) proposed by the Bidder shall be subject to Employer's approval.		
3.00.00	Work Description		
3.01.00	Truck Hopper, Limestone Storage hopper and Underground Tunnel Truck Hopper shall consist of underground portion, which shall be of R. C. C. with structural steel shed covered with permanently Colour coated profiled steel sheets. Limestone storage hopper shall be of RCC with structural steel shed covered with permanently Colour coated profiled steel sheets. The structural arrangement to be adopted for the design and construction of Limestone Storage hopper shall essentially consist of R. C. C. frames spaced at approx. 3.0M centers with R. C. C. wall panels on the sides and R. C. C. raft at the bottom, fixed to the frames. Minimum thickness of R. C. C. raft at bottom shall be 600		
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CLAUSE NO.	TECHNICAL REQUIREMENTS
IDT 8 SL 193 GE 74	mm. Minimum thickness of RCC side walls shall be 600 mm at bottom and 300 mm at top. The vertical and inclined portion of hopper shall be provided with 50 mm thick guniting (shotcreting). Details of shotcreting have been given elsewhere in this specification. Expansion joints shall be provided at a maximum distance of 40m. 600 mm wide water stop fabricated with 22G copper plate with bitumen board fillers and polysulphide sealing compound as specified elsewhere shall be used as expansion joint material. Floor shall be provided with cross slope not flatter than 1 in 50 towards side drains. Side drains shall be sloped towards sump where sump pumps as specified elsewhere, shall be provided. The slope of side drains shall not be flatter than 1 in 400. Side drains and sump shall have removable type steel grating cover. Water proofing / Damp proofing of under ground Truck hopper, Limestone Storage hopper, tunnels and underground (i. e. basement) portion of transfer houses shall be done by providing the following treatments: Chemical injection grouting for inner faces (details as specified elsewhere). Polymer modified cementitious coating on earth side face as per the following : (1) On the outer surface of walls, frames and roof slabs coming in contact with earth, polymer modified cementitious coating in two layers as specified and as per manufacturer's specifications shall be provided directly on the concrete surface. (2) 50 mm thick P. C. C. (1 : 2 : 4 with 10 mm nominal size stone aggregates) shall be provided under the raft i.e. over the lean concrete, followed by polymer modified cementitious coating in two layers (slurry mix application) as per manufacturer's specification. 50 mm thick P. C. C. (1 : 2 : 4) with 10 mm nominal size stone aggregates shall then be laid over the polymer modified cementitious coating before laying the raft. Truck hopper and its gratings shall be designed for movement of front end loader/ bulldozer over them. Bull dozer weight shall be considered as about 35T. The gratings shall be built of min. 200x28mm thick flats in main direction and min.100mm x 20mm thick in secondary direction. No painting/galvanization shall be provided in gratings. However, two coats of Red oxide Primer to be provided immediately after fabrication. Plinth protection along with drains shall be provided along the Hopper complex. However, 5m wide paving shall also be provided around machinery hatches. and Truck Earth pressure to be considered for design shall be due to earth pressure at rest (Ko) condition only. Earth pressure due to surcharge intensity of Uniformly Distributed Load (U. D. L) of intensity 2 T / Sq. M. shall be considered in the design. A minimum safety factor of 1.2 against uplift due to ground water shall be ensured during execution and after execution, considering dead weight of the structure to be
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.02.00	0.9 times only, ground water table to be taken at adjoining formation level and soil wedge angle of not more than 15 degrees.		
	Also, FOS against uplift, to be taken as 1.0, considering the dead wt. of structure and soil resting on side projections if any in the vertical plane. Inclined wedge action of soil shall not be considered in this case.		
	Wherever, slope of tunnel exceeds 10°, R. C. C. steps shall be provided for the entire width of each walkway.		
	Overhead / Ground Conveyor Galleries and Trestles		
	Overhead conveyors shall be located in a suitably enclosed gallery of structural steel. The overhead gallery shall consist of two vertical latticed girders having rigid jointed portal frame at both ends. Cross beams at floor level supporting conveyor stringer beams shall be made of single rolled steel beam or single channel section (ISMB or ISMC) or plate girder. Horizontal bracings are to be provided at top & bottom plan of the gallery (latticed girders shall be braced together in plan at the top and bottom). Common end portal frame shall not be used for adjacent conveyor spans. Roof truss shall be provided at upper node points of latticed girders to form an enclosure. Contractor can also use tubular steel sections for roof truss only of conveyor galleries. The tubular steel section shall be of circular/rectangular/square shape. The circular steel tube shall conform to IS 1161 and rectangular/square steel sections shall conform to IS 4923. The steel structures using tubular sections shall be designed and fabricated as per IS 806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005. The maximum span of overhead gallery shall be limited to 25 meters unless higher span is required due to site conditions, which shall be subject to approval of the Engineer. The gallery should as far as possible be erected as a box section keeping all the vertical and horizontal bracing tied in proper position. The gallery should be checked for all erection stresses that are likely to develop during handling and erection and if required, temporary strengthening of gallery members during erection shall be made. Seal plates under the conveyor galleries shall be provided in such a way that complete gallery bottom shall form a leak proof floor. The ground conveyors shall be located in suitably enclosed gallery of structural steel consisting of rigid portal frames spaced at regular intervals and suitably braced. Plinth protection along with drains shall be routed along the ground conveyors. For double stream conveyor gallery, two side and one central walkway of width 800 mm and 1100 mm respectively shall be provided. The width of two side walkways for single stream conveyor gallery shall be 800 mm and 1100 mm respectively. Both sides of central and side walkways shall be provided with pipe handrails all along the conveyor gallery. Hand railing should not be supported on conveyor supporting stringers. The walkways shall be chequered plate construction with anti - skid arrangement. The anti - skid arrangement will consist of welding of 10 mm square steel bars at a maximum spacing of 500 mm along the length of the gallery. Where the slope of walkway is more than 10°, chequered plate steps with nosing and toe guard shall be provided. The floor of conveyor gallery all along the gallery length, shall be provided with minimum 12 gauge thick seal plates and other drainage arrangements as specified elsewhere		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Conveyor gallery shall have permanently colour coated steel sheet covers on roof and both sides. However in roof, a panel of minimum 1.5 m x 1.5 m area at about 6.0 m center shall be provided with translucent sheets of polycarbonate material for natural lighting. A continuous slit opening of 500 mm shall be provided on both sides just below the roof sheeting. Adequate provision of windows shall be kept on both sides of conveyor gallery as appended in Mechanical Section (Belt conveyor system). Windows shall be provided with wire mesh as specified elsewhere in this specification. Cross - over with chequered plate platform and ladder for crossing over the conveyors shall be provided at approximately every 100 M intervals of conveyor. Crossover shall preferably be located over four-legged rigid trestle location. For railway tracks passing below overhead conveyor gallery and along conveyors, the railway clearances both underground as well as over ground shall have to be adhered to for design, execution and erection of foundations, trestles, galleries etc., so that movement of locomotives and wagons is not hampered in any way during execution and afterwards. However at the location where the overhead conveyor gallery crosses road / rail line, minimum clearance of 8.0m above the road crest / rail top shall be provided. For calculation of material load on moving conveyor, a multiplication factor 1.6 shall be used to take care of inertia force, casual over burden and impact factor etc. Thus material load per unit length of each moving conveyor shall be Rated capacity of conveyor system 1.6 X ----- x F Conveyor Belt Speed Where, F = 1700/1400 for lime & 1250/900 for gypsum It should be noted that for structural design, unit weight of lime shall be assumed as 1700 Kgs. / Cu. M. instead of 1400 Kgs. / Cu. M., unit weight of gypsum shall be assumed as 1250 Kgs. / Cu. M. instead of 900 Kgs. / Cu. M. considered for system sizing purpose. Conveyor Gallery structure shall be designed considering both conveyors operating simultaneously. Conveyor gallery and supporting trestles located between transfer houses / buildings shall be arranged in any one of the following ways. a) All gallery supporting trestles shall be four legged type only. One end of each gallery span shall be hinged to the supporting trestle and the other end shall		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.03.00	be slide type. Slide type support shall be with P. T. F. E. bearings to allow both rotation & longitudinal movements. b) In between transfer houses / buildings, four legged trestles shall be placed at a maximum interval of 90 metres. The arrangement shall be such so as to ensure that force in the longitudinal direction (i. e. along the conveyor length) of conveyor gallery of length not more than 90 m is transferred to any four legged trestle. In the space between each successive four legged trestles, two legged trestles shall be provided at regular intervals. The end supports resting on the four-legged trestle can have either ends hinged or one hinge and the other on slide type depending on the arrangements. Slide type support shall be with P. T. F. E. bearings to allow both rotation & longitudinal movements. End of conveyor gallery which will be supported over transfer house, shall be so detailed that only vertical reaction is transferred from conveyor gallery and no horizontal force in longitudinal direction is transferred from conveyor gallery to transfer house structure and vice - versa. For trestles and trestle foundations for conveyor galleries located adjacent to existing structures, over ground and under ground facilities, location and details of these trestles and foundations shall have to be decided such that there is no interference both underground as well as over ground with existing structures and facilities. Trestle columns / ground conveyor portal column base shall be kept 300 mm higher than the existing ground level. Transfer Houses The over ground portion of the transfer house shall be framed structure of structural steel work with permanently colour coated profiled steel sheet side cladding (from lowest working floor level till top) and R. C. C. floors comprising of RCC slab over profiled metal deck sheets (to be used as permanent shuttering) over structural beams. Shear anchor studs shall be provided through metal deck at regular interval on all top flange/flange plate of structural beams. However, the lower portion of side cladding, at ground, for a minimum height of 0.9 m above the finished floor level shall be one brick thick wall plastered on both side. In some areas like MCC floors etc., one brick thick wall cladding shall be provided. Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses. Adequate steel doors and windows for proper natural lighting and ventilation shall be provided. In addition to steel windows, panels of suitable size to suit the architectural treatment and made of translucent sheets of polycarbonate material shall also be provided on the side cladding for natural lighting. The roof of Transfer points shall be provided with pre-fabricated insulated metal sandwich panels. Composition of Insulated Metal Sandwich Panels shall be as described elsewhere in the Technical Specification. Adequate slope shall be provided for quick drainage of rain water.		
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CLAUSE NO.		TECHNICAL REQUIREMENTS	
3.04.00	Crusher House The crusher house shall be framed structure of structural steel work with permanently colour coated profiled steel sheet side cladding. However, panels of suitable size to suit the architectural treatment and made of translucent sheets of polycarbonate material shall also be provided on the side cladding for natural lighting. The lower portion of side cladding, at ground, for a height of minimum 0.9m above the finished floor level shall be of one brick thick wall plastered on both faces. Floors shall be of R. C. C. slab over profiled metal deck sheets (to be used as permanent shuttering) over structural beams. Shear anchor studs shall be provided through metal deck at regular interval on all top flange/flange plate of structural beams. Within this building cubicles are to be provided for resting room of operators and these shall be constructed with one brick thick brickwork having both sides plastered and roof slab. Adequate steel doors and windows for natural lighting and ventilation shall be provided. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery. The roof of Crusher house shall be provided with pre-fabricated insulated metal sandwich panels. Composition of Insulated Metal Sandwich Panels shall be as described elsewhere in the Technical Specification. Adequate slope shall be provided for quick drainage of rain water. Crushers shall be supported on R. C. C. deck, which in turn will rest on suitable vibration isolation system consisting of springs and dampers. This R. C. C. deck shall be isolated from the floor. However, the vibration isolation system consisting of springs and dampers may rest on main building framework. Detailed specification of vibration isolation system including the unbalanced force, frequency and amplitude criteria and other design requirements are appended elsewhere in this specification		
3.05.00	Control building, M. C. C. Buildings These shall be steel or RCC framed building with R. C. C. roof and floor. For steel framed building roof /floor shall comprise of RCC slab over profiled metal deck sheets (to be used as permanent shuttering only) over structural beams. Cladding shall be of brickwork/concrete blockwork with plastering on both sides. Roof shall be provided with roof water proofing treatment, as specified elsewhere in the Technical specification. Suitable arrangement shall be provided so as to prevent ingress of water into the cable trenches inside the building from cable entry locations. All air - conditioned areas, shall be provided with the suspended permanently colour coated aluminium false ceiling system (details specified elsewhere) with under deck insulation. Adequate aluminium doors and windows shall be provided for natural lighting, ventilation and view. All windows in air conditioned rooms shall have hermetically sealed double glazing.		
3.06.00	Pent House These shall be of R. C. C. framed structures with columns, beams, slabs and foundations etc. Cladding shall be of brickwork with plastering on both sides. Roof		
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
	~~shall be provided with roof water proofing treatment as specified elsewhere. Adequate nos. of steel doors and windows shall be provided for natural lighting and ventilation.~~				
3.07.00	Gypsum Storage Shed The Gypsum storage shed shall be RCC framed structure with structural steel work shed with permanently colour coated profiled steel sheet roof and side cladding, grade slab and RCC foundations etc. Roof shall be provided with troughed profile permanently colour coated sheet with adequate slope for quick drainage of rain water.				
3.08.00	Toilets Toilet with potable water line facilities shall be provided in each of the following locations: (a.) In all M. C. C. Rooms (b.) Control Building				
3.09.00	Staircases, Gratings, Handrails All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. All staircases of Transfer points and crusher house shall be of steel. Cage ladders (min. 450mm wide) shall be provided for access to roof of penthouses, single storey mcc rooms & mumty. All Stairs shall be minimum 1200 mm wide, maximum rise should not be more than 180 mm and minimum tread with 250 mm. Numbers and arrangement (including enclosures etc.) of stair cases shall be such as to meet the fire safety requirement as per guide lines of statutory regulatory bodies. For steel staircases , Stringers shall be of rolled steel channel (minimum ISMC 250) and tread shall be of steel gratings. Out side stairs to transfer points/crusher house shall be open type. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's All gratings shall be electro forged types. Minimum thickness of the grating shall be 40 mm for indoor installation and 32 mm for outdoor installation. However, at entry or road crossing point's minimum thickness of grating shall be 40 mm The opening size shall not be more than 30mmx100mm. The minimum thickness of the main bearing bar shall be 6 mm or as per design requirement whichever is higher. All gratings shall be designed for minimum imposed load of 500Kgs. / Sq. M. If actual expected load is more than the specified load, then actual load is to be considered. All gratings shall be hot dip galvanized at the rate of 610 g. per sq.m. after surface preparation by means of blast cleaning/ acid pickling. Minimum 1000 mm high hand railing shall be provided around all openings, projections / balconies, walkways, platforms, Stairs, etc. All handrails and ladder Pipes shall be 32 mm nominal bore MS Pipes (medium class) as per IS:1161. Handrails shall have top and middle rails at a height of 1000 mm and 500 mm and the vertical post spacing shall not exceed 1.50 M, with provision of kick Plates (100 mm high and 6 mm thick). All handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. M as per IS:4736.				
SL 192 Sheeting shall be the top.					
<table><tr><td>NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2</td><td>SUB-SECTION-IV-D CIVIL WORKS</td><td>PAGE 8 OF 114</td></tr></table>		NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 8 OF 114
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However sheeting shall be
provided at the top.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.10.00	Trenches			
	All trenches for cables or any other underground facility as detailed out elsewhere shall be of R. C. C. Cable trenches shall be provided with pre - cast R. C. C. covers / chequered plate cover. Cable trenches as well as pre - cast covers shall be provided with edge protection angles and lifting hooks. All embedments / block outs as required and specified elsewhere in these specifications shall be provided. Proper drainage arrangement shall be provided. Trench pre - cast cover weight shall not be more than 65 Kgs. Trench covers near entry or at road crossings shall be designed for 10 T wheel load at centre. Pre - cast covers shall be designed for central point load of 75 Kgs. R. C. C. cable trenches shall be filled with sand after erection of cables, up to top level and covered with pre - cast R. C. C. covers. For cable trenches outside buildings, top level shall be 200 mm above G. L and sand filling shall be overlaid with 50 thk. PCC. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection all around cut outs / openings in floor slabs, edges of drains supporting grating/precast RCC covers, edges of R. C. C. trenches supporting pre - cast covers, supported edges of pre - cast cover			
3.11.00	Cable gallery/trestles			
	Cable galleries/trestles shall be made of structural steel. The contractor can use either rolled sections or tubular steel sections. The tubular steel section shall be of circular/rectangular/square shape. The circular steel tube shall conform to IS:1161 and rectangular/square steel sections shall confirm to IS:4923. The steel structures using tubular sections shall be designed and fabricated as per IS:806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005.			
3.12.00	Transformer Foundation			
3.12.01	Foundations of transformers shall be designed for seismic and wind loads in addition to other applicable loads. Block foundations shall be provided for the main transformer block. The oil soak pit, if provided, shall be filled with gravel of size 40mm. The volume of the soak pit shall be sufficient to store complete oil of the transformer/reactor along with 10 minutes of fire water considering only 40% of the volume as available voids between gravel filling. However, in case a separate oil collection tank is provided for the transformer/reactor, oil soak pit of volume equivalent to one-third (1/3) the oil volume of transformer/reactor shall be provided around transformer/reactor. The oil collection tank, in such cases, shall be designed for an effective capacity of complete oil of the transformer along with 10 minutes of fire water. The oil soak pit shall also be provided with a sump at the corner to allow drainage of water/oil from the soak pit. Arrangement for moving the transformer into place using rail cum road, jacking pads and pulling blocks including inserts, as required, shall be provided along with the transformer/ reactor foundations.			
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CLAUSE NO.		TECHNICAL REQUIREMENTS	
3.12.02		RCC Firewall shall also be provided between the transformers wherever required.	
		300 mm thick PCC M20 encasement all around the Pylon supports inside soak pit for fire fighting system shall be provided up to top of gravel filling. Coarse aggregate filling inside the transformer oil soak pit shall be carried out only after construction/erection of Pylon supports and PCC encasement.	
		Fencing	
		Fencing with toe wall and steel gates shall be provided around the transformers. Fencing shall comprise of PVC coated GI chain link fencing of minimum 8G (including PVC coating) of mesh size 75 mm and of height 2.4 m above the toe wall. The diameter of the steel wire for chain link fence (excluding PVC coating) shall not be less than 12G. Fence posts shall be of pre – cast R. C. C. of minimum M20 grade. All corner posts will have two stay posts and every tenth post will have transverse stay post. Suitable R. C. C. foundation for the post and stays shall be provided based on prevailing soil conditions. Gates shall be sturdy with locking provisions.	
3.13.00		Toe walls of brick masonry shall be provided between fence posts all along the run of the fence with suitable foundation. Toe wall shall be minimum 200 mm above the formation level with 50 mm thick P. C. C. coping (1: 1. 5: 3) and shall extend minimum 300 mm below the formation level. Toe wall shall be plastered on both sides and painted with two coats of cement paint of approved colour and shade. Toe wall shall be provided with weep holes at suitable spacing	
		Booster Fan Foundation	
3.14.00		Booster Fan foundations shall be RCC block foundation directly resting on virgin soil/ pile below Ground level. The vertical faces of this block foundation shall be isolated from adjacent footings by providing minimum 100mm thick polystyrene board of type-1 conforming to IS: 4671 with density 20 Kg/cum sandwiched between the vertical face of block foundation and 230 thick brick wall all round.	
		CHIMNEY	
3.14.01		Salient Features	
AMDT NO. 14 SL NO. 51 PAGE 12		Configuration and height of chimney(s) shall be as specified in mechanical portion of technical specification. There shall be one flue (liner) for each unit. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.	
		The chimney shell (windshield) shall be constructed using slip form shuttering. Internal platforms of steel structure shall be provided for enabling access to various elevations of the chimney and to provide support to the flue liners. Spacing of internal platforms shall not exceed 45.0 M. The platform beams shall be supported on concrete shell using suitable load bearing arrangement in the recesses provided for the purpose. The platform beams getting supported in the chimney shell shall have complete bearing support within the thickness of shell at that location and shall in no case be supported completely/partially on corbels/ brackets from the shell. "Through openings" in shell if provided to facilitate erection of platform beams shall be closed with cast-in-situ RCC closure wall on the external face of the shell. Necessary dowel bars shall be provided in the shell during construction for this purpose. Openings in the concrete shell for flue duct entry, access door & truck entry door at ground level,	
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AMDT NO. 14 SL NO. 52 PAGE 12 AMDT NO. 14 SL NO. 53 PAGE 13 Design of expansion joint shall comply EPRI guideline to avoid contact of condensate with expansion joint material and to ensure drainage of condensate. AMDT NO. 14 SL NO. 54 PAGE 13 AMDT NO. 14 SL NO. 55 PAGE 14	air ventilation etc shall be provided. Hand railing shall be provided all around internal staircase & around the ventilation voids in the internal platform using min. 32 mm nominal bore MS pipes of medium class conforming to IS:1161. Spacing of railing posts shall not be more than 1500 mm centre to centre with a minimum height of 1200 mm. The handrail shall have three rows of horizontal members between the railing posts including the top member. Kick plate of min. size 100x6 thick shall be provided in the hand railing. The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be ~~bottom supported~~ and shall be profiled into a circular shape to connect to the flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic ~~fluoroelastomeric fabric~~ expansion joint. The expansion joint in the flue liner shall comprise of non-metallic ~~fluoroelastomeric~~ material suitable for wet stack operations shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable for wet stack operations and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. ▶ Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell with chequered plate floor panels and pipe handrails, shall be provided upto the platform just below roof platform and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch. The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, ~~mild steel wind strakes (if required)~~, all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects. Aviation Warning Lights (AWL) shall be mounted on door panel of required size (open able from interior of chimney shell) fixed to openings in the chimney shell at locations and levels specified elsewhere. Suitable provision for approach to the AWL shall be provided at the platform level. AWL shall be located at about 1-1.5 metre above the top of platform to enable easy handling for maintenance. The size of roll-up door shall be determined based on minimum requirement for ventilation and transportation & erection of flue segments.		
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3.14.02	Design Concept Design and construction of various components and systems of the chimney shall be in accordance with relevant Indian Standard and where provisions are not covered in Indian Standard, reference shall be made to ACI, BS, CICIND and other international standards. In case of any conflict between this document and the Indian and International Standards, the stipulations of this document shall prevail. Imposed loading for design of all chimney components shall not be less than 5 kN/ Sq.m. An additional 25% of liner load shall be taken as impact loading for liner erection in addition to the liner load. The min. thickness of web for plate girders shall be kept as 12 mm. Seismic forces on the chimney system shall be determined based on site specific seismic information provided elsewhere in this document. Wind forces on the chimney system shall be determined based on site specific wind design criteria provided elsewhere in this document. The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings. ~~Design of all chimney components shall be based on working stress method.~~		
3.14.03	Wind Shield The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The load calculation and analysis and design of wind shield shall be carried out as per IS 4998 The wind shield shall be analysed for cases with and without flue liner loads. Forces/stresses in the wind shield due to eccentricity effects of local (e.g. corbel) loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered. Seismic response of the chimney shall be computed by the response spectrum method. At least, the first five modes of vibrations shall be used for this analysis. The cross wind analysis of the chimney shall be carried out irrespective of the value of the Scruton Number for the chimney and other empirical considerations which suggest structural immunity to cross wind oscillations. The effect of the openings/cut-outs in the chimney shell shall be duly considered in the design of the windshield. The minimum thickness of shell shall not be less than 500mm. ~~The stresses for the shell design shall not exceed the limits given in Cl. 7.0 of IS:4998 (PART I) 1975 for various combinations of loads, excepting the stress in concrete for the case of dead load + wind load which shall not exceed 0.30f_{ck} where f_{ck} is the characteristic compressive strength of concrete.~~ The minimum vertical reinforcement shall be 0.3% of the concrete area. The maximum spacing of the reinforcement bars shall not be more than 250 mm on each face. The minimum circumferential reinforcement shall be 0.2% of the concrete area. The maximum spacing of the reinforcement bars shall not be more than 200 mm on each face. The circumferential reinforcement in the top 3 meters of the windshield		
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MDT NO. 14 SL O. 60 PAGE 16 MDT NO. 14 SL PAGE 16 of 20 times 3rd height of ey, in the area re expansion project, as the owner at the 3.14.04		shall be twice that required from design forces. The clear cover to reinforcement shall be 50 mm. There shall be a continuous ring of concrete shell without any opening for a height of atleast 5m below the soffit of flue duct openings. There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a sudden change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level. The diameter of the reinforcing bar for the main vertical reinforcement of shell shall not be less than 25mm for a shell height upto the top level of flue duct opening. Shell thickness between any two 10m reference levels shall not vary more than 150mm. The minimum thickness of shell/closure wall at beam support recess/ opening locations shall be 100mm. Grade of concrete for chimney shell, and other super structure shall be minimum M 30. Only OPC cement shall be used for Chimney shell and other super structure. The final design shall be checked & verified by 'Wind Tunnel Test' and shall be conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located in the area or in the future expansion stage of the project shall be determined along with the other topographical features of the local area through model test. Flue Liners The flue gas parameters & various operating conditions for selection of flue liner material, material specification for flue liner and the criteria of flue gas exit velocity for sizing the flue liner shall be as specified elsewhere in the specification. For flue liner with base metal as mild steel, the thickness of the base metal shall be determined from structural considerations. The thickness of any clad metal/coating/block lining etc. provided on the base metal shall not be considered for computing the structural strength of flue liner. The minimum thickness of the mild steel base metal shall, however, not be less than that specified elsewhere in the specification. Two manholes placed diametrically opposite shall also be provided in each flue at all internal platform levels. The supporting/restraining arrangements of the liners should be such that expansion of the liners longitudinally or circumferentially is not restrained. ~~Clean out door shall be provided below the flue for the removal of ash.~~	
MDT NO. 14 SL O. 62 PAGE 16 3.14.05		Internal Platforms The platforms shall be designed for dead, imposed (live), erection work and other possible loadings and temperatures effects. These platforms shall provide support and lateral restraint to the steel liners and provide access for inspections and maintenance. Forces imposed on the floors due to lateral restraint of flues shall be enhanced aptly for impact effects. These platforms shall also be designed suitably for	
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3.14.06	the liner erection works. The platform shall be made up of chequered floor panels supported on grid of structural steel beams. All beams shall have bolted connections. The maximum permissible deflection in main steel girders supporting flue liner shall be span/1000.		
	Internal Staircase The staircase shall have a clear passage way width of not less than 800 mm and a clear headroom of not less than 2100 mm. The riser height shall not be more than 175 mm and tread width shall not be less than 225 mm.		
3.14.07	Foundation The chimney foundation shall be designed for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation for any loading condition. Since chimney is a wind sensitive structure no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. ~~No allowance shall be made in the stresses for design of foundation for wind loading.~~ The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum ~~M-25~~ M30	as per limit state method as per IS 4998	
3.14.08	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner) The insulation shall be semi-rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. The density of insulation shall not be less than 64 kg/cu.m for resin bonded glass wool insulation and 100 kg/cu.m for resin bonded rock wool. The coefficient of thermal conductivity of insulation shall not be more than 0.52mW/cm/oC at a mean temperature of 100oC. ~~The insulation thickness shall be determined based on the maximum/minimum ambient temperature, surface air velocity worked out based on the draught of ventilation air in the annular space between the flue liner and chimney shell, insulation surface emissivity of 0.3 and the insulation cold face maximum temperature not exceeding 55 degree Celsius. The draught of air in the annular space shall be the natural draught created by the heating of air by the flue liner and the air being vented out through the openings in the chimney shell. The increase in the annulus air temperature due to the rising heated air shall be taken into account while calculating the insulation thickness.~~ The insulation thickness shall not be less than 100 mm, in any case, and shall be provided in two layers with the second layer of insulation covering the joints of the first layer. The insulation shall be wrapped on the outer-most surface with galvanised wire mesh using MS galvanised pins and speed washer.	AMDT 8 SL 176 PAGE 65	
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as per limit state method as per IS 4998

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3.14.09 AMDT NO. 14 SL O. 65 PAGE 19 AMDT NO. 14 SL NO. 66 PAGE 19 AMDT NO. 14 SL O. 67 PAGE 20 AMDT 8 SL 177 PAGE 66	Chimney Painting			
	(i)	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) ~~except surfaces of steel wind strakes~~ shall be painted as specified in corrosion protection clause of this specification.		
	(ii)	~~All exposed surfaces of steel wind strakes shall be painted with epoxy phenolic coating system having total 240 microns DFT.~~ a) ~~All steel surfaces shall be provided with two component epoxy primer coat (having solid by volume minimum 51% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2½ finish of ISO 8501 1 with surface profile 40-60 Micron. The primer coat shall be applied in shop immediately after blast cleaning by airless spray technique.~~ b) ~~Primer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique.~~ c) ~~Intermediate coat shall be followed with the application of finish coat of two pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied in shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer.~~		
	(iii)	All steel parts embedded in concrete like ~~Strake embedment assembly including~~ bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.		
	(iv)	The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab, ~~external surface of mini shell above roof~~ etc shall be painted with epoxy phenolic coating system having total 220 microns DFT. a) All concrete surfaces shall be provided with two component transparent polyamide cured epoxy sealer coating (having solid by volume minimum 40% ±2%) of minimum 50 micron DFT to be applied over cleaned surface in multiple coats. Surface to be coated shall be absolutely dry, clean and dust free. b) Sealer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours		
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3.14.10	exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. d) The entire external surface of chimney shell shall be painted with epoxy phenolic coating as specified in (iv) above in alternate bands of 'signal red' and 'bright white' colours. Electrical System 415V, normal and emergency AC power supply for chimney shall be derived from main plant power supply system. Emergency supply shall feed 20% of platform lighting, 50% of staircase lighting, aviation obstruction lighting and elevator load. All other loads shall be connected on normal power supply. Ambient temperature for design of all equipment shall be considered as 55 deg. C which is likely to be encountered inside the chimney. The equipment shall be suitable for installation and render trouble free operation at higher ambient temperature and rigorous weather conditions prevailing at chimney. All equipment supplied shall comply with relevant IS Standards. The distribution boards of chimney shall comprise switch fuse units of appropriate ratings. Emergency board shall have two incomers, one from emergency supply and other from normal AC distribution board itself. Auto changeover scheme shall be provided in emergency board to enable changeover to healthy source on failure of any source. Dry type isolating transformer of Dyn connection shall be provided in emergency board to obtain neutral lead, in case 3 phase 3 wire emergency supply is derived from main plant. Various platforms shall be illuminated by dust tight HPSV well glass lighting fixtures. Average illuminations level of 150 lux shall be maintained on equipment and 70 lux on platforms & 100 lux on staircases (minimum 1 lighting fixture at each landing).Any additional fixture to take care of dark patches/shadows shall also be provided. Lighting system shall be controlled through MCB provided in lighting panel. A lighting and power panel each shall be located at grade level and at other in between levels as required. All distribution boards, aviation lighting controls, etc. shall be located at grade level only. At each platform, 1 No. 63A, 415V welding receptacle and 1 No. 20A, 240V receptacle shall be provided and shall be fed from power panel. Wiring installation for lighting fixture shall be of PVC insulated copper/aluminium wires through galvanised steel conduits. Aviation obstruction lighting system shall conform to the requirements of the latest rules and regulations of the International Civil Aviation Organization (ICAO), National Airports Authority (NAA) and Directorate of Air Routes and Aerodromes (DARA). The type of aviation obstruction lighting system shall be of medium intensity aviation obstruction lights having an effective intensity of 2000 to 20,000 cd depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 20000 cd. The intensity of lights shall be 20000 cd ± 25% at twilight and shall reduce automatically to a night time intensity of 2000 cd ± 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction		
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3.14.11	lights and there will be four light units per level. The lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc.. A temporary aviation obstruction lighting system shall be provided during construction of the chimney. Cables from distribution board to lighting panels/power panels/receptacles shall be 1100V grade, multicore FRLS HR-PVC insulated, PVC inner sheathed, armoured, PVC outer sheathed stranded copper/ Aluminum laid on galvanised sheet steel cable trays. Cables shall be terminated using double compression type cable glands and solder less crimping type tinned copper cable lugs. Minimum size of the power cable shall not be less than 2.5 sq.mm copper or 4 sq.mm Aluminum. Minimum size of control cable shall not be less than 1.5 sq.mm. Lightning protection system shall comprise minimum 3 vertical air terminations for each flue liner, horizontal air terminations and minimum 4 Nos. of down conductors spaced 90 degrees apart routed all along chimney height on external surface and connected to the earthing system. Down conductors shall be of minimum 50x6 mm galvanized steel strip. Each down conductor shall be provided with a test link at 1 metre above ground level. Each test link shall be enclosed in a galvanised sheet steel enclosure. Above ground level earthing and lightning protection system shall comprise galvanised steel strips. These materials provided at top 12 meters shall have additional coating of 2 mm thick seamless lead cover and the accessories like nuts, bolts, washers etc. shall be of stainless steel to take care of corrosion. Chimney earthing system shall be interconnected to main plant earthing system. A temporary lightning protection & earthing system shall be provided during construction of the chimney till a permanent lightning protection & earthing system is installed. In no case reinforcement bars of Shell should be used as earthing Down Conductors Communication system comprising of telephone socket at every internal platform level and at grade level, necessary wiring installation, a telephone hand set, junction boxes etc. shall also be provided. Telephone cables shall be of minimum 0.6 mm diameter annealed high conductivity electro copper conductor, PVC insulated, twisted, PVC tape wrapped, screened, rip corded, PVC sheathed, conforming to relevant ITD (Indian Telephones Department) specifications. All equipment to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all type tests as listed below: (A) Distribution boards/panels-Degree of protection tests (B) Aviation lights: (1) Intensity Test (2) Degree of protection test For various equipment, the technical requirements and practices shall conform to the relevant clauses of the main plant electrical specification. Rack and Pinion Elevator A rack and pinion elevator, with a load carrying capacity of 400 kg (min) (passenger cum goods), cabin floor size of 1100 mm x 1000 mm (min.) and an operating speed		
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	of 40 m/min. (approx.), shall be provided for travel from the grade level to the top of the chimney. A landing platform shall be provided at all access/ platform levels. The elevator shall be of a proven and approved make. Enclosure shall be fabricated from tubular steel and expanded metal or wire mesh, 2.1 m high (Approx.). A Safety device comprising of an over speed governor in constant mesh with the rack by means of a flame hardened steel pinion shall be provided to protect the cab against over speed during the cab downward motion and the same shall actuate the brake mechanism and stop the down ward motion gradually. The lift shall be installed using anchor fasteners. The electrical requirement of the system shall conform to the main electrical specification. Drive motor shall be of S3 duty class with CDF of 25% and maximum number of 120 starts per hour in 55 degree Celsius ambient temperature. The motor shall be provided with internal 220V AC single phase space heaters or an alternate heating system. The elevator shall be supplied, installed, painted, tested, commissioned etc. complete with all mandatory spares (as specified in Part-F of this specification) and operation maintenance manual		
4.00.00	Drainage & Water Supply Works		
4.01.00	Drainage System: The drainage arrangements shall be so planned so as to ensure quick disposal of drainage water without stagnation and / or overflow. It is envisaged to clean the facility buildings etc. with water periodically. Minimum 4 nos. down comers shall be provided in each building at corners. For Conveyors, each down comer shall lead the water / slurry to pit (of 2 Cu.M capacity) to allow settling of lime/gypsum. The water from the pit shall overflow into contractor’s R.C.C drain, which will lead the discharge finally into owner’s drain routed alongside the nearby road. For Ball Mill building, Gypsum dewatering building, FGD control room building, peripheral drains (Brick drains with steel gratings provided around the building) shall lead the water / slurry to a local pit (of 2 Cu. M. capacity) near each facility to allow settling. The water from the pit shall overflow into contractor’s R.C.C drain, and finally into owner’s drain routed alongside the nearby road. In case of Control rooms and M. C. C. buildings Pump houses, etc, water / slurry coming from down comers shall discharge into peripheral drains (Brick drains with steel gratings provided around the building) which will lead the water / slurry into contractor’s R.C.C drain, which will lead the discharge finally into owner’s drain routed alongside the nearby road. Contractor’s scope shall also include construction of necessary culverts under the rail lines / roads as per railway / I. R. C. standards and approval of Railway culverts from concern Railway authorities.		
4.02.00	Internal and external water supply, drainage etc. The scope for potable water supply includes all distribution systems, tanks, pipes, fittings etc. as required and as described here or elsewhere in the specifications.		
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T 8 SL 188 E 71	The scope for service water supply and dust control water supply shall be as described elsewhere in the specifications. For water supply, medium class galvanized mild steel pipes conforming to IS: 1239 shall be used. All facility buildings shall be provided with open surface brick drains of minimum size of 300 mm width and 300 mm depth all around the periphery. All drains excepting the peripheral drains around facility building shall be of R. C. C. construction. Drains shall have removable steel grating cover and shall be provided with edge protection angles. The scope for foul water from toilets shall include layout and laying of sewers up to the Employer’s main sewer line for sewerage system together with all fittings and fixtures and inclusive of ancillary works such as connections, manholes and inspection chambers within the building and from the building to the Employer’s sewer line. For rain water down comer and those to be used for conveying water / slurry generated from cleaning of buildings floors, Galvanised MS pipes conforming to IS: 1239 (for 150 mm NB Medium grade pipes) with welded joints shall be used for MCC buildings, penthouse, control rooms, ball mill building, gypsum dewatering building, storage sheds. Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be less than 400 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. All rain water down comers shall be provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anti corrosive painting over a coat or primer. For design of building drainage system IS: 1742 shall be followed. For sanitary / sewerage pipes above ground, sand cast iron pipes conforming to IS : 1729 with leak proof lead joints. For underground drain pipes, minimum class NP - 2 pipes conforming to IS: 458. At road crossings, concrete pipes of class NP 3 conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided. ~~For sewerage below ground stoneware pipes conforming to IS: 651 with concrete bedding and haunch.~~			
	5.00.00	COLOUR COATED AND OTHER SHEETING WORK		
	5.01.00	Material		
		a) Wall Cladding & Roofing Material		
		Troughed permanently colour coated sheet of approved shade and colour shall be		
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5.04.00	For profiled metal decking sheets (to be used for RCC floor slab or roof slab) the sectional modulus and moment of inertia of troughed profile per meter width shall be so as to limit the deflection of sheets to span/250 under total super imposed loading (DL +LL) comprising the self-weight of metal deck sheet, dead weight of green concrete and an additional construction load 100kg per sq.m for two span condition. The section modulus and moment of inertia of troughed profile shall be computed as per the provisions of IS: 801 for satisfying the deflection and strength requirements. For metal deck sheets used for roofing (with or without RCC) and side cladding, the sectional modulus and moment of inertia of troughed profile per metre width shall be such that the deflection of sheets is limited to span/250 under design wind pressure for two span condition. The sectional modulus and moment of inertia of troughed profile shall be computed as per the provisions of IS: 801 for satisfying the deflection and strength requirements. No increase in allowable stress is permissible under wind load condition.		
	Fasteners Side cladding/roofing/decking sheets shall be fixed to the runner/purlins using self-drilling special coated fasteners confirming to corrosion resistant class 3 of AS3566 and tested for 1000 hours salt spray test. Spacing of Self-drilling fasteners in transverse direction (along runners/purlin) shall be equal to the pitch of trough or 250(+/-100) mm, whichever is lesser and in longitudinal direction at every runner/purlin location. Shear anchor studs shall also be provided through troughed permanently colour coated metal decking sheets metal deck, which are to be used as permanent shuttering, at regular interval on all top flange / flange plate of structural beams. The shear anchor studs for fixing metal deck sheet to floor structural beams shall conform to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 19mm diameter and 100mm length manufactured from cold drawn round steel bars conforming to the requirement of 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. The shear anchor studs for fixing metal deck sheet to roof structural purlins shall conform to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 16mm diameter and 65mm length manufactured from cold drawn round steel bars conforming to the requirement of 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. Alternatively, J/U type hooks shall be used in roofing which shall be provided in transverse direction (along runners/purlin) at a spacing equal to the pitch of trough or 250(+/-100) mm, whichever is lesser and in longitudinal direction at every runner/purlin location.		
5.05.00	Miscellaneous Details To minimize the number of joints, the length of the sheet shall preferably be not less than 4.5m, cut pieces shall not be used, unless specifically approved by the Engineer. However, the actual length shall be such so as to suit the purlin / runner spacing.		
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5.06.00	Lap between the sheets shall be at least 150mm in the longitudinal direction and at least one crest wide in the transverse direction which shall be properly anchored / fixed with fasteners. Z spacers if required shall be made of at least 2 mm thick galvanised steel sheet of grade 350 as per IS: 277 Sealant used for cladding shall be butyl based, two parts poly sulphide or equivalent approved, non stainless material and be flexible enough not to interface with fit of the sheets Filler blocks as a trough filler shall be used to seal cavities formed between the profiled sheet and the support or flashing. The filler blocks shall be manufactured from black synthetic rubber or any other material approved by the Engineer. All flashings, trim closures, caps etc. required for the metal cladding system shall be made out of plain sheets having same material and any weather/moisture sealants with appropriate material and coating specification as mentioned above for the outer face of the metal cladding. Overlap shall be min. 150 mm or as specified by manufacturer.		
	Pre-Fabricated Insulated Metal Sandwich Panels For structures where Pre-Fabricated Insulated Metal Sandwich Panels shall be used for Roofing, the sandwich panels shall comprise top sheet as troughed permanently colour coated sheet & bottom sheet as plain permanently colour coated with 50mm thick insulation sandwiched between the two sheets. Each sheet shall be i) either of steel with minimum 0.6mm bare metal thickness (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of 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 ii) or of minimum 0.5mm BMT (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of grade G350 as per AS1397 / grade SS340 class 4 as per ASTM A792M / grade S350GD as per EN 10326 with zinc coating to class Z275 / aluminium-zinc alloy coating to class AZ150 iii) or of steel of minimum 0.4mm BMT (i.e. excluding the thickness of galvanizing/aluminium-zinc coating and painting) of grade G550 as per AS1397 / grade SS550 as per ASTM A792M / grade S550GD as per EN 10326 with zinc coating to class Z275 / aluminium-zinc alloy coating to class AZ150. Alternatively aluminium feed material of minimum bare metal thickness of 0.7 mm of aluminium alloy of Series 31000 and above as per IS 737 and IS 1254. Metal sheets (steel or aluminium) shall be colour coated with total coating thickness of at least 40 microns (nominal) dry film thickness (DFT) comprising of Silicon Modified Polyester (SMP with silicon content of 30% to 50%) paint or Polyester paint, of minimum 20 microns (nominal) SMP or polyester paint on one side (exposed face), over minimum 5 micron (nominal) primer coat and minimum 10 micron (nominal) SMP or Polyester paint over minimum 5 micron (nominal) primer coat on other side. SMP and Super Polyester paint shall conform to product type 4 of AS/NZS 2728. Troughed sheet shall be of approved profile, sectional properties, (suitable for the specified loading / deflection and purlins / runners spacing), colour and shade.		
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5.07.00	Special coated fastener conforming to corrosion resistant Class 3 of AS3566 and tested for 1000 hours salt spray test shall be used for fixing Pre-Fabricated Insulated Metal Sandwich Panels with the structural members below. The contractor shall prepare working drawings of sheeting system including end and side laps, fixing details etc. before starting sheeting work at site. Polycarbonate Sheets The polycarbonate sheet to be used for cladding and glazing purpose in conveyor galleries, Transfer points & pump houses shall have toughed profile to match with the metal cladding profile. Minimum 3.0mm thick fire retardant and UV resistant polycarbonate clean sheet of approved make shall be used. The polycarbonate sheet shall be installed along with the metal cladding so as to have a watertight lapping arrangement. Suitable detailing shall be made to cater for the thermal expansion. IS 14434 to be referred for other details				
6.00.00	Roof Details				
6.01.00	Roof slab shall be minimum 150 mm thick(above the top surface (crest) of the metal deck sheet) and shall have minimum 10 dia HYSD reinforcement bars placed at 200 mm center both ways at top and bottom.				
6.02.00	900 mm high and minimum 100 mm thick R. C. C. parapet wall shall be provided over roofs of all buildings. Parapet wall shall have suitable coping. External face of parapet wall of the buildings provided with metal cladding shall also be finished with metal cladding of design and colour as per approved architectural drawings.				
6.03.00	Junction of roof and parapet shall be provided with 150 x 150 mm size concrete fillet.				
6.04.00	Drain level shall be provided with 45 x 45 cm size khurras having minimum thickness of 30 mm of M-15 concrete over PVC sheet of 1 m x 1m x 400 micron and finished with 12 mm 1 : 3 cement : sand plaster.				
6.05.00	Roofs of all control rooms, M. C. C. rooms, penthouse etc., shall have roof water proofing treatment. Roof water proofing treatment shall be as follows: 1) Application of polymerised mastic over the RCC roof to achieve smooth surface as primer coat. 2) Application of high solid content liquid applied urethane based elastomeric water proofing membrane, over the primer coat, to give uniform joint less dry film thickness of minimum 1.5 mm (as per ASTM C 836 and C 898). 3) For efficient disposal of rain water, the run off gradient for the roof shall not be less than 1: 100. This gradient shall be provided by screed concrete M-15 (using 12.5 mm coarse aggregate) and / or cement mortar (1: 4) over the elastomeric water proofing membrane with 25mm thick cement mortar (1:4) topping. 4) Wearing course at top, shall consist of 25 mm thick P. C. C. (M-15) cast in panels of maximum 1.2 x 1.2 m size and reinforced with 0.56 mm diameter galvanized chicken wire mesh and sealing of joints using sealing compound / elastomeric water proofing membrane. Pathways for handling of materials and movement of personnel shall be provided with 22 mm thick chequered cement concrete tiles as per IS : 13801 for a width of 1000 mm in place of P. C. C.				
6.06.00	For efficient disposal of rain water, the run off gradient for the roof shall not be less than 1:100. This gradient can be provided either in structure or subsequently by				
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6.07.00 6.08.00 6.09.00 6.10.00 7.00.00	screed concrete M-15 (using 12.5 mm coarse aggregate) and/ or cement mortar (1:4). However, minimum 25 mm thick cement mortar (1:4) shall be provided on top to achieve smooth surface. Medium class galvanised mild steel pipes conforming to IS: 1239/ IS: 3589 with welded joints shall be provided for rain water down comers to drain off rain water from the roof. These shall be suitably concealed with masonry work, to match with the exterior finish. The number and size of down comers shall be governed by IS: 1742 and IS: 2527. RCC roof shall be provided with 45 x 45 cm size Khurras having minimum thickness of 30 mm with M-15 concrete over PVC sheet of 1mx1mx400micron and finished with 12 mm thick cement sand plaster 1:3. Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, Ball mill building shall be through RCC staircase, and roof access to all other buildings all shall be through cage ladder as per requirement. Fillets at junction of roof and vertical walls shall be provided with cast - in - situ cement concrete (M-15) nominal mix followed by 12 mm thick 1:4 cement sand plaster. The rainwater down comers shall be provided with suitable C.I. grating at inlet point. RCC Floors, Paving & Grade Slab details The floor slabs shall be minimum 150 mm thick(above the top surface (crest) of the metal deck sheet) and shall have minimum 10 dia HYSD reinforcement bars placed at 200 mm center both ways at top and bottom. In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.6 mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification. Chequered plates (used for floors, walkways etc.) shall be minimum 6 mm thick. Mild steel flats/angles of suitable size shall be welded to the bottom portion of chequered plates at a designed spacing to stiffen chequered plates suitably. Chequered plates shall be fixed by staggered welding of suitable size. Floors of trenches shall have integral finish to concrete base. Toe guard of size 100 x 6 mm shall be provided at various openings provided in floors e.g. around stair case openings, chute openings and other similar cutouts. For conveyor walkways, angle runner to act as toe guard shall be provided. R. C. C. floors (where no brick masonry walls are provided) shall be provided with handrails all along the periphery. RCC paving of minimum 150 mm thick with M25 grade concrete, over an under bed as specified herein shall be provided for areas mentioned below. RCC paving shall be designed as rigid reinforced concrete pavement for the crane/ vehicular/ equipment movement loads which the paving has to bear. The under bed for paving shall consist of preparation and consolidation of sub-grade to the required level, laying of stone soling of 200mm compacted thick for normal duty paving and 400mm		

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	compacted thick for heavy duty paving with 63 mm and down aggregate with interstices filled with selected moorum/ non-expansive soil followed by 75 mm thick 1:4:8 PCC (1 part cement, 4 parts sand and 8 parts stone aggregate) with 40 mm nominal size aggregate. For normal duty paving, reinforcement of the RCC paving shall consist of minimum 8mm dia bars @ 200 mm c / c in both directions at the centre of the slab. For heavy duty paving/ passage, reinforcement of the RCC paving shall consist of minimum 10mm dia bars @ 200 mm c / c in both directions at the centre of the slab. Paving areas shall be provided with the metallic hardener floor finish as specified elsewhere in the specification. Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings. These passage areas shall be provided with heavy duty paving for movement of heavy vehicles. The top surface of the passages shall be finished with 50 mm thick metallic hardener topping. Heavy duty paving shall also be provided for the areas in the equipment lay down area, unloading & maintenance area with 50 mm thick metallic hardener topping. Lightly loaded areas such where no heavy traffic movement is envisaged shall be provided with Normal Duty paving. All facility buildings shall be provided with 750 mm wide plinth protection all around. It consists of 50 mm thick P.C.C. M-20 grade with 12 mm maximum size aggregate over 200 mm thick stone soling using 40 mm nominal size rammed, consolidated and grouted with fine sand An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection. Further, heavy duty paving shall be provided for passages connecting the outer periphery road to have access to the various facilities/buildings. Plinth level of all buildings shall be kept at least 500 mm above the finished grade / formation level. Suitable open RCC drains shall be provided to dispose off storm water drain. The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain. Sewer lines (Cast Iron), interconnected by sewer manholes (RCC) at regular intervals (not exceeding 30 meter centre to centre) shall be provided to dispose off sewage from FGD block to sewage pump house. GRADE SLAB OF BUILDINGS AT GROUND FLOOR In buildings, the grade slab shall consist of 150mm thick RCC M25 grade base slab over an under bed as specified below. The under bed for ground floor slab shall consist of 75mm thick 1:4:8 PCC on stone soling of 200mm compacted thick with 63 mm and down aggregate with interstices filled with well graded selected sand/ moorum/ non-expansive soil on compacted and dressed sub - grade. Reinforcement for the slab shall consist of minimum 8mm dia. bars @ 200 mm c/c at top & bottom of the slab in both directions. However, at unloading & maintenance area, stone soiling of minimum 400mm thick and grade slab with minimum 10mm dia bars @ 200 mm c/c at top and bottom in both directions shall be provided. Further, top surface of grade slabs shall be finished with 50mm thick metallic hardener topping.		
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8.00.00	Brickwork and allied masonry works All brick walls shall be non - load bearing in-filled panel walls. All brickwork shall be designed as per Indian Standards and shall be plastered on both faces. All external walls shall be minimum one brick thick in 1: 6 cement: sand mortar. Brick walls shall be provided with 12 mm and 18 mm thick 1: 6 cement: sand plaster on smooth and rough face of the brick work respectively. Only fly ash bricks shall be used in all construction. Bricks shall be table moulded/ machine made of uniform size, shape and sharp edges and shall have minimum compressive strength of 75kg/cm2. Burnt clay fly ash bricks and fly ash lime bricks shall conform to IS 13757 and IS 12894 respectively. Minimum fly ash content in fly ash based bricks shall be 25%. Brickwork cladding for various structures shall be so provided that there is a clear gap of 40 mm between inside face of external brick wall and outside face of column flange. Structural steel wall beams supporting brickwork shall be suitably encased with plaster or 1: 2: 4 concrete as the case may be. In case of box type steel beam, encasement shall be done with cement sand plaster in specified thickness and proportions over G. I. wire netting of 0.9 mm thickness. Parapets, chajjas, windows and door heads, architectural faces, fins etc. shall be provided with drip course in 1 : 4 cement sand mortar. 50 mm thick Damp proof course shall be provided at plinth level for all brick wall. All R. C. C. ceilings shall be rendered smooth and finished with whitewash unless otherwise specified. Ceiling of control rooms, M. C. C. rooms (except areas provided with false ceiling) shall be provided with 6 mm thick plaster.		
9.00.00	Earthing Mat 40 mm Dia MS Rods as earthing mat, placed at a distance of 1.0M away and at depths between 0.60M and 1.00M shall be supplied and laid all around the periphery of buildings, structures, and outdoor equipment, as per the approved drawings. Risers of 40 mm Dia MS Rods and connecting to the above Earthing mat shall also be supplied and laid in position by the Contractor, as per the approved drawings. Risers shall be laid up to a height of 300 mm above the local Ground level, at each of the columns of the buildings on outside of the buildings, and minimum 2 (Two) numbers for structures and outdoor equipment. The contractor also supply and lay necessary number of 3.0 M deep vertical 40 mm Dia MS Rods Earthing electrodes and connecting them to the Earthing mat, as per the approved drawings and the supplying and laying of 40 mm Dia MS Rods for connecting the Contractor's earthing mat with the Employer's earthing mat separately at two locations.		
10.00.00	SITE LEVELLING Site leveling of gypsum storage area , lime storage area , gypsum dewatering area , truck hopper and associated areas to be levelled in one blocks as defined in the drawing no. 4410-999-POC-F-001 titled, "Layout plan of FGD System ". Each block shall be finished to the formation level as specified in drawing. Bidder shall deploy adequate number of experienced site leveling contracting agency(s) with requisite earth moving and compacting equipment to complete the work as per schedule.		
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	Bidder shall carry out the topographical survey before he commences detailed design and site leveling. This survey shall cover the entire FGD area including gypsum storage ,gypsum handling area , lime storage area ,gypsum dewatering area , truck hopper area, limestone grinding and slurry storage area in Bidder's scope of work. Based on field observations the contractor shall prepare and submit for Owners review the survey maps of the surveyed sited on suitable scale, indicating grid lines, contour lines and demarcating all permanent features like roads, railways, waterways, buildings, power lines, natural streams, trees etc. For each area two sets of survey maps shall be prepared and submitted, one showing the spot levels and contours with grid lines and the other showing the grid lines, contours and permanent features Since the construction of roads and drains for the FGD area including gypsum storage ,gypsum handling area , lime storage area ,gypsum dewatering area , truck hopper area, limestone grinding and slurry storage area is included in the scope of Bidder, it shall be the responsibility of the Bidder to ensure that these facilities are also constructed along with site leveling works. Bidder shall ensure that road access and drainage facilities for each block is available when site leveling in that block is completed. Unless otherwise instructed by the Engineers, all roads and drains within a block shall be constructed by the bidder within a month from the date of completion of site leveling of that block. The specified formation level(s) shall be achieved either by excavation where the existing ground levels are higher than the specified formation level or by raising by controlled filling with borrowed earth where the existing ground levels are lower than the specified level All materials arising out of site clearance and excavation shall be the property of owner. They shall be dealt with in the manner specified by the Engineer. Earth / boulders / rock etc. excavated and useful portion (serviceable materials) of trees cut shall be stacked at suitable places within Owner's acquired land for the plant including the reservoir and the ash disposal area in a manner as directed by the engineer. Woods, branches, trunks of trees shall be termed as serviceable material. Other materials like twigs, leaves, roots, vegetable and organic matters etc. shall be termed as unserviceable material and shall be sorted out from the serviceable materials before disposal. They shall be cleared from the area and disposed off at places within Owner's acquired land for the plant including the reservoir and the ash disposal area in a manner as directed by the engineer. If the excavated material is suitable and accepted by the Engineer as fill material, the same can be used for filling in other areas where raising by filling is required. Otherwise the same shall be taken and stacked at places(s) within the plant boundary as directed by the Engineer. Filling with rock shall be done only after the written permission of the Engineer in the following manner: Filling with rock shall be done only in areas identified for laydown and preassembly . Original ground after removal of all organic and vegetable matters shall be consolidated by rolling as directed by the engineer subject to a minimum of six passes of 8-10 tonnes roller.		
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	- Excavated rock shall be laid (on original ground or after filling 300 mm thick layers of soil as specified), in layers not exceeding 1000 mm and rolled with with vibratory roller (10-15 tonnes static weight) with minimum six passes. - Over the compacted layer of rock, soil shall be filled in horizontal layers not exceeding 300mm in compacted thickness. The soil shall be compacted as specified elsewhere. - It shall be ensured that the top soil layer is in minimum 3 layers of 300 mm each. To achieve this the thickness and number of rockfill layers below can be suitably adjusted. Contour map and spot levels of the area based on the preliminary survey carried out by Owner is enclosed for the purpose of guidance of Bidder. Refer tender drawing no. "4410-999-POC-F-001". However, Owner does not lake any responsibility about the accuracy of the survey details furnished and any variation of the said data shall not constitute a valid reason for changing the terms and conditions of the contract. Bidder is requested to carry out his independent assessment of the existing ground levels before furnishing his. bid Detailed survey shall be carried out by Bidder after award of work and all findings as stated earlier shall be submitted for Owner's review. Before commencement of cutting/filling, all organic and vegetable matters like grass. Plants shrubs bushes, weeds, trees (with girth less than 30 cm measured at height of 1m above ground level) etc. in the areas to be filled, shall be completely removed along with their roots and disposed off. .It shall also be ensured that the area to be filled is clear of any water, slush etc. Original ground shall be compacted by rolling as directed by the Engineer subject to a minimum of six passes of 8 to 10 tonne roller The earth shall then be spread in horizontal layers not exceeding 300 mm in compacted thickness. Each layer shall be watered and compacted with proper moisture content and with such equipment as may by required to obtain a compaction of 95% or more of Standard Proctor's maximum dry density. The moisture content of the fill material shall be controlled to obtain near optimum moisture content during compaction. The fill material shall be tested for determining optimum moisture content and maximum dry density by Standard Proctor Test as per IS : 2720 (Part-VII). The fill material shall also be tested for determining moisture content before compaction as per IS:2720 (Part-II) For each of the above tests, one sample for every 10,000 cubic metre of fill material shall be tested. Additional samples shall be tested, whenever there is a change in the source or type of fill material. The compacted soil shall be tested for its dry density as per IS2720 (Part-XXIX) or Part-XXVIII). Samples shall be taken at the rate of one sample for every 10,000 sq.m. area for each compacted layer. In addition random checks shall be carried out in compacted soils by means of Proctor needle penetration. Bidder shall submit to the Engineer, the test results immediately after completion of the tests. A sample shall be deemed to have passed the test when the in-situ dry density is equal to or more than the specified percentage of maximum dry density. If a sample taken from a layer fails to pass the test, the layer shall be further compacted till two samples		
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	taken and tested from this layer pass without any negative deviation. Only after this. spreading of further layers shall be taken up. Before start of filling, the Bidder shall submit to the Owner his proposal for the methodology to be adopted for compaction for each type of fill material. The Bidder shall also carry out compaction trials to establish the proposed methodology. The Bidder shall start the compaction work only after approval of the methodology by the Owner The surface of the cut/filled up areas after reaching final level shall be dressed to the required levels and slopes. The difference in levels shall not be more than +/- 10cm locally. The borrow areas outside the overall plant boundary limits for obtaining suitable fill material which is required over and above the earth available after cutting high grounds within the plant area, for site levelling shall be arranged by the Bidder himself and all expenses in respect of royalties, taxes, duties, etc. for borrow areas/fill material shall be borne by him. He shall also obtain and submit to the Owner the necessary clearances/permission from the concerned authorities for the borrow areas/fill material. Material suitable for filling shall be loaded and transported to the filling site by the Bidder. Any coarse grained or fine grained low plastic soil, free from shingle, salts, organic matter, sod or any other foreign substances, may be used for filling. The Bidder shall test the fill material to establish its suitability and submit its results to the Owner. Fill material shall be approved by the Owner. The following types of materials shall not be used for filling: a) Material from swamps, marshes and bogs. b) Expansive clays c) Peat, logs, stumps, sod and perishable materials. d) Materials susceptible to combustion e) Any material or industrial and domestic produce which will adversely affect other materials in the work. f) Materials from prohibited areas Bidder shall include in his offer any extra filling that may be required on account of subsidence of the original ground due to overburden of filling above and/or compaction works for site levelling. After levelling, the contractor shall establish concrete pillars at the intersection points of the grid lines for future reference. These pillars shall project at least 450 mm above the formation level and shall be labelled permanently with their respective coordinates and reduced levels.		
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11.00.00	Filling upto the specified formation level shall extend at least 2.0m beyond the outside face of boundary wall/fence. Thereafter, it shall be finished at a suitable slope (not steeper than 1 Vertical:2 Horizontal) and provided with good quality dry stone pitching minimum 300mm thick for slope upto level difference of 3m. If the level difference is more than 3m, the stone pitching shall be provided with RCC bands with suitable design and benching. FENCING Fencing with toe wall and steel gates shall be provided around the gypsum storage area , lime storage area , gypsum dewatering area , truck hopper and associated areas . Fencing shall comprise of PVC coated GI chain link fencing of minimum 8G (including PVC coating) of mesh size 75 mm and of height 2.4 m above the toe wall. The diameter of the steel wire for chain link fence (excluding PVC coating) shall not be less than 12G. All Fence posts shall be of 75 x 75 x 6 MS angles spaced at 2.5 m c/c distance. All corner posts will have two stay posts and every tenth post will have transverse stay post. Suitable R. C. C. foundation for the post and stays shall be provided based on prevailing soil conditions. Gates shall be sturdy with locking provisions. Toe walls of brick masonry shall be provided between fence posts all along the run of the fence with suitable foundation. Toe wall shall be minimum 200 mm above the formation level with 50 mm thick P. C. C. coping (1: 2. 4) and shall extend minimum 300 mm below the formation level. Toe wall shall be plastered on both sides and painted with two coats of cement paint of approved colour and shade. Toe wall shall be provided with weep holes at suitable spacing. 12.00.00 ROADS All roads shall be of rigid pavements unless otherwise specified. The design of rigid pavement shall be carried out as per IRC: 58. The effects of design wheel load, maximum tyre inflation pressures, tyre contact area for the vehicle, traffic loads, environmental factors such as temperature changes in the pavement, other factors, like impact, load repetitions, etc., are to be taken. Detailed plate load tests to determine the modulus of sub grade reaction “K” shall be carried out as per the procedure outlined in IS: 1888. The design traffic load shall be a minimum value of 4 million standard axles. The road shall be designed for 30 years of life and considering a minimum traffic growth rate of 1 per cent per annum. The concrete pavement for roads shall be minimum 250 mm thick slab. The road construction including its shoulders, base, sub base and concrete pavement shall be as per IRC standards. IRC: 58 shall be followed for the pavement design and IRC: 15 shall be followed for the construction of the concrete pavement. The road base shall be with minimum 150 mm thick dry lean concrete over granular sub base. Dry lean concrete shall be laid by a mechanical paver and compacted by vibratory rollers. Concrete pavement of the road shall be done with fully mechanized paver fitted with electronic sensors for construction techniques. Dry lean concrete
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13.00.00	shall be minimum M10 grade and concrete pavement slab shall be minimum M35 grade concrete. The finished top (crest) of all roads shall be 350 mm above the surrounding finished ground level. The sub grade under all roads and its shoulders shall be compacted to achieve 95 per cent or more of Standard Proctor's Density MDD using mechanical means. Cutting / extending / rerouting / remaking of existing roads including associated works to maintain continuity of road system / network shall also be carried out. All culverts and RCC bridges at crossings of all roads / rail tracks / facilities with drains / nallahs / channels / roads / rail tracks / pipes / other facilities, etc. are to be designed and constructed. Unless otherwise specified, all roads shall be double lane roads. The road section should be as per drawing no. 4410-999-POC-F-001. GATE ALONG BOUNDARY WALL: The gates shall be provided at the entry and exit of truck movement road gates in Bidder's Scope are as identified in Drawing No.: 4410-999-POC-F-001. The gate shall comprise of two mild steel double panelled openable shutter of minimum 7.75 m clear width and minimum height of 3.0m from top of road. The gate shall be complete with fabricated hinges, MS aldrops with locking arrangement, tempered steel pivot, guide track of MS tee, bronze aluminum ball bearing, castor wheel etc. All gates shall be given anti-corrosive treatment in three coats. The structural steel shall confirm to IS: 2062 (latest) and all other relevant IS codes. Beside the each gate one room of size not less than 3m X 3m shall be provided for security guards. The room shall be made of brick/ RCC and with RCC roof. In addition to the room, one toilet block shall also be provided.		
	14.00.00	LIME & GYPSUM HANDLING AND ASSOCIATED BUILDINGS STORM WATER DRAINAGE SYSTEM Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr. All RCC drains shall be either RCC Cast-in-Situ or RCC Pre-cast drains. The minimum grade of concrete shall be M25 for RCC Cast-In-Situ drains and M30 for RCC Pre-cast drains. The maximum velocity for RCC open drains shall be limited to 1.8 metre per second. However, minimum velocity of 0.6 metre per second for self - cleansing shall be ensured. Bed slope not milder than 1 in 1000 shall be provided. Open RCC rectangular section, unless required otherwise due to functioned requirement, shall be provided for all drains. The thickness of side walls and bottom slab of RCC drains shall be minimum 150mm or as per design considerations	
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15.00.00	whichever is higher for drains upto depth of 1m from formation level. For depth of drain more than 1m from formation level, the thickness of side walls and bottom slab of RCC drains shall be minimum 200mm or as per design considerations whichever is higher. The drains shall be provided on both sides of roads .These shall be designed to drain the road surface as well as all the free and covered areas, etc. Box culverts shall be provided at all rail, road and other crossings. All drains inside the building shall have minimum 40 mm thick grating covers. In areas where heavy equipment loads would be coming, precast RCC covers shall be provided in place of steel grating. The invert levels of the in-plant and plant peripheral drains shall be kept such that water can be discharged by gravity to the main / trunk drains under all conditions. The invert levels of the drains shall be decided in such a way that the water can easily be discharged to the natural water bodies above the high flood.			
	SEWERAGE SYSTEM The connection of sewer pipe line for the associated buildings of FGD and Lime and gypsum handling area to nearest owner’s sewage network is in bidder’s scope. Cement concrete pipes of class NP-3 as per IS:458 shall be used below ground level for sewage disposal in all areas . However, for pressure pipes and under roads spun C.I. pipes conforming to IS:1536 of required class shall be used. RCC manholes with CI cover shall be provided at every 30m along the length, at connection points, and at every change of alignment, gradient or diameter of a sewer pipeline. This shall be as per IS:4111.			
	PUMPING STATIONS AMDT 8 SL 183 PAGE 70 Sewage ~~pump house~~ shall be provided as per IS:4111.			
	16.00.00	LOADING		
	16.01.00	For consideration of loads on structures IS : 875 - ‘Code of practice for structural safety of buildings’ shall be followed. In addition to the dead load, live load, equipment load (including impact / vibration). Temperature loads etc. various loading conditions arising due to operation and maintenance of equipment shall be considered in the design. The structure and equipment shall also be designed for seismic loads as per the “Criteria for Earthquake Resistant Design of Structures and equipment” and the “Criteria for Wind Resistant Design of Structures and equipment” specified in the “Annexure-A” and “Annexure-B” respectively in Civil Section, whichever is governing. Wind and seismic forces shall not be considered to act simultaneously. The following minimum live loads shall be adopted for the design of various structures. If actual expected load is more than the specified load, then actual load is to be considered.		
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	a) Roofs 150 Kgs. / Sq. M. for accessible roofs and 75 Kgs. / Sq. M. for non - accessible roofs. In addition to this dust load (Dead load) of 150 Kgs. / sq. m. on flat roofs & 75 Kgs. / sq. m. on inclined roofs shall also be considered. b) R. C. C. floors 500 Kgs. / Sq. M. c) Stair and balconies 500 Kgs. / Sq. M. d) Toilet rooms 200 Kgs. / Sq. M. e) Chequered plate floors 400 Kgs. / Sq. M. f) Walkways (including walkways in conveyor galleries) 300 Kgs. / Sq. M. g) Conveyor galleries In addition to the live loads, loads due to cable trays, fire fighting / service water pipes shall also be considered @ 125 Kgs. / m (minimum) on each of the longitudinal girder. Roof-truss members are to be checked for supporting fire fighting pipes/ Service water pipes. h) Road Culverts and its allied structures including R. C. C. pipe crossing & road crossing of trenches. For class 'AA' loading and checked for class A loading as per IRC standard. i) Channels / trenches In addition to earth pressure and water pressure, etc. additional earth pressure due to surcharge of 2T / Sq. M. shall also be considered for design. j) Covers for trenches / channels Covers for channels & trenches, shall be designed for a live load of 0.4T Sq. M. and loading as mentioned under clause in trenches, whichever is critical. k) Sumps and tanks and other underground basement type structures In addition to earth pressure with a surcharge of 2T / Sq. M. (or surcharge due to Railway loading whichever is critical for Railway load bearing structures etc.) and sub - soil water pressure etc. These are also to be designed for the following conditions : i) Water / liquid inside and no earth outside (applicable only to such		
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	structures which are liable to be filled up with water or any liquid). ii) Earth with surcharge outside and no water / liquid inside iii) For underground (basement) structures protection against buoyancy during execution and after execution shall be ensured without superimposed loadings with minimum factor of safety of 1.2 against buoyancy. If the erection load is higher than the specified live loads on any floor or part thereof, then the erection loads are to be considered for the design. Permissible increase in stresses of materials and bearing pressure of soil due to wind load or seismic load shall be as per relevant I. R. S. and I. S. code.		
16.02.00	Crane load For crane loads, an impact factor of 25% and lateral crane surge of 10% (of lifted weight + trolley weight) shall be considered in the analysis of frame according to the provisions of IS:875. The longitudinal crane surge shall be 5% of the static wheel load. Longitudinal surge and lateral surge shall not be considered to act simultaneously.		
16.03.00	Temperature load For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for this purpose shall be taken as the difference between the mean of the daily minimum ambient temperature during the coldest month of the year and mean of daily maximum ambient temperature during the hottest month of the year. The structure shall be designed to withstand stresses due to 50% of the total temperature variation. Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns. The maximum distance of the expansion joint shall be as per the provisions of IS: 800 and IS: 456 for steel and concrete structures respectively.		
17.00.00	DESIGN CRITERIA		
17.01.00	The design of all R. C. C. structures shall be carried out as per ‘code of practice for plain and reinforced concrete for general building construction’, IS : 456 (latest).		
17.01.00	Design of steel structures shall be done as per provisions of IS:800: 2007 (Limit state design) and other relevant IS standards.		
17.02.00	Minimum size of the angle section to be used as structural members shall be 50 X 50 X 6. Minimum weld size shall be 6 mm. Connections shall be designed for 70 % of shear capacity of the member or the actual shear force, whichever is higher. The steel structures using tubular sections shall be designed and fabricated as per IS:806 – “Code of Practice for use of steel tubes in general building construction.” and EN 1993-1-8:2005. Minimum grade of steel & thickness of Tubular/Hollow sections shall be Yst 240 Mpa & 4.0mm respectively		
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17.03.00	The building shall conform to local bye - laws, rules and regulations for industrial buildings and also B. I. S. publications, SP 32 and 41.						
17.04.00	Slotted holes shall not be assumed to act as expansion joint for relieving of stresses and suitable bearings shall be provided at the supports.						
17.05.00	Stresses for all structures shall be checked for the higher of the forces obtained from gust factor method and the peak wind speed method.						
17.06.00	Horizontal bracing system shall be provided at floor levels around the openings.						
17.07.00	Shear force in steel columns shall be transferred to the pedestals / foundations exclusively either through foundation bolts or the shear key arrangement.						
17.08.00	For design of liquid retaining structures, IS : 3370 (Part - I to IV) (latest) shall be followed. Face of the structure in contact with liquid shall be designed as un - cracked section. For design of R. C. C. pipes for culverts, latest editions of IS : 458, IS : 783 should be followed.						
17.09.00	For design of all underground structures / foundations, ground water table shall be assumed at the formation level (i. e. the adjoining ground level). For all underground structures like tunnel, underground transfer point and underground hopper etc. crack width shall be limited to 0.2mm.						
17.10.00	Design of masonry walls shall be made as per IS : 1905.						
17.11.00	Civil task drawing indicating various equipment loading and supporting arrangement and floor loads to be submitted along with the design calculation.						
17.12.00	Minimum 0.12% of reinforcement shall be provided on the top face of the foundation concrete on either direction and minimum percentage of reinforcement at bottom face of foundation shall be same as that stipulated for beam as per IS:456.						
17.13.00	Foundations for all tanks shall be designed for as per IS: 803.						
17.14.00	Footings shall be so proportioned to as to minimise the differential settlement.						
17.15.00	All gallery supporting trestles shall be so proportioned that the transverse deflection of gallery due to wind / seismic load should not exceed trestle height / 1000 as stipulated in IS: 11592. This deflection condition shall be strictly followed. Peak wind speed method shall be considered for checking the transverse deflection.						
17.16.00	The crusher and transfer house structures shall be so designed that transverse deflection at places where conveyor galleries meet, should be equal to the respective transverse deflection of conveyor supporting trestles.						
17.17.00	Deflection criteria The maximum Horizontal Deflection for various structures shall not exceed and be limited to the following:						
<table><tr><td>NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2</td><td>SUB-SECTION-IV-D CIVIL WORKS</td><td>PAGE 35 OF 114</td></tr></table>				NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 35 OF 114
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	Sl. No.	Description	Maximum value of
	1.	For Trestles and transfer points (Transverse deflection at Conveyor gallery supporting level)	Height/1000 (For Wind load by Peak Wind Speed Method / Seismic Load)
	2.	For other Buildings	Height/325
17.18.00	a)	Permissible deflection (unless specified otherwise in this specification) for latticed framework and beams of floors other than drive floor shall be span/325.	
	b)	The allowable deflection for beams directly supporting drive machinery shall be restricted to span/500 unless specified otherwise in this specification.	
	c)	The deflection for manually operated cranes & monorail supporting beams shall not exceed span/500. For electric overhead cranes :	
		1) upto 50 t capacity : span/750	
		2) over 50 t capacity : span/1000	
	d)	The vertical deflection of metal deck sheet for roofing and side cladding shall be limited to span/250	
	e)	The permissible vertical deflection for beams supporting drive machinery shall be restricted to span / 500 and for other beams it shall be within span / 325.	
	f)	Permissible deflection for all purlins, cladding runners, roofing/cladding sheets and grating / chequered plates shall be span/250. However, the maximum vertical deflection of Grating/ Chequered plate shall be limited to 6 mm.	
17.19.00	a)	Dispersion of load in any direction through soil shall be as per IS: 8009 (relevant part).	
	b)	Dispersion of load through concrete shall be considered at an angle of 45 degrees with horizontal from the edge of contact area.	
17.20.00	a)	The design and construction of RCC structures shall be carried out as per IS: 456. Working stress method shall be adopted for the design wherever specifically mentioned in this specification.	
	b)	For design and construction of steel-concrete composite members, IS: 11384 shall be followed.	
	c)	For reinforcement detailing, IS: 5525 and SP: 34 shall be followed.	
	d)	Two layers of reinforcement (on both inner and outer faces) shall be provided for RCC wall sections having thickness 150 mm or more.	
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17.21.00	a) All RCC liquid retaining/conveying shall be designed by working stress method as outlined in clause no. 4.5 of IS 3370 (Part-2) 2009 unless specified other wise. b) Water proofing treatment shall be provided for liquid retaining/ carrying structures and basement type structures (requiring dry working condition). Dense and durable concrete with water cement ratio not more than 0.45 shall be used. Plasticiser /super-plasticiser cum water proofing compound shall be added to the concrete. All the construction/expansion joints shall be provided with PVC water bar and/or chemical injection grouting as per IS:6494. As applicable internal/external surface of such structures shall be provided with acrylic based polymer modified cementitious composite coating system for critical structures. For liquid carrying/retaining structures, minimum two coats of such coating shall be applied. For external application wherever the surface is in contact with the earth, fine silica/quartz sand of 0.6 mm nominal size shall be added in the coating mix for better abrasion resistance and total nominal thickness of such coating shall be minimum 1.5 mm. For non critical structures minimum two coats of bitumen grade 85/25 as per IS:702, mixed with 1% of anti-stripping compound meeting the requirement of IS:6241, shall be applied. The total application of bitumen shall not be less than 1.7 kg/sq.m. Bidder shall submit a comprehensive scheme for water proofing treatment based on above or any other alternative scheme, internationally accepted for Employer's approval prior to commencement of work. c) All liquid retaining/carrying structures shall be tested for water tightness as per the provisions of IS: 3370 and IS: 6494 and in case of leakage, the same shall be rectified by chemical injection grouting through nozzles.		
17.22.00	For design of all underground structures, foundations, etc. ground water table shall be assumed at the finished ground level unless specified otherwise.		
17.23.00	Earth pressure for all underground structures shall be calculated using coefficient of earth pressure at rest or co-efficient of active earth pressure, whichever is applicable, depending upon the structural configuration. However, for the design of substructure of pump houses, earth pressure at rest shall be considered. Co-efficient of passive earth pressure shall be used only in design of shear keys for stability against sliding.		
17.24.00	a) Following loading conditions shall be considered in addition to the loading from super structure for the design of substructure of pump house, channels, sumps, tanks, trenches and other underground structures containing liquid i) Water pressure from inside and no outside pressure, like earth pressure, ground water and surcharge pressure (applicable only to structures, which are liable to be filled up with water or any other liquid.) ii) Earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside. iii) Design shall also be checked against buoyancy due to the ground water during construction as well as after construction stages. Minimum factor of safety of 1.2 against buoyancy shall be ensured considering empty condition inside and ignoring the superimposed loadings. Provision of pressure relief valves/flap valves, etc., shall not be permitted to counter the buoyancy unless specified otherwise. iv) Base slab and piers of the pump houses shall also be designed for the		
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CLAUSE NO.	TECHNICAL REQUIREMENTS
17.25.00 AMDT 14 SL 142 PAGE 56 17.26.0 0 DELETED 17.27.0 0 Design drawings of steel structures shall include the connection, joint & fastener details for Main columns, Beams & Bracings AMDT 8 SL 186 PAGE 71 18.00.00	condition of different combination of pump sumps being empty during maintenance stages with maximum ground water level. b) Intermediate dividing pier of pump sumps and partition wall (if applicable) in channel shall be designed considering water on one side only and other side being empty for maintenance. c) All pump houses and other substructures (wherever applicable) shall be checked for stability against sliding and overturning during construction as well as operating conditions for various combinations of loads. Design of Block Foundation a) Block foundation resting on soil shall be analyzed using elastic half space theory. In case the foundation is supported over piles, Novak's approximation shall be used for determining the spring constant and damping ratio of pile groups. The mass of the RCC block shall be at least three times the mass of machine. Free vibration analysis of the foundation shall be carried out to evaluate the natural frequencies. The fundamental natural frequency shall be kept at least 20% away from the operating frequency (speed). Forced vibration analysis shall be carried out if the dynamic forces are made available by the machine supplier in which case the amplitude limits stipulated by the machine supplier and ISO 10816, whichever is lower, shall be satisfied. Reinforcement design shall be done by working stress method as per IS:456-2000 and IS:2974 (Part-IV). For the foundations supporting minor rotating equipment weighing less than one ton or if the mass of the rotating parts is less than one hundredth of the mass of the foundation, no dynamic analysis is necessary. However, if such minor equipment is to be supported on building structure, floors, etc., suitable vibration isolation shall be provided by means of springs, neoprene pads, etc., and such vibration isolation system shall be designed suitably. Coating on RCC water retaining structures (other than drinking water) Epoxy phenolic coating shall be applied on internal surfaces of the RCC water retaining structures, as per details specified below: All concrete surfaces shall be provided with two component transparent polyamide cured epoxy sealer coating (having solid by volume minimum 40% $\pm$2%) of minimum 50 micron DFT. Surface to be coated shall be absolutely dry, clean and dust free. Sealer coat shall be followed with the application of epoxy phenolic coating (solid by volume minimum 63%) of minimum 400 micron DFT. This coat shall be applied after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. Coating on RCC water retaining structures (drinking water) Internal surfaces of RCC water retaining structures shall be provided with minimum 400 micron Food grade epoxy coating complying to FDA Title 21, Part 175.300. Surface to be coated shall be absolutely dry, clean and dust free
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19.00.00	Fabrication All steel structures shall be fabricated in factory, transported and erected at site. All factory fabricated structures shall have bolted field connections. Chimney flue liners can either be fabricated at factory in segments, transported and welded at site before erection or fabricated at site. For Chimney flue liners, to prevent flue gas leakages, the applicable field joints shall necessarily be welded.			
20.00.00	Electrodes			
20.01.00	The electrodes used for welding shall be of suitable type and size depending upon specifications of the parent material, the method of welding, the position of welding and quality of welds desired. Only low hydrogen electrodes shall be used for welding of medium / high tensile steel and for mild steel plate thickness above 20 mm.			
20.02.00	All low hydrogen electrodes shall be baked and stored before use as per manufacturer's recommendation. The electrodes shall be re-baked at 250°C - 300°C for one hour and later on cooled in the same oven to 100° C. It shall be transferred to a holding oven maintained at 60°C - 70°C. The electrodes shall be drawn from this oven for use.			
20.03.00	Where coated electrodes are used they shall meet the requirements of IS: 814 and relevant ASME - Sec. II. Covering shall be heavy to withstand normal conditions of handling and storage.			
20.04.00	Only those electrodes that give radiographic quality welds shall be used for welds, which are subjected to radiographic testing.			
20.05.00	Where bare electrodes are used these shall correspond to specification of the parent material. The type of flux-wire combination for submerged arc welding shall conform to the requirements of F-60 class of AWSA-5-17-69 and IS: 3613. The electrodes shall be stored properly and the flux shall be baked before use in an oven in accordance with the manufacturer's requirements as stipulated.			
20.06.00	The contractor shall take specific approval of the weld for the various electrodes proposed to be used on the works before any welding is started.			
20.07.00	Edge Preparation for Welding Suitable edge as per weld joint detail shall be prepared either by machines or by automatic gas cutting. All edges cut by flame shall be ground before they are welded.			
20.08.00	Pre Heating and Post Heating Mild steel and medium / high tensile steel plates thicker than 20mm, will require Pre-Heating of the parent plate prior to welding as mentioned in Table - 1 for mild steel and Table - 2 for medium / high tensile steel, however, higher pre heat temperature may be required as per approved welding procedure and it shall be followed. In welding materials of unequal thickness, the thicker part shall be taken for this purpose. Base metal shall be preheated, notwithstanding provisions of IS: 9595 to the temperature given in Table - 1 for mild steel and Table - 2 for medium / high tensile			
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20.09.00 electric extending up is	steel, prior to welding or tack welding. When base metal not otherwise required to be pre heated is at a temperature below 0°C it shall be pre heated to atleast 20°C., prior to tack welding or welding. Pre heating shall bring the surface of the base metal to the specified pre heat and this temperature shall be maintained as minimum inter-pass temperature welding is in progress. TABLE - 1 MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR WELDING MILD STEEL <table><tr><th rowspan="2">Thickness of thicker part at Point of welding</th><th colspan="2">Welding Using</th></tr><tr><th>Low hydrogen electrode or submerged arc welding</th><th>Other than low hydrogen electrode</th></tr><tr><td>Upto and including 20mm</td><td>None</td><td>None</td></tr><tr><td>Over 20mm and up to and including 40mm</td><td>20°C</td><td>Not allowed</td></tr><tr><td>Over 40mm and up to and including 63mm</td><td>66°C</td><td>Not allowed</td></tr><tr><td>Over 63mm</td><td>110°C</td><td>Not allowed</td></tr></table> Note: Type of electrode and the preheating requirements for welding shall be as per approved welding procedure. TABLE - 2 MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR WELDING MEDIUM / HIGH TENSILE STEEL <table><tr><th rowspan="2">Thickness of thicker part at Point of welding</th><th colspan="2">Welding Using</th></tr><tr><th>Low hydrogen electrode or submerged arc welding</th><th>Other than low hydrogen electrode</th></tr><tr><td>Upto and including 20mm</td><td>None</td><td>Not Allowed</td></tr><tr><td>Over 20mm</td><td>120oC - 140°C</td><td>Not Allowed</td></tr></table> Note : Type of electrode and the preheating requirements for welding of medium and high tensile steel shall be as per approved welding procedure.			Thickness of thicker part at Point of welding	Welding Using		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode	Upto and including 20mm	None	None	Over 20mm and up to and including 40mm	20°C	Not allowed	Over 40mm and up to and including 63mm	66°C	Not allowed	Over 63mm	110°C	Not allowed	Thickness of thicker part at Point of welding	Welding Using		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode	Upto and including 20mm	None	Not Allowed	Over 20mm	120oC - 140°C	Not Allowed
	Thickness of thicker part at Point of welding	Welding Using																													
		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode																												
	Upto and including 20mm	None	None																												
	Over 20mm and up to and including 40mm	20°C	Not allowed																												
	Over 40mm and up to and including 63mm	66°C	Not allowed																												
	Over 63mm	110°C	Not allowed																												
	Thickness of thicker part at Point of welding	Welding Using																													
		Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode																												
	Upto and including 20mm	None	Not Allowed																												
Over 20mm	120oC - 140°C	Not Allowed																													
Pre heating may be applied by external flame which is non-carbonizing like LPG, by resistance or electric induction process such that uniform heating of the surface to a distance of four times the thickness of the plate on either side of the welded joint obtained.																															
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20.10.00 measuring the	Thermo-chalk, thermo-couple or other approved methods shall be used for plate temperature.		
20.11.00 beam in AWS per	All butt welds with plates thicker than 50mm and all site butt welds of main framing supporting the bunker shall require post weld heat treatment as per procedure given D-1.1. Post heating shall be done up to 600oC and rate of application shall be 200oC per hour.		
20.12.00 For heated	The post heat temperature shall be maintained for 60 minutes per 2.5cm thickness. maintaining slow and uniform cooling, asbestos pads shall be used for covering the areas.		
21.00.00	Paving, Drainage and Sewage RCC paving of minimum 150 mm thick with M25 grade concrete, over an underbed as specified herein shall be provided. RCC paving shall be designed as rigid reinforced concrete pavement for the crane/ vehicular/ equipment movement loads which the paving has to bear. The under bed for paving shall consist of preparation and consolidation of sub-grade to the required level, laying of stone soling of 200mm compacted thick for normal duty paving with 63 mm and down aggregate with interstices filled with selected moorum followed by 75 mm thick 1:4:8 PCC (1 part cement, 4 parts sand and 8 parts stone aggregate) with 40 mm nominal size aggregate. Paving areas shall be provided with the metallic hardener floor finish as specified elsewhere in the specification. 2.5 m wide paving with metallic hardener around periphery of all sumps and underground tanks shall be provided. Suitable drains shall be provided to dispose off storm water as well as floor wash of the FGD area block. The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain. Sewer lines (Cast Iron), interconnected by sewer manholes (RCC) at regular intervals (not exceeding 30 meter centre to centre) shall be provided to dispose off sewage from FGD area to the nearest available manhole of the owner. The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr. The maximum velocity for pipe drains and open drains shall be limited to 2.4m/sec and 1.8 m/sec. respectively. However, minimum velocity of 0.6m/sec. for self-cleansing shall be ensured. Bed slope not milder than 1 in 1000 shall be provided. The open drains shall be open rectangular drains of RCC unless required otherwise due to functional requirement. RC box culverts shall be provided at rail, road or other crossings. Sewers shall be designed for a minimum self-cleansing velocity of 0.75m/sec and the maximum velocity shall not exceed 2.4m/sec.		
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22.00.00	Statutory Requirements Bidder shall comply with all the applicable statutory rules pertaining to Factories Act, Fire Safety Rules at Tariff Advisory Committee. Water Act for pollution control, Explosives Act, etc. Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkways along the crane - girder level on both sides of building, comfortable approach to EOT crane cabin, railing, fire escape, locker room for workmen, pantry, toilets, rest room etc. Provisions for fire proof doors, number of staircases, fire separation wall, lath plastering/encasing the structural members (in fire prone areas), type of glazing etc. shall be made according to the recommendations of Tarrif Advisory Committee. Statutory clearances and norms of State Pollution Control Board shall be followed. Bidder shall obtain approval of Civil/Architectural drawings from concerned authorities before taking up the construction work.				
23.00.00	INSPECTION, TESTING AND QUALITY CONTROL Sampling and testing of major items of civil works viz. earthwork, concreting, structural steel work (including welding), piling, sheeting, etc. shall be carried out in accordance with the requirements of this specification. Wherever nothing is specified relevant Indian Standards shall be followed. In absence of Indian Standard equivalent International Standards may be used. The Bidder shall submit and finalise a detailed field Quality Assurance Programme before starting of the construction work according to the requirement of this specification. This shall include frequency of sampling and testing, nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer. The Bidder shall furnish the test certificate from the manufacturer's of various materials to be used in the construction.				
24.00.00	CONCRETE All R. C. C. works to the done under this specification, unless specified otherwise shall be design mix concrete. Minimum grade of concrete for various structures shall be as follows: a) M25 - For all underground / sub-structural/ super-structure R. C. C. work. b) M30- For Block Foundation c) M35- For spring supported RCC deck and rail load bearing structure (if applicable).				
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	Minimum 75 mm thick P.C.C M-7.5 shall be provided as mud mat below all foundations. For concreting of underground structures requiring water tightness, plasticizer cum water proofing admixture shall be added to the concrete mix. Both coarse and fine aggregates shall conform to IS: 383 for concrete, shotcreting etc. unless otherwise mentioned.		
25.00.00	Excavation, Backfilling, Disposal and Stacking of materials Details		
25.01.00	Excavation in Soil Excavation for foundation shall be to the bottom of lean concrete and as shown on drawing or as directed by the Engineer. The bottom of all excavations shall be trimmed to required levels and when excavation is carried below such levels by error, it shall be brought back to the specified level by filling with concrete of nominal mix 1 : 3 : 6 (cement: coarse sand: 40 mm down aggregates), as directed by the Engineer. The Contractor shall ascertain for himself the nature of materials to be excavated and the difficulties, if any, likely to be encountered in executing this work. Cofferdams, sheet piling, shoring, bracing to maintain suitable slopes, draining etc. shall be provided and installed by the contractor, to the satisfaction of the Engineer. Surplus excavated materials shall be disposed off by the contractor at locations up to a lead of 5 kms from the plant boundary wall as directed by the engineer. The Contractor shall have to constantly pump out any water collected in excavated pits and other areas due to rain water, springs etc. and maintain dry working conditions at all times until the excavation, placement of reinforcement, shuttering, concreting, Backfilling is completed. The Contractor shall remove all slush/muck from the excavated areas to keep the work area dry. The Contractor, if required, shall employ sludge pumps, for this purpose. For other details, excavation clauses as given at Annexure-C of this specification, are to be referred.		
25.02.00	Excavation in Rock For the work of excavation in rock, Contractor shall engage specialised agency having experience of excavation in rock involving wedging and blasting. The agency shall be subject to approval of Engineer and the Contractor shall furnish details of relevant experience in support while seeking approval for the agency. Blasting shall be resorted to only with the written permission of the Engineer. All the statutory laws, (Explosives Act etc.) rules, regulations, Indian Standards etc. pertaining to the acquisition, transport, storage, handling and use of explosives etc. shall be strictly followed.		
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25.03.00	The contractor shall obtain Licenses from Competent Authorities for undertaking blasting work as well as for procuring, transporting to site and storing the explosives as per Explosives Act. The Contractor shall be responsible for the safe transport, use, custody and proper accounting of the explosive materials. Surplus excavated materials shall be disposed off by the contractor at locations up to a lead of 5 kms from the plant boundary wall as directed by the engineer. The Contractor shall have to constantly pump out any water collected in excavated pits and other areas due to rain water, springs etc. and maintain dry working conditions at all times until the excavation, placement of reinforcement, shuttering, concreting, backfilling is completed. For other details forexcavation in rock, clauses as given at Annexure-C of this specification, are to be referred.		
	Backfilling, Disposal and Stacking of materials		
	Backfilled earth shall be compacted as per “Foundation system and Geotechnical Data Chapter” given at Annexure-C of this specification.		
	However, the backfill under the rail lines and roads shall be compacted to minimum 95 % of the standard proctor density at OMC unless otherwise stated by rail Authorities.		
	The contractor is required to excavate upto any depth as shown on the drawings or as directed by the Engineer. Lifting of excavated materials shall be done either by manual or mechanical or both means if called for by the Engineer.		
	The disposal / stacking areas for excavated materials shall be indicated by the Engineer. The carriage of excavated materials shall be done by the methods mentioned below:		
	The excavated materials shall be carried beyond the initial lead of 50 m but upto 500 m by manual / animal labour or by mechanical means. If directed by the Engineer this material shall be used directly for filling purposes.		
	For leads exceeding 500 m the Contractor shall transport the excavated materials by mechanical means only and as directed by the Engineer. The Contractor may be allowed to carry materials through Kuccha roads. Providing and maintaining of the Kuccha roads shall be the responsibility of the Contractor. The transported material shall be neatly stacked as directed by the Engineer.		
	Some excavated materials required for filling purposes, may have to be carried upto a lead of 500 m and stacked as per instructions of the Engineer. Excavated materials carried beyond 500 m shall normally be for disposal purpose only. Double handling of materials shall be avoided as far as possible. However, depending on site condition excavated materials carried beyond a lead of 500 m may also be required to be brought back for filling purpose.		
	Materials to be used for filling purpose shall be stone, sand or other inorganic materials and they shall be clean and free from shingle, salts, organic matter, large roots and excessive amount of sod, lumps, concrete or any other foreign substances which could harm or impair the strength of the substances in any manner. All clods		
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26.00.00 27.00.00	shall be suitably broken to small pieces. When the material is mostly rock boulders, these shall be broken into pieces not larger than 150 mm size before backfilling and shall be backfilled in layers of 300mm interstices filled with sand. In case of broken rock boulders used for back filling, the top cover shall be with 1.0m thick soil. The layers of rock boulders, interstices filled with sand shall be compacted by plate vibrators. Sand used for filling shall be clean, medium grained and free from impurities. Fines less than 75 microns shall not be more than 20%. In any case, the materials to be used for filling purposes shall have the prior written approval of the Engineer. In case the materials have to be brought from pits / quarries, then it shall be the Contractor's responsibility for identification of such quarry areas, obtaining approval from their use from concerned authorities, excavation / quarrying loading and carriage of such material, unloading and filling at specified locations. The Contractor shall pay any fees, royalties etc. that may have to be paid for utilisation of borrow areas. GALVANISING All burrs and irregular edges of the structural steel members to be galvanised shall be ground smooth before galvanising. Purity of Zinc to be used for galvanising shall be 99.5 % as per IS : 209 (latest edition). The weight of the zinc coating shall be at least 610 Gms. / m² unless noted otherwise. CHEMICAL INJECTION GROUTING Minimum, 12 mm dia (NB) threaded nozzle of suitable length, shall be provided over the surface and along the construction joint line in a grid pattern at a spacing not exceeding 1.5 m c / c before concreting operation. Adequate precaution shall be taken to keep the nozzles plugged at both ends to prevent them from getting closed by concrete. For fixing of any nozzle in set concrete suitable size hole shall be drilled, preferably by using percussive hammer drill electrically operated, in grid pattern and grouting nozzle shall be fixed in these holes. After the nozzles are fully set, neat cement slurry admixed with water soluble non - shrink polymer / monomer based chemical shall be injected through the net - work of nozzles with low pressure grout pumps at a pressure of about 2.0 Kgs. / cm². Cement slurry shall be prepared by mixing cement with non-shrink polymer/monomer @ 500 gm/50 kg bag of cement and water, ensuring that Water: Cement ratio does not exceed 2 (by weight). Wetter the structure, lesser should be the water cement ratio. The property of the polymer/monomer should be such that when it is mixed with water @0.5% by weight of water, the viscosity of the resultant solution (water and polymer/monomer) should not be more than 1.2 centipoises. Plasticizing agent shall be added wherever required. The grouting shall be started at very low pressure and increased gradually to a required pressure. The grouting shall continue, till the hole refuses to take any further grout, even at an increased pressure. Applied pressure
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	shall not be more than the designed strength of the concrete. After completion of grouting operation, the nozzles shall be sealed properly to the satisfaction of the Engineer.		
28.00.00	POLYMER MODIFIED CEMENTITIOUS COATING		
28.01.00	Materials		
	Modified liquid polymer blend shall be a dispersion containing 100 % acrylic based polymer solids. Polymer shall be mixed in the ratio of 1 cement: 0.5 polymer (for minimum solid content of polymer 30%). Portland cement based dry powder. Clean, fine specially prepared quartz sand approximately 0.6 mm size.		
28.02.00	Mixing		
	The liquid polymer shall be stirred well and cement based powder shall then be added slowly to make a Slurry Mix. For preparation of Brush Topping Mix, quartz sand shall be added slowly and mixed well till a homogeneous mixture is obtained. The mix shall be used within half an hour of the preparation. Addition of quartz sand may not be necessary, in case dry power contains the same.		
28.03.00	Properties of Coating		
	It must adhere to wet surface. It should develop adequate bond strength, with the concrete surface, not less than 2 N / Sq. mm. Co - efficient of permeability shall be about 5×10^{-10} Cm / Sec. Water absorption after continuous soaking shall not be more than 1 %. The materials shall be permeable under water vapour. The material shall be resistant to acids and alkalis present in the soil and underground water with normal pH value between 4 and 14. The co - efficient of thermal expansion of the material shall be close to that of concrete.		
28.04.00	Application		
	The concrete surface shall be cleaned and made free from grease, oils or loosely adhered particles. The surface shall be damp without any free water. For exterior underground part, application (b) pertaining to Brush topping Mix shall be followed.		
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29.00.00	(a) For Slurry Mix			
	A minimum of 2 coats shall be applied on the surface. The first coat being applied, when the surface is still damp and left to harden for 4 to 6 hours. After 4 to 6 hours of the application of second coat, it shall be finished by rubbing down with a soft dry sponge. The coverage shall not be less than 1 : 1 Kgs. / m ² in the 2 coats. A lap of 75 mm shall be provided at the joints.			
	The coating shall be air dried for 4 to 6 hours and, thereafter, cured for 7 days after the application of last coat.			
	(b) For Brush Topping Mix			
	This shall be applied in two coats. A primary coat of slurry mix can also be first applied on the surface as first coat. After the coating has dried up, a coat of Brush Topping Mix shall be applied over it with a push broom or any other similar brush. It shall be left in broom finished condition. The nominal thickness shall be 1.5 mm and minimum thickness shall be 1.0 mm. A lap of 75 mm shall be provided at the joints. It shall be ensured that no pinhole exists and rebrushing shall be done to cover the pinholes, if any.			
	The Coating shall be air dried for 4 to 6 hours and thereafter cured for 7 days after the application of last coat.			
	Rate of application of coating shall be established to achieve the required thickness.			
	Architectural Concepts			
	Buildings shall be architecturally treated in such a way that it presents a pleasing composition of mass and void with suitable and functionally designed projections and recesses. The overall impact of the building shall be one of aesthetically unified architectural composition having a comprehensive scale, blending with the surroundings and taking full consideration of the climatic conditions and the building orientation. All the buildings shall be architecturally treated in such a way so as to be in harmony with the surroundings. The over all composition may have straight or curvilinear profiles.			
	Necessary projections, fins, parapets, chajjas etc. in addition to the minimum area specified elsewhere in this specification shall be provided as required.			
	Nothing extra shall be payable for any changes required while getting the drawings / scheme approved and for executing the same.			
	All structures, buildings and facilities shall be designed as per provisions of National Building Code 2005 and Local building by - laws as applicable including provisions of the Factories Act of the State concerned, with regard to requirement of free access, stairs, minimum head room, walkways, ventilation, toilets etc. and safety requirements like railings, fire escapes etc. Further all layouts and detailed drawings shall meet the relevant statutory requirements specified in recommendations of Petroleum act, Explosives act and Indian Electricity rules' as applicable.			
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29.01.00	FINISHING SCHEDULE		
29.01.01	Flooring		
	The nominal total thickness of floor finish shall be 50mm i.e. underbed & topping. The floor shall be laid on an already laid and matured concrete base Flooring of tiles / stone shall be fixed with 18 mm thk cement sand mortar 1:4, above PCC under bed (M 20 (with graded aggregate of nominal size 12.5mm) design mix) Flooring of Concrete hardener topping shall be provided above the PCC underbed (M 20 (with graded aggregate of nominal size 12.5mm) design mix).		
29.01.02	Wherever specified Heavy duty ceramic tiles of size 300x300x7 mm thick (minimum) of reputed manufacturer (Kajaria, Orient, Johnson or equivalent) of approved finish shade and colour to be used. Vitrified ceramic tiles wherever specified shall be 600x600 mm with minimum 9.5 mm thickness and of reputed manufacturer (Kajaria, Johnson, Orient or equivalent).		
29.02.00	Floor finish & skirting:		
	The nominal thickness of floor finish shall be 50 mm. Floors of toilets, pantries / kitchen shall be finished with Heavy duty (grade-5) dust pressed ceramic tiles 300mmx300mm x7 mm thick as per IS:15622, including pointing the joints with white cement mixed with matching pigment, of approved make, size & colour shade. (1) Floors of Office Room, Labs, Control Rooms, RIO Rooms and all other A/c Room shall be finished with Mirror polished Vitrified ceramic tiles (minimum 9.5 mm thk) with 3 mm groove joints as per approved pattern, pointed neatly with 3X4mm stainless epoxy grout SP- 100 of Laticrete or approved equivalent in approved colour to match colour of tile. (2) Suitable supporting arrangement shall be provided with M.S. angles / channels on cable trenches in MCC and Control rooms for mounting Control panels / MCC. (3) In rest of the areas, IPS (Cement concrete flooring) with Concrete hardener topping shall be 12mm thick with ordinary grey cement using uniformly graded, properly treated iron particles shall be provided. (4) Floors and sides of under ground RCC structures like valve pits, trenches and tanks shall have simultaneous (integral) neat cement finish at the time of concreting. (5) The interconnecting walkway between various structures, buildings and facilities shall be finished with 22 mm chequered concrete tiles at top. 1000 mm wide walkway of 22mm thick chequered concrete tiles shall be provided on terrace for maintenance purpose, in all RCC /Metal deck roof buildings. (6) Skirting in general shall be 150mm high, Dado in toilet, kitchen & pantry shall be up to specified height (up to 2200 mm for toilets, up to 600 mm high above counter top in kitchen and pantry area). The dado height shall be measured from finished floor level. Skirting and Dado shall match with the floor finish.		
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	(7) Battery Room shall be provided with Acid resistant tile on horizontal and vertical surfaces, at all levels for all type of works, including One coat of bitumen primer followed by 12 mm thick bituminastic layer, 20 mm thick Acid Resistant tiles, 6 mm thick under-bed by potassium silicate mortar, 6 mm thick pointing of joints of tiles with acid/alkali resistant epoxy/furane mortar up to a depth of 20 mm and bituminastic end sealing. 1200 mm high dado on wall shall be with 12 mm thk Acid resistant tiles of the similar finish and the joints to be finished as per flooring tiles, with the rest of wall height and ceiling finished in chemical resistant paint (chlorinated rubber based). (8) Well polished 18 mm thick Kota stone jointed with neat cement slurry mixed with pigment to match the shade of the stone including rubbing and cleaning, complete, to be provided in entrance area, entrance steps, Entrance area, staircases (tread, riser, landings, skirting).		
29.03.00	Sunken RCC slab shall be provided in false flooring area and toilet, Kitchen and pantry, so as to keep the finished floor level of these areas same as that of the surrounding area.		
29.04.00	Water proofing treatment to be provided on sunken portion of all vertical and horizontal surfaces of depressed portions of all toilets, W.C., kitchen, Pantry and the like consisting of : (i) Ist course of applying cement slurry @ 4.4 kg/sq.m mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement: 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sq.m of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sq.m).		
29.05.00	Acid / Alkali Resistant Treatment: Acid / alkali resistant lining treatment shall be provided in different areas as follows: Neutralization Pit: The walls shall be provided with one coat of bitumen primer, followed by 18 mm thick bitumastic layer, 115 mm thick A.R. bricks, 6 mm thick under bed of potassium silicate mortar, pointing the joints of bricks with acid / alkali resistant epoxy / furane mortar upto a depth of 20 mm and bitumastic end sealing. Suitable plasters shall be provided with A.R. bricks at regular intervals depending upon the height of lining, as per the specification.		
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	The floor of neutralization pit shall be provided with acid / alkali resistant lining treatment as given in the above para, except that the 115 mm thick A.R.tile layer shall be replaced by 75 mm thick A.R. tile layer and pilasters shall be omitted. The ceiling of neutralization pit shall be provided with one coat of epoxy primer followed by 2 coats of epoxy paint (150 micron). Acid / Alkali storage area / projections above the floor, pedestals projecting from the floor / saddles. : The floor shall be provided with one coat of bitumen primer followed by 12 mm thick bitumastic layer, 20 mm thick A.R. tiles, 6 mm thick under - bed by potassium silicate mortar, 6mm thick pointing of joints of tiles with acid / alkali resistant epoxy / furane mortar up to a depth of 20 mm and bitumastic end sealing. Dado of 12 mm thk Acid Resistant tiles up to 1.0M high shall also be provided if applicable in case of walls nearby. Alum/Lime Storage area and first floor of Chemical House : One coat of bitumen primer followed by 12mm thick bitumastic layer, 20 mm thick A.R. tiles, 6 mm thick underbed of potassium silicate mortar, 6mm thick pointing of joints of tiles with acid /alkali resistant epoxy /furane mortar up to a depth of 20 mm and bitumastic end sealing. Alum solution preparation tank: The wall shall be provided with one coat of bitumen primer followed by 12 mm thick bitumastic layer, 75 mm thick A.R. tiles, 6 mm thick underbed by potassium silicate mortar, pointing of joints of tiles with acid / alkali resistant epoxy / furane mortar upto a depth of 20 mm and bitumastic end sealing. The floor shall be provided with acid / alkali resistant lining treatment as given in the above para except that the 75 mm thick A.R. tile layer shall be replaced by 12 mm thick A.R. tile layer. Basket of Alum solution preparation tank: 5 mm thick epoxy lining over a coat of epoxy primer. Curved surfaces of saddles shall have minimum 12 MM thick bitumastic layer to support the vessel / tanks. Effluent Drains: Acid Resistant lining treatment indicated for the storage area shall be provided on the bed as well as walls of the drains with 38 MM AR tiles. The underside of the pre-cast slab cover shall be applied with one coat of epoxy primer and two coats of epoxy coating, total DFT 150 microns. Lime tank: Two coats of bitumen paint conforming to IS: 9862, with total DFT 150 microns.		
29.06.00	Walls		
29.06.01	All walls shall be non-load bearing infilled panel walls. All external walls shall be minimum one brick thick masonry wall.		
29.06.02	All external and internal walls shall be with minimum one brick masonry (230 or 250 mm) including toilet walls. Toilet partition low height walls shall be minimum half brick masonry.		
29.06.03	For all air conditioned areas/ rooms, wherever metal cladding is envisaged as cladding material, additional brick masonry wall (230mm thick) shall also be provided in		
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	addition to metal cladding for effective air conditioning. This brick wall shall be plastered & painted as specified elsewhere in the specification.		
29.06.04	RCC transoms and mullions of size 115x115mm with suitable reinforcement shall be provided wherever necessary to reinforce the brickwork.		
29.06.05	50 mm thick DPC in Cement concrete (M-20) with water proofing compound followed by two layers of bitumen coating 85/ 25 grade as per IS: 702 @ 1.7 kg/ sq.m. shall be provided at plinth level before starting the masonry work.		
29.06.06	The bricks shall be laid with cement mortar (1:6) for one brick thick walls and (1:4) for half brick thick walls IS: 1905, IS: 2212 and SP -- 20 shall be followed for brick work design and construction.		
29.07.00	Plastering		
29.07.01	External (rough) surface of walls shall be plastered with 18 mm thick cement plaster, consisting first (base) layer of 12 mm thick plaster in cement sand mortar (1:6) and second (finishing) layer of 6 mm thick plaster in cement sand mortar (1:4). The internal (smooth) surface of walls shall have 12 mm thick plaster in cement sand mortar (1:6). All external / internal RCC surfaces including RCC parapet walls shall be provided with minimum 12mm thick plaster in cement sand mortar (1:4) except walls of underground structures like cable trenches / valve pits etc.		
29.07.02	All exposed faces of R.C.C. walls of structures, buildings and facilities shall have minimum 12 mm thick cement sand plaster 1:6.		
29.07.03	All RCC ceilings (except areas provided with false ceilings and cable vault ceiling) shall be provided with 6 mm thick cement sand plaster 1:4.		
29.07.04	All plastering work shall conform to IS: 1661.		
29.08.00	Painting		
29.08.01	All painting on masonry or concrete surface shall preferably be applied by roller. If Applied by brush then same shall be finished off with roller.		
29.08.02	All paints shall be of approved make including chemical resistant chlorinated rubber paint.		
29.08.03	Minimum two finishing coats of paint shall be applied over a coat of primer.		
29.08.04	The thinner shall not be used with textured paint (Sandtex Matt or equivalent) finish.		
29.09.00	Internal Finish		
	All Air conditioned areas shall have 2mm of polymer based water resistant putty (wall putty) to given an even and smooth surface.		
29.09.01	Acrylic emulsion paint shall be as per IS: 5411 (Part - 1). Acrylic distemper shall be as per IS: 428. Air - conditioned areas shall be applied with minimum 2 coats of acrylic emulsion paint. All other areas shall be applied with minimum 2 coats of Acrylic distemper.		
29.09.02	Toilet, Pantry / Kitchen areas shall have dado with Designer ceramic tiles, 300x200mw (matt finish) upto 2.2 m height and shall match with floor finish. Above dado, Acrylic distemper shall be applied.		
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29.09.03	Areas coming in contact with chlorine fumes or acid / alkali shall have two coats of acid / alkali resistant chlorinated rubber paint over suitable primer on walls above dado & ceiling. The paint shall be of approved colour shade and make.		
29.10.00	External Wall Finish One pack, ready mix and ready to use, resin / polymer bonded granular textured coating finish of 2.5 mm (natural coloured graded stone chips), of approved colour, and shade for all types of plastered and / or exposed concrete surface, in all kinds of works, at all levels, including preparation of surface, preparation of working drawing, labour, material, equipment, handling, transportation, mixing, laying, applying finishing, testing, curing, making grooves, scaffolding, staging, etc., all complete, as per specifications, drawings and instructions of the Engineer-in-charge. Toe wall of chain link fencing shall be provided with two coats of Acrylic Smooth Exterior Paint The finish shall be of approved colour shade and make.		
29.11.00	Ceiling Finish Ceiling shall have min. two (2) coats of Acrylic distemper except AC areas & Battery room.		
29.11.01	For painting on concrete, masonry and plastered & surface, IS: 2395 shall be followed. For painting on steel work and ferrous metals, IS: 1477 shall be followed.		
29.11.02	Fire resistant transparent paint (confirming to IS: 162) shall be provided on all wood work, over French police or flat oil paint. French polish shall confirm to IS : 348. Flat oil paint shall confirm to IS: 1237.		
29.12.00	Doors, Windows, Ventilators, Louvers, Rolling Shutters & Glazing		
29.12.01	Adequate Doors, Windows, Louvers and Ventilators shall be provided for proper lighting and ventilation of all buildings. The area of windows shall be at least 10% of the floor area of the respective building. In addition to the above, wherever room height is more than 3.5 m, a band of ventilators of 600 mm height (minimum) shall be provided at the top.		
29.12.02	Unless specified all doors, of air conditioned areas, entrance lobby of all buildings shall have electro colour coated (anodised) aluminium frame work with glazing. Windows, ventilators & partitions of all buildings shall have electro colour coated (anodised) aluminium frame work with glazing. All doors of toilet, kitchen, pantry & store areas shall be of factory made pre - laminated solid core flush door shutters, as per IS: 2202 (Part-II) with pressed steel door frame. Control room shall have Aluminium glazed door & partitions. All other doors (unless otherwise specified) shall be of steel.		
29.12.03	All steel doors shall consist of double plate flush door shutters. The door shutter shall be 45 mm thick with two outer sheets of 18 G rigidly connected with continuous vertical 20 G stiffeners at the rate of 150 mm centre to centre. Side, top and bottom edges of shutters shall be reinforced by continuous pressed steel channel with minimum 18 G. The door shall be sound deadened by filling the inside void with mineral wool. Doors shall be complete with all hardware and fixtures like door closer, tower bolts, handles, stoppers, aldrops, etc.		
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29.12.04	Wherever functionally required, rolling shutters of suitable size approved by the Owner, with suitable operating arrangement manual/ electric shall be provided to facilitate smooth operations. Rolling shutters shall conform to IS: 6248.
29.12.05	All windows and ventilators at ground floor level shall be provided with suitable anodised aluminum grill.
29.12.06	Fire proof doors with panic devices shall be provided at all fire exit points as per the requirements. However minimum Fire rating shall be 2 hours. These doors shall be double cover plated type with mineral wool insulation.
29.12.07	Hollow excluded Section of minimum 2 mm wall thickness as manufactured by INDAL, Jindal, Hindalco or equivalent shall be used for all Aluminium doors, windows, ventilators and Partitions.
29.12.08	The doors, Windows & ventilators frame shall be of suitable size & thickness for fixing the glazing. The Glazing thickness shall be minimum 6 mm thk clear toughened glass for all glazed doors, windows, ventilators & partitions. Windows in air conditioned areas shall be provided with 24mm thick hermetically sealed composite double glazing.
29.12.09	Doors and windows on external walls shall be provided with sunshade over the openings with width 600 mm more than the opening width. The projection from the finished face of the wall for sunshade shall generally be 450 mm over window openings, 750 mm over door openings and 900 over Rolling shutters, or as decided and approved by the Engineer.
29.12.10	Float glass or flat transparent sheet glass shall conform to IS: 2835.
29.12.11	All glazing work shall conform to IS: 3548.
29.12.12	Windows in conveyor gallery shall be provided with welded wire fabric of 1.6mm thick wire as per IS: 4948 and 12mm x 30mm mesh size.
30.00.00	WATER SUPPLY, DRAINAGE AND SANITATION
30.01.00	Polyethylene water storage tank conforming to IS: 12701 shall be provided (for the use of toilet, pantry and kitchen) over the roof, with adequate capacity depending on the number of users and 8 hours requirement complete with all fittings including float valve, stop cock etc. The capacity of tank shall be calculated minimum 500 liters, per toilet, pantry and kitchen
30.02.00	Galvanised MS pipe of medium class conforming to IS: 1239 shall be used for internal piping works for potable water supply.
30.03.00	Sand C.I. pipes with lead joints conforming to IS: 1729 shall be used for sanitary works above ground level.
30.04.00	The facilities provided in the toilet block shall depend on the number of users. However, minimum facilities to be provided shall be as stipulated below. IS: 1172 shall be followed for working out the basic requirements for water supply, drainage and sanitation. In addition, IS: 2064 and IS: 2065 shall be also be followed.
30.05.00	Each toilet block shall have the following minimum facilities. Unless specified all the fittings shall be of chromium plated brass (fancy type). The common toilet area shall have finished floor level at 15 mm below the finished floor level of surrounding area. Following minimum fittings & fixtures together with associated plumbing works shall be provided as specified below.
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	Sl. No.	Type of Fitting / Fixtures	Gents Toilet
	i)	1 no wall mounted coloured glazed vitreous china European water closet with flush valve.	1 No.
	ii)	Coloured glazed vitreous china flat back lipped urinals with photo voltaic controlled automatic flushing system including all requisite fittings and fixtures	1
	lii)	Wash Basin (oval shape) with photo voltaic control system and all requisite fittings and fixtures to be fixed on concrete platform finished with 18mm thick first grade polished granite stone	1 No.
	iv)	Wall to wall mirror minimum 450 mm high (minimum 6mm thick float glass) including all fittings	1 No.
	v)	Stainless steel Towel Rail 600mm Long x 20 mm dia.	1 No.
	vi)	Stainless steel Liquid soap holder cum dispenser with requisite fittings.	1 No.
	vii)	Overhead Drinking water storage tank (Minimum 500 Litres capacity)- High density polyethylene (cylindrical/vertical) molded seamless type.	1
	viii)	Overhead Service water storage tank (Minimum 500 Litres capacity)- High density polyethylene (cylindrical/vertical) molded seamless type	1 No.
30.06.00	One No. drinking water connection with C.P. brass valve for fixing water cooler by Owner. Required plumbing work from Owner's service water terminal point to the service water tank and from tank to the toilet accessories mentioned above. Required plumbing work from Owner's potable water terminal point to the drinking water tank and from tank up to the water coolers. Janitor room. Adequate space shall be provided. Provision for installation of water cooler.		
30.07.00	All structures, buildings, facilities, liquid storage tanks shall be provided with peripheral surface brick drains of all around periphery and suitably connected to nearest Owner's drain. Overflow and drains from storage tanks shall be laid to and suitably connected to Owner's open surface drains. The sewerage and waste water disposal system shall consist of providing all associated plumbing and underground pipe works together with all fittings and fixtures and inclusive of ancillary works such as connections, manholes and inspection chambers, including connection to Owner's nearest main sewer line or as directed by Engineer. If required, R.C.C. septic tank and soak pit of required capacity shall be provided by the Bidder.		
30.08.00	Miscellaneous Architectural Items (a.) In all buildings suitable arrangement with provision of floor traps for draining the water collected from leakage, floor washing, fire fighting etc. shall be provided on all floors which shall be connected to rain water down comers.		
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	(b.) Wherever required minimum 1000 high hand railing with 32 NB M.S. pipes medium class as per IS : 1239 shall be provided, with toe & knee rail and toe guard plate, around all floor / roof openings, around periphery of Neutralisation Pit, projections of balconies, walkways, platforms, steel staircase etc. (c.) However for RCC staircases in structures, buildings and facilities, railings with 20 mm square MS bar balustrades with suitable anti corrosive paint of approved colour MS flats for knee & toe guard with 50mm Ø NB MS pipe hand rail at top shall be provided. (d.) All air conditioned areas / common corridors shall be provided with false ceiling constructed from 15 mm mineral Fibre Board in tile form of 600x600mm with supporting system as per manufacture guidelines. 50 mm thick mineral wool insulation (conforming to IS : 8183) shall be provided with as under deck insulation). Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures, Air conditioning ducts etc. Minimum headroom below false ceiling shall be 3.0 m. (e.) Under - deck insulation shall be provided on the ceiling (underside of roof slab) and underside of floor slab of air - conditioned areas depending upon the functional / air - conditioning requirements. The under - deck insulation shall consist of 50 mm thick mineral wool insulation conforming to IS : 8183 backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements. (f.) Parapets, chajjas, window / door heads, architectural facias, fins etc., shall be provided with drip course in cement mortar (1 : 3). (g.) 150mm thick fillets at junction of roof slab / chajja slab and parapet / vertical walls shall be provided with cast - in - situ cement concrete 1 : 2 : 4 nominal mix, followed by 12 mm thick cement sand plaster (1 : 4). (h.) Suitable provision shall be made for fixing of ceiling fans in office areas of different structures, buildings and facilities.		
31.00.00	CORROSION PROTECTION		
31.01.00	GENERAL		
	(a) All Steel structures shall be provided with painting as given in the specification. Further, painting system shall also meet the requirements of Corrosivity category C3 (durability High) as per ISO 12944. Painting system for steel surfaces embedded in Concrete is given separately. (b) All Painting shall be done as per technical specification. Painting scheme shall be submitted by the bidder for approval of employer. (c) All steel structures shall be designed by following basic design criteria in ISO 12944 Part 3. However, where it is not feasible to follow the design criteria given in ISO 12944 Part 3 where the steel surface are inaccessible for application of protective coating, corrosion allowance of 1.5 mm shall be kept in thickness(over the design thickness) of structural steel members. d) Painting scheme shall be resubmitted by the Bidder for approval of employer.		
31.02.00	PAINTING OF STEEL SURFACES EMBEDDED IN CONCRETE:		
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31.03.00 CONCRETE)	a) For the portion of Steel surfaces embedded in Concrete, the surface shall be prepared by Manual Cleaning and provided with Primer Coat of Chlorinated Rubber based Zinc Phosphate Primer of Minimum 50 Micron Dry Film Thickness (DFT). b) All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, sleeves, etc. shall be coated with temporary rust preventive fluid and during execution of civil works, the dried film of coating shall be removed using organic solvents. PAINTING OF STEEL SURFACES (OTHER THAN THOSE EMBEDDED IN a) All steel surfaces shall be provided with two component moisture curing zinc (ethyl) silicate primer coat (having minimum 80% of metallic Zinc content in dry film, solid by volume minimum 60% ±2%) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2 ½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer coat shall be applied in shop immediately after blast cleaning by airless spray technique. Zinc dust composition and properties shall be Type-II as per ASTM D520-00. b) Primer coat shall be followed with the application of Intermediate coat of two component polyamide cured epoxy with MIO Content (containing lamellar MIO minimum 30% on pigment, solid by volume minimum 80% ±2%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT. This coat shall be applied shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer. Notes: 1. For Primer, high quality surface preparation is necessary and good amount of moisture is required for proper curing. Below 70 % relative humidity, curing time may go up to 7 days or more. In such a case additional water sprinkling may be ensured for completion of curing. Additionally Inorganic zinc silicate cannot be recoated; even with itself. Typically it should be used when coating bare steel surface for first time. 2. The most frequent problem associated when top coating Primer is bubbling/pin holing especially with non-weathered zinc silicate coatings. To a great extent, this bubbling of finish paint can be eliminated by applying a mist coat of intermediate/topcoat as the first pass of the product, allow the bubbles to subside and then apply a full coat, as required. 3. In case top coating of zinc silicate with epoxy/polyurethane coatings, is expected to be delayed, it is advisable to use a suitable tie coat to avoid formation of white rust. However, if white rust forms then clean the surface with high pressure water, dry and apply the subsequent coats as required. 4. Touch up paintings on damaged areas: Surface preparation by manual tools, wire brush/ emery paper etc. Minimum 6 inches peripheral area, adjoining to damaged area to be covered. If metal surface is exposed, it is to be painted		
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31.04.00	with Zinc rich epoxy (70 micron) or suitable primer with existing paint scheme. If primer is intact, intermediate & top coat to be done with specified DFT in scheme. COATING FOR MILD STEEL PARTS IN CONTACT WITH WATER. a) All mild Steel parts coming in contact with water or water vapour shall be hot dip galvanised. The Minimum Coating of Zinc shall be 610 Gms / Sq. M. for galvanised Structures and shall comply with IS: 4759 and other relevant Codes. Galvanising shall be checked and tested in accordance with IS: 2629. b) The galvanising shall be followed by the application of an etching Primer and dipping in black bitumen in accordance with BS: 3416, unless otherwise specified.		
31.05.00	Gratings All gratings shall be blast cleaned to Sa 2 ½ finish or cleaned by acid pickling as per ISO 8501-1 and shall be hot dip galvanized at the rate of 610 Gms / Sq. M.		
31.06.00	Hand Railings and Ladders All Mild steel handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. as per IS: 4736. However, Stainless steel handrails shall be provided as specified in General Architectural Specification clause 9.0.0.		
31.07.00	Sea Worthiness All Steel Sections and fabricated Structures, which are required to be transported on sea, shall be provided with anti corrosive Paint before shipment to take care of sea worthiness.		
31.08.00	For Reinforced Concrete Work. i) The protection for concrete sub-structure shall be provided based on aggressiveness of the soil, chemical analysis of soil/sub-soil water and presence of harmful chemicals/salts. ii) The protection to super structure shall depend on exposure condition and degree of atmospheric corrosion. This shall require use of dense and durable concrete, control of water cement ratio, increase in clear cover, use of special type of cement and reinforcement, etc., coating of concrete surface, etc., Bidder shall furnish the details of corrosion protection measures.		
32.00.00	Miscellaneous		
32.01.00	Ordinary form work shall be used in roofs and floor slabs in transfer houses, footings, pedestals, cable trenches, pits etc., Plywood form work shall be used for all over ground exposed work like columns, beams, floors and ceilings in control room and M. C. C. buildings.		
32.02.00	Monorail girders and fixtures shall be provided for monorails at the locations as required and as described elsewhere in these specifications or drawings. Monorail openings in the walls shall be provided with steel frame doors preferably sliding type or otherwise open able inside, access platforms and ladders.		
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32.03.00	Steel frame around openings in roof and on external walls for mounting of exhaust fans shall be provided.				
32.04.00	Ready mix non - shrink cementitious grout of reputed manufacturer as approved by the Employer shall be used for grouting of block outs and foundation bolts, underpinning of base plates and machine bases. Crushing strength of grout shall be one grade higher than the foundation concrete. Minimum crushing strength shall be 30 N / mm ² unless higher strength requirement is specified by the equipment supplier or the grout manufacturers.				
32.05.00	The bottom of steel in case of cable / pipe galleries and trestles shall be generally 3m above the ground except for rail / road crossing where it shall be 8m above the rail top / road crest/ground. Further in bunker areas it shall be 8 m above the ground.				
32.06.00	Polysulphide Sealing Compound shall be two-part polysulphide sealant and shall be from approved manufacturer, conforming to IS : 12118. Materials shall consist of polysulphide polymer and a curing agent. Gun grade material shall be used unless otherwise specified. The application of the sealant shall be strictly followed as per manufacturer's guidelines.				
33.00.00	SHOTCRETING				
33.01.00	General Requirements				
33.01.01	Generally, shotcreting shall be done in accordance with IS : 9012.				
33.01.02	Reinforcement for shotcreting shall be as detailed below, unless specified otherwise. Reinforcement in one direction consisting of 6 mm M. S. bars at 750 mm c / c shall be connected to the lugs for fastening of the wire fabric. This shall be used in case of 50 mm or above thick shotcreting.				
33.01.03	Wire fabric conforming to IS : 1566 shall be used as reinforcement and shall consist of wire, 3 mm diameter, spaced 50 mm both ways and shall be electrically cross welded. Wire fabric shall be securely tied to 6 mm bars for 50 mm thickness. Adjacent sheet of wire fabric shall be lapped at least 100 mm and tied.				
33.01.04	Clear cover to reinforcement mesh shall not be less than 15 mm.				
33.01.05	Minimum thickness of shotcreting shall be 50 mm. for abrasion resistant work and 25 mm for ordinary surface protection work.				
33.02.00	Material Generally, the materials shall be in accordance with aggregates specification given hereunder.				
33.02.01	Fine aggregate shall consist of natural sand or crushed stone from a known source and shall be strong, hard, coarse, sharp, chemically inert, clean and free from any coating. It shall be free from clay, coal or coal residue, organic or any other impurities that may impair the strength or durability of the concrete and shall conform to IS : 383.				
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33.02.02	Fine aggregate (Sand) shall be well graded and particles shall range in size within the following limits. The Engineer, may approved the use of any other grading as per requirement or as per IS : 9012.		
33.02.03	The fineness modulus shall be preferably between 2.5 and 3.3. Any other value can be used, with prior approval of the Engineer.		
33.03.00	Application		
33.03.01	After the placement of reinforcement and / or welded mesh and not more than six hours prior to the application of shotcrete, the surface shall be thoroughly cleaned of all loose materials and dirt. The Contractor shall properly prepare the surfaces, reinforcement and / or welded mesh to receive the shotcrete. Cleaned surfaces shall be wetted not more than hour prior to shotcreting.		
33.03.02	The mix as placed on surface shall be one part cement to three parts approved sand by mass. Cement and sand shall be dry mixed; not water shall be added after mixing and before using in the gun. The quantity of water when added shall be only that which is sufficient to hydrate the cement. For average atmospheric conditions, the water cement ratio for shotcrete in place shall be between 0.35 and 0.5 by mass. Suitable admixture shall be used wherever required.		
33.03.03	A uniform pressure of not less than 3 Kg/cm ² at the nozzle shall be maintained. Necessary adjustments shall be made to ensure this pressure, taking into account the length of hose and height of the place to be shotcreted, above location of the machine.		
33.03.04	The application shall proceed in an upward direction. Beams, stiffeners and intermediate walls, if any, shall be wrapped with wire fabric and completely covered with shotcreting. All rebound shall be removed from the area of application as the work progresses and such rebound material shall not be reused.		
33.03.05	As soon as the freshly shotcreted surface shows the first dry patches, a fine spray of water shall be applied to keep too moist. After the surface has hardened, it shall be kept continuously moist for minimum seven days. If there is extreme heat, especially when accompanied by hot winds, the shotcreted surface, immediately upon completion, shall be covered with burlap or similar covering, which must be kept continuously moist for 14 days after shotcreting. The temperature of the lining shall not be permitted to exceed 38 ⁰ C during placing of concrete.		
34.00.00	VIBRATION ISOLATION SYSTEM These specifications are meant for the design, supply and erection of vibration isolation system for supporting crushers.		
34.01.00	Supporting Arrangement		
34.01.01	~~For Crushers: The crushers shall be supported on vibration isolation system consisting of steel helical springs and viscous dampers. The supporting arrangement for each crusher shall consist of an R. C. C. deck supported on steel helical spring units and viscous~~		
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34.01.02	~~damper units which in turn shall be supported on girders. The girders shall be an integral part of the crusher house building.~~						
	~~The part of the structure consisting of the R. C. C. deck, springs and viscous dampers shall hitherto be referred to as "spring supported foundation". The part of the structure, which is below the spring shall hitherto be called "supporting structure".~~						
	The Contractor should do the Engineering / design, supply and erection of vibration isolation system consisting of steel helical spring units and viscous dampers supporting the top deck which in turn would support the crushers. The vibrations isolation system supplied shall be of a proven make. The Contractor or his sub - contractor who designs and supplies the system should have designed, supplied and installed such systems for not less than five machines of speeds and unbalance forces comparable to the machine proposed by the vendor. The vibration isolation systems installed by the contractor or his sub - contractor in such machines should have been working satisfactorily for at least five years.						
34.02.00	Scope of Work						
34.02.01	Scope of work shall include the following :						
	(a.) Engineering						
	(1.) Design of the vibration isolation system using steel helical springs and viscous dampers to support an R. C. C. top deck supporting the equipment. This includes the static and dynamic analysis of the vibration isolation system with the R. C. C. top deck and the equipment.						
	(2.) Structural design of the R. C. C. top deck including preparation of General Arrangement drawings, detailed reinforcement drawings, bar - bending schedules etc.						
	(3.) Calculation of loads on the structure supporting the springs and viscous dampers, their points of application and the stiffness requirements of the supporting structure.						
	(4.) Drawings showing embedments and their locations and details on the R. C. C. top deck.						
	(5.) Drawings showing blockouts, recesses etc. on the top deck.						
	(6.) Design of the supporting structure, including preparation of detailed drawings and bill of materials.						
	(b.) Supply including packing and transportation to site						
	(1.) Steel helical spring units and viscous dampers, including associated auxiliaries for installation of the spring units and dampers like steel shims, adhesive pads etc.						
	(2.) Frame (s) for pre-stressing of spring elements.						
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	(3.) Suitable hydraulic jacks system including electric pumps, high pressure tubes etc. required for the installation, alignment etc. of the spring units, two extra hydraulic jacks, one hand operated pump and spares for the hydraulic jack system as required. (c.) Erection and Commissioning (1.) Complete erection and commissioning of the vibration isolation system including : (2.) Pre-stressing of spring elements, placing of spring elements in position, checking clearances on the shuttering of the R. C. C. top deck, construction of the supporting structure and the R. C. C. top deck, releasing to pre-stress in spring elements and making final adjustments and alignments after machine installation etc. (3.) The scope of work shall be deemed to include all activities which may not have been explicitly mentioned but are reasonably implied for the successful completion of the work for which these specifications are intended. (4.) This part of the specifications is for vibration isolation system. For the construction of the supporting structure for the crusher and the top deck, the relevant parts of the specification should be referred to. (d.) Documentation (1.) Submission of detailed design calculation, analysis (static and dynamic) and drawings for Employer's acceptance and approval. (2.) Furnishing methodology of providing shuttering and its removal as well as concreting of deck slab, installation of springs and dampers and the sequence of operation. (3.) Furnishing installation and maintenance manual indicating equipment, procedure etc., necessary for installation, maintenance of vibration isolation system. (4.) Furnishing a check list for confirming the readiness of the civil fronts for the installation of vibration isolation system and equipment required at each stage installation. (5.) Bill of materials of various elements such as springs, visco-dampers, with their rating, stiffness etc., included in supply. (6.) Detailed specifications of the vibration isolation system and various items included in the supply and the standard (local or international) to which they conform. (7.) Proposed erection strategy of the entire system.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
34.03.00	Design Requirements for Crusher Foundation		
34.03.01	Dynamic Analysis Detailed dynamic analysis shall be done for the top deck together with springs and dampers and the natural frequencies and amplitudes of vibration shall be determined. A mathematical model of the top deck shall be formulated with three dimensional beam / plate finite elements for the purpose of analysis with the spring idealised with vertical and horizontal stiffnesses. The mass of the machine together with that of the top deck shall be considered for the analysis. Natural frequencies upto at least 10 % above the operating speed shall be determined and these frequencies shall be checked against the design criteria. Forced response dynamic analysis shall be carried out for the operating condition unbalance forces using a sinusoidal forcing function. Unbalance forces as given by this specifications shall be used for his purpose. The amplitudes shall be checked against the design criteria. The dynamic forces from this analysis shall be used for structural design with a suitable fatigue factor.		
34.03.02	Isolation Efficiency The vibration isolation system shall be designed for about 90 % isolation efficiency.		
34.03.03	De-coupling A ratio of the least 10 (ten) shall be ensured between the stiffness of the supporting structure and the stiffness of the spring system in the vertical direction to achieve de-coupling between the two (the stiffness of the spring system being lower). This ensures that dynamic analysis of the supporting structure need not be carried out.		
34.03.04	Frequency Criteria The frequency criterion has already been laid down implicitly by the isolation efficiency criteria and de-coupling required. The first bending mode frequency of the top deck shall be at least 20 % above the operating speed.		
34.03.05	Unbalance Forces for Crushers Unbalance forces arising out of all the following cases shall be considered for checking the design and amplitudes. (a.) Balance quality grade Q 40 as per VDI 2060 - 1966. (b.) One hammer broken condition. The missing hammer shall be assumed to be closest to the crusher non - drive end of the crusher.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
34.03.06	(c.) Three hammers broken condition. All the three hammers broken shall be assumed to be from the same suspension bar and located at the non - drive end of the crusher. Amplitude Criteria for Crushers The calculated amplitudes (mean to peak values) shall not exceed following limits under the specified conditions. 1) Operating speed of 750 RPM (a.) 150 microns for an unbalance force arising out of balance quality grade Q 40 as per VDI 2060 - 1966. (b.) 300 microns in case of a one hammer broken condition. (c.) Amplitudes need not be checked for a three hammer broken condition. 2) Operating speed of 450 RPM (a.) 200 microns for an imbalance force arising out of balance quality grade Q-40 as per VDI -2060-1966. (b.) 400 microns in case of a one hammers broken condition. (c.) Amplitude need not be checked for a three hammer broken condition. For intermediate operating speed between 450 to 750 RPM the amplitude limits can be linearly interpolated. The amplitude limits mentioned above are in both vertical and horizontal directions. The amplitudes shall be calculated at critical points on the top surface of the R. C. C. deck. The amplitudes shall be checked for the most unfavorable superposition of modes in any direction. However, phase difference between the maximum amplitude occurring in different directions due to the rotating vector may be considered while superimposing the modes.			
	34.03.07	Unbalance force and Amplitude Criteria The unbalance forces and amplitude criteria shall be as per the equipment manufacturer's recommendations or as per VDI 2060/ VDI 2056, whichever is more stringent.		
	34.03.08	Transient Resonance Transient resonance, which may occur during the start - up or coasting down condition of the crusher, shall be checked, and the amplitudes in such a condition should not exceed one - and - half times those at operating speed for each design condition.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
34.04.00	Strength Criteria			
	The following criteria shall apply for the design of top deck :			
	(a.) Dead loads, live loads, Seismic loads and dynamic loads shall be considered for the design. The most unfavorable combination shall considered for design. (b.) Seismic loads shall be assumed to act together with dynamic loads for a one millimeter eccentricity in the rotor. However, seismic loads and dynamic loads arising out of hammer breakage need not be considered together (c.) Fatigue shall be considered while designing for dynamic forces. A fatigue factor of 2.0 shall be used on all dynamic forces to arrive at the equivalent static force for the purpose of design. (d.) Working stress method shall be used for the design of R. C. C. deck. In survival condition, 10 % overstressing may be permitted. (e.) The R. C. C. top deck shall be at least of M35 grade of concrete as per IS : 456. (f.) Fatigue need not be considered for the three hammer broken condition. (g.) For calculating unbalance forces, the heaviest hammer (plain or toothed) shall be considered.			
34.05.00	Approval of Designs and Drawings			
All design calculation, drawings and documents shall be in English. All design calculations and drawings shall be submitted to Employer for approval. However, approval of such designs and drawings shall not relieve the contractor of his responsibility regarding the adequacy of the foundation to carry the design forces.				
34.06.00	Standards			
	Latest revisions of the following Codes shall be used for the design of the crusher foundations.			
	(a.) IS : 456 Code of Practice for Plain and Reinforced concrete. (b.) IS : 2974 (Part IV) Code of Practice for Design and Construction of Machine Foundations (Part IV) for rotary type machine of low frequency. (c.) IS : 1893 (Criteria for Earthquake Resistant Design of Structures). (d.) DIN 4024 Machine Foundations : Flexible supporting structures for machines with rotating masses. (e.) DIN 2089			
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Helical Compression Springs out of round wire and rod; calculation and Design. (f.) DIN 2096 Helical Compression Springs out of round wire and rod; quality requirements for hot formed compression springs. (g.) VDI 2056 - Criteria for assessing mechanical vibrations of machines. (h.) VDI 2060 - Criteria for assessing the state of balance of rotating rigid bodies.not be permitted to exceed 38°C during placing and curing		
35.00.00	Packaging and Transportation. All the equipment shall be suitably protected coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials the limitations from the point of view of availability of railway wagon sizes in India should be taken into account. The contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing.		
36.00.00	Plant Life The plant shall be designed for a minimum operating life of 30 years under the conditions of operation. Assurance shall be given that plant components are adequate for this lifetime. If there are any exceptional items of the plant on which an assurance of meeting this clause cannot be given, life of such components and the difficulties associated with them shall be stated.		
37.00.00	PTFE (Poly Tetra Fluoroethylene) Bearing The bearing shall be of reputed make and manufacturer as approved by the Engineer, for required vertical load and end displacement/rotation. PTFE bearing shall be sliding against highly polished stainless steel and the coefficient of friction between them shall be less than 0.06 at 55 kg/sq.cm. In order to prevent cold flow in PTFE surface it shall be rigidly bonded by a special high temperature resistance adhesive to the stainless steel substrata. The stainless steel surface that slides against the PTFE is mirror polished. The stainless steel shall be bonded to the top plate by special high strength adhesive. The thickness of stainless steel plate shall be between 1.0 mm to 1.5 mm.		
38.00.00	TESTS FOR MATERIAL / WORKMANSHIP All tests required for all materials, quality of workmanship or any other tests as desired by the Engineer shall be at contractor’s cost.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS
39.00.00	MATERIALS
39.01.00	For Civil, Structural and Architectural works Employer will not supply any material. All materials including cement, reinforcement steel and structural steel, whatsoever required for execution and completion of the entire scope of work covered under this specification shall be arranged by the contractor at his own cost. All materials procured by the contractor shall meet the quality requirements specified in this specification. The contractor shall keep sufficient stock of cement and steel at site at any point of time when the work is in progress excluding what has been already incorporated in the works, so that any disruption / delay in availability of these materials during procurement will not affect the progress of work at site. The minimum quantity of such materials in stock at site shall not be less than the Requirement of one (1) month in case of Cement and Requirement of two (2) Consecutive months in case of Steel.
39.02.00	Structural steel Structural Steel (including embedded Steel) shall be straight, sound, free from twists, cracks, flaw, laminations and all other defects. Structural steel shall comprise of mild steel, medium strength steel and high tensile steel as specified below.
39.02.01	Mild Steel - Rolled sections shall be of grade designation E250, Quality A/BR, Semi-killed/ killed conforming to IS 2062. All steel plates shall be of Grade designation E250, Quality BR (fully killed), conforming to IS 2062 and shall be tested for impact resistance at room temperature. Plates beyond 12mm thickness and up to 40mm thickness shall be normalized rolled. Plates beyond 40mm thickness shall be vacuum degassed & furnace normalised and shall also be 100% ultrasonically tested as per ASTM –A578 level B-S2. - Pipes shall conform to IS 1161. - Hollow (square and rectangular) steel sections shall be hot formed conforming to IS: 4923 and shall be of minimum Grade Yst 240. - Chequered plate shall conform to IS 3502 and shall be minimum 6 mm thick excluding projection. Steel for chequered plate shall conform to grade E250A semi killed of IS: 2062 or equivalent grade conforming to ASTM & BS standards only.
39.02.02	Medium and High Tensile Steel Rolled Sections and plates shall be of grade designation E350 or higher, Quality B0 (Fully killed), conforming to IS 2062. Plates beyond 12mm thickness and up to 40mm thickness shall be normalized rolled. Plates beyond 40mm thickness shall be vacuum degassed & furnace normalised and shall also be 100% ultrasonically tested as per ASTM –A578 level B-S2.
39.03.00	Cement Fly ash based portland pozzolana cement conforming to IS:1489 (Part-1) shall be used for all areas other than for the critical structures identified below. Other properties shall be as per IS code. Ordinary Portland Cement (OPC) shall necessarily be used for the following structures. - Spring supported decks of limestone crusher - RCC for Chimney shell. The grade of cement shall be Grade 43 for OPC conforming to IS:8112. In place of fly ash based portland pozzolana cement, OPC mixed with Fly Ash can be used. Batching plant shall have facility for mixing fly ash. Fly ash shall conform to IS:3812(Part I & Part II). Percentage of fly ash to be mixed in concrete shall be based on trial mix. Mix design shall be done with varying percentage of fly ash mix with cement.

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39.05.0 0 Aggregates**a) Coarse Aggregate**

Coarse aggregate for concrete shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383.

b) Fine Aggregate

Fine aggregate shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or pellets. Fine aggregate in concrete shall conform to IS : 383. For plaster, it shall conform to IS : 1542 and for masonry work to IS : 2116.

c) Petrographic examination of aggregate shall be carried out by the contractor at National Council for Cement and Building Materials (NCB), Ballabgarh, or any other approved laboratory to ascertain the structure and rock type including presence of strained quartz and other reactive minerals. In case, the coarse aggregate sample is of composite nature, the proportions (by weight) of different rock types in the composite sample and petrographic evaluation of each rock should also be ascertained. While determining the rock type, special emphasis should be given on identification of known reactive rocks like chalcedony, opal etc. The procedure laid down in IS 2430 for sampling of aggregates may be followed.

The laboratory shall determine potential reactivity of the aggregate, which may lead to reaction of silica in aggregate with the alkalis of cement and / or potential of some aggregates like limestone to cause residual expansion due to repeated temperature cycle. If the same is established, the contractor shall further carry out alkali aggregates reactivity test as per IS 2386 (Pt.VII) and / or repeated temperature cycle test to establish the suitability of the aggregates for the concrete work. The test results, with the final recommendations of the laboratory, as to a suitability of the aggregate, for use in the concrete work for various structures and suggested measures, in case of results are not satisfactory, shall be submitted to the Engineer for his review, in a report form.

In case in the report, it is established, that the aggregates contain reactive silica, which would react with alkalis of the cement, the contractor shall change the source of supply of the aggregate or use low alkali cement as per recommendation or take measures as recommended in the report as instructed by Engineer.

In case aggregates indicate residual expansion, under repeated temperature cycle test (from 10o Celsius to 65o Celsius and for 60 temperature cycles) the material shall not be used for concreting of Lime stone crusher decks, Mills, Fans and other equipment foundations which are likely to be subjected to repeated temperature cycle. The contractor shall use aggregates free from residual expansion under repeated temperatures cycle test.

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39.04.00	Reinforcement steel shall conform to: a) Mild steel bars of grade I of IS: 432 Part – I or grade A of IS: 2062. b) High yield strength deformed TMT steel bars of grade Fe-500 having minimum elongation of 14.5 % or Fe-500D, and conforming to other requirements of IS 1786.																								
40.00.00	CODES AND STANDARDS All standards, specifications, acts and code of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. Other Indian, foreign Codes and Standards not listed here but referred to elsewhere within this specification shall also be deemed to be part of this list. In case of conflict between this specification and those (IS standards, codes etc.) referred to herein, the former shall prevail. Some of the relevant Indian standards, Acts and Codes applicable to this section of the specification are listed below <table><tr><td>IS : 383</td><td>Specification for coarse and fine aggregates from natural sources for Concrete.</td></tr><tr><td>IS : 432</td><td>Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.</td></tr><tr><td>IS : 456</td><td>Code of practice for plain and reinforced concrete.</td></tr><tr><td>IS : 458</td><td>Specification for concrete pipes.</td></tr><tr><td>IS : 516</td><td>Method of test for strength of concrete.</td></tr><tr><td>IS : 800</td><td>Code of practice for use of structural steel in general building construction.</td></tr><tr><td>IS : 814</td><td>Specification for covered electrodes for metal arc welding for weld steel.</td></tr><tr><td>IS : 816</td><td>Code of practice for use of metal arc welding for general construction.</td></tr><tr><td>IS : 817</td><td>Code of practice for training and testing of metal arc welders.</td></tr><tr><td>IS : 875 (Pt. I to V)</td><td>Code of practice for design loads other than earthquake) for buildings and structures.</td></tr><tr><td>IS : 1038</td><td>Steel doors, windows and ventilators.</td></tr></table>			IS : 383	Specification for coarse and fine aggregates from natural sources for Concrete.	IS : 432	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS : 456	Code of practice for plain and reinforced concrete.	IS : 458	Specification for concrete pipes.	IS : 516	Method of test for strength of concrete.	IS : 800	Code of practice for use of structural steel in general building construction.	IS : 814	Specification for covered electrodes for metal arc welding for weld steel.	IS : 816	Code of practice for use of metal arc welding for general construction.	IS : 817	Code of practice for training and testing of metal arc welders.	IS : 875 (Pt. I to V)	Code of practice for design loads other than earthquake) for buildings and structures.	IS : 1038	Steel doors, windows and ventilators.
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	IS : 1172	Basic requirements for water supply, drainage and sanitation.	
	IS : 1361	Steel windows for industrial buildings.	
	IS : 1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.	
	IS : 1892	Code of practice for subsurface investigation for foundation.	
	IS : 1893	Criteria for earthquake resistant design of structures.	
	IS : 1904	Code of practice for design and construction of foundations in soils; general requirements.	
	IS : 1905	Code of practice for structural safety of buildings - Masonry walls.	
	IS : 1948	Specification for aluminium doors, windows and ventilators.	
	IS : 2062	Steel for general structural purposes.	
	IS : 2131	Method of standard penetration test for soils.	
	IS : 2212	Code of practice for brickwork.	
	IS : 2645	Specification for Integral cement water proofing compounds.	
	IS:2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL)	Methods of test for soils - determination for water content etc code of practice for earth work on canals.	
	IS : 2911	Code of practice for design and construction of pile foundations.	
	(Part-1/Sec.1)	Driven cast in situ concrete piles.	
	(Part-1/Sec.2)	Bored cast-in-situ concrete piles.	
	(Part-IV)	Load test on piles.	
	IS : 2974 (Part - I TO V)	Code of practice for design and construction of machine foundations.	
	IS : 3370 (Part I to IV)	Code of practice for concrete structures for the storage of liquids.	
	IS : 3658	Code of practice for liquid penetrant flaw detection.	
	IS : 3664	Code of practice for ultra sonic testing by pulse echo method.	
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	IS : 4326Code of practice for earthquake resistant design and construction of buildings. IS : 4990Specification for plywood for concrete shuttering work. IS : 5624Specification for foundation bolts. IS : 7215Tolerances for fabrication steel structures. IS : 8112Specification for 43 grade Ordinary Portland Cement. IS : 9103Specification for admixtures for concrete. IS : 9595Code of procedure of manual metal arc welding of mild steel. IS : 10262Recommended guidelines for concrete mix design. IS : 13311Method of non - destructive testing of concrete. IS : 13755Dust pressed ceramic tiles with water absorption of 3%, E6% (Group B11a) ASTM 898 -89Standard guide for use of high solid content, cold liquid-applied elastomeric water proofing membrane for use with separate wearing course. AS/NZS 2728Pre finished / pre painted sheet metal product for interior / exterior building applications – Performance requirements. AS : 1365Standards for steel manufacturing. AS : 1397A steel sheet & strip – hot – dipped-zinc-coated or Aluminium-Zinc coated. AS : 3566Self drilling screws for building and construction industry. IRC : 37Guidelines for the design of flexible pavements. -Manual on sewerage and sewage treatment (Published by CPH & EEO) As updated. Indian Explosives Act. 1940 as updated.		
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	Annexure-A CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments. A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration ‘g’) in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I. Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values. The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4). Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table><tr><td>a)</td><td>Steel structures</td><td>:</td><td>2%</td></tr><tr><td>b)</td><td></td><td>:</td><td>5%</td></tr><tr><td></td><td>Reinforced Concrete structures</td><td></td><td></td></tr><tr><td>c)</td><td>Reinforced Concrete Stacks</td><td>:</td><td>3%</td></tr><tr><td>d)</td><td>Steel stacks</td><td>:</td><td>2%</td></tr></table>			a)	Steel structures	:	2%	b)		:	5%		Reinforced Concrete structures			c)	Reinforced Concrete Stacks	:	3%	d)	Steel stacks	:	2%
a)	Steel structures	:	2%																				
b)		:	5%																				
	Reinforced Concrete structures																						
c)	Reinforced Concrete Stacks	:	3%																				
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	Method of Analysis Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1). In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1). The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve. For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\bar{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\bar{V}_B / V_B$. However, no reduction is permitted if $\bar{V}_B$ is less than V_B. ~~For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using site specific spectral acceleration coefficients with appropriate multiplying factor given in Appendix I.~~ Design/Detailing for Ductility for Structures The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	AMDT 8 SL 181 PAGE 69 REFER ANNEXURE VIII TO AMDT APPENDIX – I <u>SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT</u> The various site specific seismic parameters for the project site shall be as follows: 1) Peak ground horizontal acceleration : 0.19g 2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra a) for moment resisting steel frames designed and detailed as per IS:800 and moment resisting RC frames designed and detailed as per IS:456 : 0.067 b) for braced steel frames designed and detailed as per IS:800 : 0.05 c) for moment resisting RC frames designed and detailed as per IS:456 and IS:13920 : 0.04 d) for RCC Chimney :0.133 e) For Liquid retaining tanks : 0.08 f) for Steel chimney, Absorber tower : 0.10 g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below : 0.067 3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted : 0.133 Note: g = Acceleration due to gravity The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.		
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ANNEXURE – VIII**NORTH KARANPURA STPP****SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

The various site specific seismic parameters for the project site shall be as follows:

1) Peak ground horizontal acceleration	: 0.19g
2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra	
a) for special moment resisting steel frames designed and detailed as per IS:800	: 0.067
b) For special concentrically braced steel frames designed and detailed as per IS:800	: 0.05
c) for moment resisting RC frames designed and detailed as per IS:456 and IS:13920	: 0.04
d) for RCC chimney, RCC Natural Draft Cooling Tower	:0.133
e) For Liquid retaining tanks	: 0.08
f) for steel chimney, Absorber tower, Vessels	: 0.10
g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials)	: 0.067
3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted	: 0.133

Notes:

1. g = Acceleration due to gravity
2. ~~For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015.~~

The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages

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APPENDIX – I

**HORIZONTAL SEISMIC ACCELERATION SPECTRAL
COEFFICIENTS**

In units of 'g' for NORTH KARANPURA STPP

Period (Sec)	Damping Factor (as a percentage of critical damping)		
	2%	3%	5%
0.000	1	1	1
0.030	1	1	1
0.040	1.693	1.564	1.418
0.050	2.548	2.213	1.859
0.058	3.344	2.787	2.226
0.059	3.450	2.863	2.273
0.060	3.558	2.938	2.320
0.061	3.667	3.015	2.367
0.062	3.778	3.092	2.414
0.065	4.119	3.328	2.557
0.067	4.366	3.488	2.652
0.070	4.366	3.734	2.797
0.071	4.366	3.772	2.846
0.074	4.366	3.772	2.992
0.075	4.366	3.772	3.042
0.084	4.366	3.772	3.054
0.094	4.366	3.772	3.054
0.104	4.366	3.772	3.054
0.114	4.366	3.772	3.054
0.120	4.366	3.772	3.054
0.121	4.366	3.772	3.054
0.123	4.366	3.772	3.054
0.124	4.366	3.772	3.054
0.126	4.366	3.772	3.054
0.133	4.366	3.772	3.054
0.304	4.366	3.772	3.054
0.310	4.366	3.772	3.054
0.327	4.366	3.772	3.054
0.335	4.366	3.772	3.054
0.352	4.366	3.772	3.054
0.376	4.366	3.772	3.054
0.400	4.366	3.772	3.054
0.450	4.350	3.760	3.042
0.500	3.808	3.454	2.720
0.550	3.462	3.140	2.473
0.601	3.168	2.874	2.263
0.604	3.152	2.859	2.252
0.617	3.086	2.799	2.204
0.622	3.061	2.777	2.186
0.632	3.013	2.733	2.152
0.667	2.855	2.589	2.039

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APPENDIX – I

**HORIZONTAL SEISMIC ACCELERATION SPECTRAL
COEFFICIENTS**

In units of 'g' for NORTH KARANPURA STPP

Period (Sec)	Damping Factor (as a percentage of critical damping)		
	2%	3%	5%
0.767	2.482	2.252	1.773
0.867	2.196	1.992	1.569
0.967	1.969	1.786	1.406
1.067	1.784	1.619	1.275
1.167	1.632	1.480	1.165
1.267	1.503	1.363	1.073
1.367	1.393	1.263	0.995
1.467	1.298	1.177	0.927
1.567	1.215	1.102	0.868
1.667	1.142	1.036	0.816
1.767	1.078	0.977	0.770
1.867	1.020	0.925	0.728
1.967	0.968	0.878	0.691
2.067	0.921	0.836	0.658
2.167	0.879	0.797	0.628
2.267	0.840	0.762	0.600
2.367	0.804	0.730	0.575
2.467	0.772	0.700	0.551
2.567	0.742	0.673	0.530
2.667	0.714	0.648	0.510
2.767	0.688	0.624	0.492
2.867	0.664	0.602	0.474
2.967	0.642	0.582	0.458
3.067	0.621	0.563	0.443
3.167	0.601	0.545	0.429
3.267	0.583	0.529	0.416
3.367	0.565	0.513	0.404
3.467	0.549	0.498	0.392
3.544	0.537	0.487	0.384
3.559	0.535	0.485	0.382
3.666	0.519	0.471	0.371
3.765	0.506	0.459	0.361
3.865	0.493	0.447	0.352
3.965	0.480	0.436	0.343
4.006	0.475	0.431	0.339
4.017	0.474	0.430	0.339
4.056	0.469	0.426	0.335

CLAUSE NO.	TECHNICAL REQUIREMENTS														
	ANNEXURE-B CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures shall be designed for wind forces in accordance with IS: 875 (Part-3) and as specified in this document. See Annexure – B for site specific information. Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard. Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method. Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz. Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards. It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects. Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table><tr><td>a)</td><td>Welded steel structures</td><td>1.0%</td></tr><tr><td>b)</td><td>Bolted steel structures</td><td>2.0%</td></tr><tr><td>c)</td><td>Reinforced concrete structures</td><td>1.6%</td></tr><tr><td>d)</td><td>Steel stacks</td><td>As per IS:6533 & CICIND Model Code whichever is more critical.</td></tr></table>			a)	Welded steel structures	1.0%	b)	Bolted steel structures	2.0%	c)	Reinforced concrete structures	1.6%	d)	Steel stacks	As per IS:6533 & CICIND Model Code whichever is more critical.
	a)	Welded steel structures	1.0%												
	b)	Bolted steel structures	2.0%												
	c)	Reinforced concrete structures	1.6%												
	d)	Steel stacks	As per IS:6533 & CICIND Model Code whichever is more critical.												

NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 75 OF 114

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	ANNEXURE-B		
	SITE SPECIFIC DESIGN PARAMETERS		
	The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:		
	a)	The basic wind speed “V _b ” at ten metres above the mean ground level	47 metres/second
	b)	The risk coefficient “K ₁ ”	1.07
c)	Category of terrain	Category-2	

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	ANNEXURE-C		
1.00.0	FOUNDATION SYSTEM AND GEOTECHNICAL DATA		
1.01.0	Soil Data		
	Owner has carried out geotechnical investigation at the project site. Few bore logs, available of vicinity to this area are enclosed at Annexure-III for Bidder's reference. The geotechnical investigation report for nearby areas will be made available for the Bidder's study at the Owner's office, if required. Onus of correct assessment/ interpretation and understanding of the existing subsoil condition / data is on the Bidder. The natural ground reduced levels (RLs) of FGD Area as per topographical survey drawing varies from RL 459.0m to 461.6m. Site levelling & grading had been carried out and achieved finished ground level (FGL) is RL (+) 460.0m i.e. there is maximum filling of 1.0m and maximum cutting of 1.6m in FGD area. However, site levelling in Hopper, Crusher House, Lime & Gypsum storage area etc. shall be done under this package and as per Topographical survey drawing existing ground levels are varying from 461.9m to 465.6m and FGL to be achieved in this area shall be as indicated in GLP. Bidder may refer topographical survey drawing for variation in existing/ natural ground level and FGL. As per borelog data, water table is varying from 1.6m to 3.8m at the time of field investigation and may fluctuate with season.		
1.01.01	Since the available soil data is of vicinity, bidder shall carryout his own detailed soil investigation for facilities under this package and shall be as per the scheme approved by Owner. The scheme for geotechnical investigation shall be as given at Clause 1.07.00 and shall be approved by Owner before execution. Geotechnical investigation work shall be got executed by the Contractor through the agencies as mentioned in Clause No. 1.07.03. However, no time extension shall be given on account of soil investigation carried out by the Bidder. The geotechnical investigation report shall be prepared with detailed recommendations regarding type of foundation and allowable bearing pressure for various structures/ facilities and other soil parameters. The report shall be submitted for Owner's approval prior to commencement of design of foundation.		
1.01.02	The Bidder should note that nothing extra whatsoever on account of variation between soil data collected by Owner and that found by the Bidder during geotechnical investigation by him or during execution of works, shall be payable.		
1.01.03	Tank Foundations		
	a) The tanks shall rest on flexible tank pad foundation, resting on sand with concrete ring wall to retain sand. Base of the concrete ring wall shall not rest on the expansive soil, if any. b) Entire loose/ soft soil inside the concrete ring wall shall be removed and shall be filled with sand. Sand for filling shall be clean and well graded conforming to IS 383 with grading Zone I to III. c) Sand shall be spread in layers not exceeding 30cm compacted thickness over the area. Each layer shall be uniformly compacted by mechanical means like plate vibrators, small vibratory rollers, etc to achieve a relative density of not less than 80%.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
1.02.00	d) Other requirements of tank foundations shall be as per IS 803 and as specified elsewhere in the specifications.		
	Foundation System The requirements for the foundation system to be adopted are as given in subsequent clauses. Depending upon the depth of competent strata/stratum, type of structures, functional requirement of facility, extent of cutting / filling, suitable foundation, open or pile shall be adopted with approval of owner.		
102.01	General Requirements a) All structures/equipment shall be supported either on suitable open foundations (isolated, combined, raft) or pile foundations depending on type of structures/facilities, sub-strata, topography etc. b) The roads, ground floor slabs, trenches, pipe pedestals, channels/drains and staircase foundation with foundation loading intensity less than 4 T / M2 may be supported on open / shallow foundations resting on virgin / controlled compacted filled up soil. c) No other foundation (other than as mentioned in (b) above) shall rest on the filled up ground / soil. d) All foundations shall be designed in accordance with relevant parts of the latest revisions of Indian Standards. e) The water table for design purpose shall be considered at Finished Ground Level. f) A combination of open and pile foundations shall not be permitted under the same equipment / structure / building. g) Foundation for equipments on ground floor For equipments of static weight upto 1.5 T, the equipment may be supported on the ground floor slab by locally thickening the slab. Thickening of the ground floor slab shall be done upto an extent of about 0.6 m beyond the plan area of the equipment on all the sides. Further, the load intensity below the equipment shall be limited to 4T/m2. Other requirements of floor slab and compaction below the floor slab shall be adhered, as specified elsewhere in the specifications. For equipment of static weight more than 1.5 T, the equipment foundation shall be taken to the founding level or shall be built up with PCC from the level as mentioned in the Table 1. The pedestal of equipment foundation or the foundation Block shall be isolated from the adjoining floor slab by providing bitumen impregnated fiber board of minimum 50 mm thick, conforming to IS: 1838 all around the equipment pedestal for the full depth of the floor slab.		
	Open Foundations In case open foundations are adopted, following shall be adhered to.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS																																					
	a) The minimum width of foundation shall be 1.0 m. b) Minimum depth of foundation shall be 1.0m below Ground Level. c) It shall be ensured that all foundations of a particular structure/ buildings/ facility shall rest on one bearing stratum. d) Wherever the intended bearing sub-strata is virgin soil stratum but the actual stratum encountered during foundation excavation consists of filled up soil at founding level, under such cases either the foundation shall be lowered completely into the virgin stratum or the filled up soil upto the virgin layers shall be removed and built up through PCC (1:4:8) up to designed foundation level. e) During design the Allowable Bearing Pressure shall be adopted after approval of geotechnical investigation report. However, the maximum allowable bearing pressure shall be as per approved geotechnical report and shall be limited to the values as furnished in Table-1. Table-1 <table><tr><th rowspan="3">Founding Depth/ Stratum</th><th colspan="3">Net Allowable Bearing Pressure T/m2</th></tr><tr><td>Isolated and combined footings including raft for 25mm permissible settlement in case of soil and 12mm in case of rocky strata</td><td>Isolated and combined footings for 40mm permissible settlement in case of soil and 12mm in case of rocky strata</td><td>Rafts (width > 6m) for 75mm permissible settlement in case of soil and 12mm in case of rocky strata</td></tr><tr><td colspan="3">Width upto 6.0m</td></tr><tr><td colspan="4">In case of Soil</td></tr><tr><td>2.0m below NGL</td><td>10</td><td>14</td><td>18</td></tr><tr><td>3.0m below NGL</td><td>14</td><td>18</td><td>24</td></tr><tr><td colspan="4">In case of rocky strata</td></tr><tr><td>1m into highly weathered rock*</td><td>35</td><td>35</td><td>35</td></tr><tr><td>2m into highly weathered rock*</td><td>45</td><td>45</td><td>45</td></tr></table> * Highly weathered sandstone with shale bands/highly weathered fine grained fractured rock, stratum is with SPT 'N' > 100 (Refusal) and core recovery (CR) around 20% or more.				Founding Depth/ Stratum	Net Allowable Bearing Pressure T/m2			Isolated and combined footings including raft for 25mm permissible settlement in case of soil and 12mm in case of rocky strata	Isolated and combined footings for 40mm permissible settlement in case of soil and 12mm in case of rocky strata	Rafts (width > 6m) for 75mm permissible settlement in case of soil and 12mm in case of rocky strata	Width upto 6.0m			In case of Soil				2.0m below NGL	10	14	18	3.0m below NGL	14	18	24	In case of rocky strata				1m into highly weathered rock*	35	35	35	2m into highly weathered rock*	45	45	45
Founding Depth/ Stratum	Net Allowable Bearing Pressure T/m2																																					
	Isolated and combined footings including raft for 25mm permissible settlement in case of soil and 12mm in case of rocky strata	Isolated and combined footings for 40mm permissible settlement in case of soil and 12mm in case of rocky strata	Rafts (width > 6m) for 75mm permissible settlement in case of soil and 12mm in case of rocky strata																																			
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1m into highly weathered rock*	35	35	35																																			
2m into highly weathered rock*	45	45	45																																			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 79 OF 114																																			

CLAUSE NO.	TECHNICAL REQUIREMENTS																
1.02.03	For NGL & FGL of the proposed area GLP along with topographical survey drawing may be referred. In case any loose/soft pockets in rocky strata is encountered at founding level, the same shall be removed completely upto the hard strata and filled up with PCC (1:4:8). f) For open foundations, the total permissible settlement shall be governed by IS: 1904 / IS: 13063 and from functional requirements whichever is more stringent. However, total settlement shall be restricted to the following: <table><tr><td>Isolated & Raft (Mill foundations/ Machine Foundations) resting on soil</td><td>25 mm</td></tr><tr><td>Isolated (other than Mill foundations/ Machine Foundations) resting on soil</td><td>40 mm</td></tr><tr><td>Raft (other than Mill foundations/ Machine Foundations) resting on soil</td><td>75 mm</td></tr><tr><td>Foundations in Weathered rock / rock</td><td>12 mm</td></tr></table> Incase pile foundations are to be adopted the requirements under para "Pile Foundations" shall be adhered to. Pile Foundations – In case piles are adopted, following shall be adhered to : i) The pile foundation shall be of RCC, Cast-in-situ bored piles as per IS:2911. Pile boring shall be done using Rotary Hydraulic Rigs. Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the Employer. If required, temporary or permanent MS liner may be provided for piling. ii) The minimum diameter of pile shall be 600 mm. The allowable load capacity of the pile in different modes (vertical compression, lateral and pullout) shall be as per approved geotechnical report & shall be limited to the values given below: <table><tr><td>Pile</td><td>Dia. (mm)</td><td>Vertical compression capacity (T)</td></tr><tr><td rowspan="2">Bored cast-in-situ pile</td><td>600</td><td>140</td></tr><tr><td>760</td><td>250</td></tr></table>	Isolated & Raft (Mill foundations/ Machine Foundations) resting on soil	25 mm	Isolated (other than Mill foundations/ Machine Foundations) resting on soil	40 mm	Raft (other than Mill foundations/ Machine Foundations) resting on soil	75 mm	Foundations in Weathered rock / rock	12 mm	Pile	Dia. (mm)	Vertical compression capacity (T)	Bored cast-in-situ pile	600	140	760	250
	Isolated & Raft (Mill foundations/ Machine Foundations) resting on soil	25 mm															
	Isolated (other than Mill foundations/ Machine Foundations) resting on soil	40 mm															
	Raft (other than Mill foundations/ Machine Foundations) resting on soil	75 mm															
	Foundations in Weathered rock / rock	12 mm															
	Pile	Dia. (mm)	Vertical compression capacity (T)														
	Bored cast-in-situ pile	600	140														
		760	250														
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	The pile shall be socketed into rock strata with minimum socket length of 5 times the diameter of pile below the start of socketing horizon. Socketing horizon shall be considered as the zone wherein average core recovery is atleast than 30 %. The uplift and lateral load capacity shall be respectively restricted to 35% and 5% of the allowable load capacity in vertical compression. However, the pile capacities to be adopted shall be the least of the estimated design values and that obtained from the initial pile load tests. iii) Only straight shaft piles shall be used. Minimum cast length of pile above cutoff level shall be 1.0 m. iv) The contractor shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, pile load test arrangement, locations of initial test piles etc.) for Engineer's approval. v) The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval. vi) Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under. Vertical Lateral Minimum of 2 Nos. in each mode. Uplift vii) The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of vertical compression test (initial test) the method of loading shall be cyclic as per IS:2911 (relevant part). viii) Load test shall be conducted at pile Cut-off Level (COL). If the water table is above the COL the test pit shall be kept dry throughout the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case, an annular space shall be created to remove the effect of skin friction above COL by providing an outer casing of suitable diameter larger than the pile diameter. ix) Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under : i) Vertical : 0.5% of the total number of piles provided. ii) Lateral : 0.5% of the total number of piles provided.		
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	x) The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer. xi) In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required. xii) Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm. xiii) The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge with concrete blocks. xiv) Low Strain Pile Integrity test shall be conducted on all test piles and job piles. This test shall be used to identify the routine load test and not intended to replace the use of static load test. This test is limited to assess the imperfection of the pile shaft and shall be undertaken by an independent specialist agency to be approved by Engineering department of Owner. The test equipment shall be of TNO or PDI make or equivalent. The process shall confirm to ASTM. xv) High Strain Dynamic Load Test may be carried out for routine load testing of working piles. However, at least two numbers of static routine vertical load tests shall be carried out on pile on which high strain dynamic load test has already been carried out for establishing the correlation between the two tests. In case of discrepancy if any between dynamic and static vertical load tests, then additional static routine vertical load tests shall be conducted as decided by the Engineer and the results of static routine vertical load shall prevail. Number of routine vertical pile load tests as per clause 7.02.03 (ix) shall be total of static routine vertical load test and high strain dynamic load tests. The procedure to carry out the test shall be submitted to the Engineer. The test and equipment shall conform to ASTM D4945-00. The test shall be conducted by an experienced independent test agency approved by the owner. Field data shall be submitted to the site engineer and shall include force velocity curves, pile capacity, simulated static load test curve, net and total pile displacement, pile integrity. A (Case pile wave analysis) CAPWAP or equivalent software analysis shall be conducted on the field data for correct capacity estimation and to evaluate end bearing and skin friction components of the pile.		
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	xvi) From load considerations, single pile may be used under a column/tower. In that case, pile shall be connected with tie beams at pile cut off level in both directions. xvii) Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles. xviii) Reinforcement for job piles shall be designed as following: (a) Compression + bending piles: For these piles, the allowable safe pile capacities in compression and bending shall be considered. (b) Tension + bending piles: For these piles, the actual pile forces to be considered. However, maximum 3 types of combinations for varying percentage of tension capacity + bending case may be designed & adopted by contractor for the entire scope of work under this package.		
1.03.00	Special Requirements		
1.03.01	Details of treatment for foundations / underground structures required to counteract soil / water chemical environment shall be as per detailed geotechnical investigation to be carried out by contractor. Contractor shall carry out chemical analysis during detailed geotechnical investigation and required treatment shall be provided accordingly.		
1.04.00	Excavation, Filling and Dewatering		
1.04.01	For excavation works, comprehensive dewatering with well point or deep wells arrangement, if required, shall be adopted. Scheme for dewatering and design with all computations and back up data for dewatering shall be submitted for the owner's information. The water table shall be maintained at 0.5m below the founding depth.		
1.04.02	Excavation for shallow foundations shall be covered with PCC immediately after reaching the founding level. In case of any local loosening of soil or any loose pockets are encountered at founding level during excavation the same shall be removed and compensated by PCC M7.5. The final layer of about 300 mm thickness above the founding level shall be excavated by suitable means, so as to avoid disturbance to founding stratum.		
1.04.03	Backfilling around foundations, pipes, trenches, sumps, pits, plinths, etc. shall be carried out with approved material in layers not exceeding 300 mm compacted thickness (higher thickness of layers upto 500mm with heavy mechanical compacting equipment) and each layer shall be compacted to 90% of standard proctor density for cohesive soils and to 80% of relative density for non cohesive soils Rock pieces having size less than 150 mm and interstices filled with soil may be used for backfilling around foundation, plinths etc. and shall be compacted to minimum of 85% of original stack of material after filling the interstices.		
1.04.04	Founding level for trenches/channels shall be decided as per functional requirement. The bottom of excavation shall be properly compacted prior to casting of bottom slab of trenches / channels.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2 SUB-SECTION-IV-D CIVIL WORKS PAGE 83 OF 114			

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.04.05	CBR tests for pavement/road design shall be carried out by the Contractor after earth filling (if applicable) has been completed upto the formation level.			
1.04.06	THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES DURING EXCAVATION TO PREVENT THE HAZARDS OF FALLING OR SLIDING OF MATERIAL OR ARTICLE FROM ANY BANK OR SIDE OF SUCH EXCAVATION WHICH IS MORE THAN ONE AND A HALF METER ABOVE THE FOOTING BY PROVIDING ADEQUATE PILING, SHORING, BRACING ETC. AGAINST SUCH BANK OR SIDES. Adequate and suitable warning signs shall be put up at conspicuous places at the excavation work to prevent any persons or vehicles falling into the excavation trench. No worker should be allowed to work where he may be stuck or endangered by excavation machinery or collapse of excavations or trenches.			
1.05.00	EXCAVATION IN ROCK Excavation in rock shall be carried out by mechanical means and if blasting is required for founding of some of the structures under this package, control blasting only shall be carried out.			
1.05.01	Controlled blasting shall be done by a specialised agency duly approved by Engineer. All controlled blasting shall be done by using time delay detonators (i.e. excel type).			
1.05.02	a) Contractor shall engage an agency expert in blasting such as, NIRM (National Institute of Rock Mechanics), CMPDIL, Central Institute of Mining and Fuel Research Dhanbad, Dept. of Mining of Govt. Institutions etc. to design detailed blasting scheme and get the same approved from Engineer before carrying out the blasting operation. All blasting shall be done as per the approved blasting scheme & initial blasting operations shall be done under the supervision & guidance of the representative of the blasting expert. b) All the statutory laws, (Explosives Act etc.) rules, regulations, Indian Standards, etc. pertaining to the acquisition, transport, storage, handling and use of explosives, etc. shall be strictly followed. c) The Contractor shall obtain Licenses from Competent Authorities for undertaking blasting work as well as for procuring, transporting to site and storing the explosives as per explosives act. The Contractor shall be responsible for the safe transport, use, custody and proper accounting of the explosive Materials. d) The Contractor shall be responsible and liable for any accident and injury / damage which may occur to any person or property of the project or public on account of any operations connected with the storage, transportation, handling or use of explosive and blasting operations.			
1.06.00	Sheeting & Shoring The contractor shall ascertain for himself the nature of materials to be excavated and difficulties, if any, likely to be encountered in excavation while executing the work. Sheet piling, sheeting and shoring, bracing and maintaining suitable slopes,			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 84 OF 114

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	drainage, etc. shall be provided and installed by the Contractor, to the satisfaction of the Engineer.				
1.07.00	Geotechnical Investigation The Contractor shall carry out detailed geotechnical investigation in the areas under his scope for establishing the sub-surface conditions and to decide type of foundations for the structures envisaged, construction methods, any special requirements/treatment called for remedial measures for sub-soil/ foundations etc. in view of soft sub-soils, aggressive sub-soils and water, expansive/swelling soils etc. prior to commencement of detailed design/drawings. The Contractor shall obtain the approval for the field testing scheme proposed by him from the Owner before undertaking the geotechnical investigation work.				
1.07.01.00	Scheme of geotechnical Investigation				
1.07.02.01	Field test shall include but not be limited to the following: Boreholes, Standard Penetration Test (SPT), Dynamic Cone Penetration Test (DCPT), collection of disturbed samples (DS) and undisturbed soil samples (UDS), Trial Pits (TP), Plate Load Tests (PLT), Electrical Resistivity Test (ERT), In situ field permeability tests, collection of water samples, etc.				
1.07.02.02	The diameter of borehole shall be minimum 150 mm in soil and 76 mm in rock. The diameter of UDS sampler shall be 100 mm minimum. Core drilling in rock shall be done by using hydraulically feed rotary drill & double tube core barrel with diamond bit.				
1.07.02.03	The minimum tests are indicated in Clause No. 7.08.00. Adequate number of tests shall be conducted up to sufficient depth for complete determination of subsoil conditions. The depth of boreholes shall be as specified in Appendix A. SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery up to 20%, met within a borehole. This test shall be conducted at every 3.0 m interval or at change of strata, up to the final depth. SPT 'N' of 100 and above shall be referred as refusal. UDS shall be collected at every 3.0 m interval or at change of strata up to depth of borehole. UDS may be replaced by additional SPT, if SPT'N' value in the strata is above 50.				
1.07.02.04	Laboratory tests shall be done as per relevant IS codes. The laboratory tests, not be limited to the following shall be conducted on disturbed and undisturbed soil samples, rock samples & water samples collected during field investigations in sufficient numbers. Laboratory Tests on Soil Samples Laboratory tests shall be carried out on disturbed and undisturbed soil samples for Grain Size Analysis, Hydrometer Analysis, Atterberg Limits, Triaxial Shear Tests (UU), Natural Moisture Content, Specific Gravity and Bulk Unit Weight, Consolidation Tests, Unconfined Compression Test, Free swell Index, Shrinkage Limit, Swell Pressure Test, Chemical Analysis test on soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, organic matter and any other chemicals harmful to concrete and reinforcement/ steel. Laboratory Tests on Rock Samples Moisture content, porosity & density, Specific Gravity, Hardness, Soundness, Slake durability index, Unconfined compression test (Both at saturated and in-situ water content), Point load strength index and deformability test (Both at saturated and in-situ water content) shall be carried out on rock samples.				
<table><tr><td>NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2</td><td>SUB-SECTION-IV-D CIVIL WORKS</td><td>PAGE 85 OF 114</td></tr></table>		NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 85 OF 114
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CLAUSE NO.	TECHNICAL REQUIREMENTS																					
1.07.02.05	Geotechnical investigation (field & laboratory) shall be carried out in accordance with the provisions of relevant Indian Standards. On completion of all field & laboratory work, geotechnical investigation report shall be submitted for Owner's review/approval. The Geotechnical investigation report shall contain geological information of the region, procedure adopted for investigation, field & laboratory observations/ data/ records, analysis of results & recommendations on type of foundation for different type of structures envisaged for all areas of work with supporting calculations. Recommendations on treatment for soil, foundation, based on subsoil characteristics, soft soils, aggressive chemicals, expansive soils, etc. Recommendations on foundation system and the net allowable bearing pressures and pile capacity shall be based on the conservative values of geotechnical investigation data.																					
1.07.03.00	Geotechnical investigation work shall be got executed by the Contractor through the following agencies. 1. C.E.TESTING COMPANY Pvt. Ltd, Kolkata 2. Cengrs Geotechnica Pvt. Ltd, New Delhi 3. M.K. Soil Testing Laboratory, Ahemdabad 4. SECON Pvt Ltd, Bangalore 5. Soil Engineering Consultants, New Delhi 6. Orbital Infrastructure Consultancy & Research Pvt. Ltd. Cuttack 7. KCT Consultancy Services, Ahemdabad 8. ARKITECHNO Consultants (India) Pvt. Ltd. Bhubaneswar																					
1.08.00	Geotechnical Investigation Scheme a) Boreholes (Minimum) <table><tr><th>S.N</th><th>Structure</th><th>Spacing/Number of borehole</th><th>Depth of borehole</th><th>Remarks</th></tr><tr><td>1</td><td>FGD</td><td>Minimum 14 Nos.</td><td>Depth of boreholes shall be 20m to 25m.</td><td rowspan="3">Depth of boreholes shall be as mentioned in column "Depth of Borehole" or 5m continuous</td></tr><tr><td>2</td><td>Crusher House</td><td>Minimum 2 Nos.</td><td>Depth of boreholes shall be 20m to 25m.</td></tr><tr><td>3</td><td>Gypsum and Lime storage area</td><td>Minimum 10 Nos.</td><td>Depth of boreholes shall be 10m to 15m</td></tr></table>				S.N	Structure	Spacing/Number of borehole	Depth of borehole	Remarks	1	FGD	Minimum 14 Nos.	Depth of boreholes shall be 20m to 25m.	Depth of boreholes shall be as mentioned in column "Depth of Borehole" or 5m continuous	2	Crusher House	Minimum 2 Nos.	Depth of boreholes shall be 20m to 25m.	3	Gypsum and Lime storage area	Minimum 10 Nos.	Depth of boreholes shall be 10m to 15m
S.N	Structure	Spacing/Number of borehole	Depth of borehole	Remarks																		
1	FGD	Minimum 14 Nos.	Depth of boreholes shall be 20m to 25m.	Depth of boreholes shall be as mentioned in column "Depth of Borehole" or 5m continuous																		
2	Crusher House	Minimum 2 Nos.	Depth of boreholes shall be 20m to 25m.																			
3	Gypsum and Lime storage area	Minimum 10 Nos.	Depth of boreholes shall be 10m to 15m																			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2	SUB-SECTION-IV-D CIVIL WORKS	PAGE 86 OF 114																		

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	4	Chimney	Minimum 2 Nos.	25 to 30 m	in rock with RQD > 50% whichever is earlier.
	5	Other Structure/Facility	Minimum 2 Nos. boreholes under each area / facility	15 to 20 m	
	b) Other Field Tests (Minimum)				
	1	Cyclic Plate Load Test (CPLT)	3 nos	Test Depth from 2 to 4 m	
	2	TRIAL PIT (TP)	5 Nos.	Depth - 3 m	
	3	IN SITU PERMEABILITY TEST IN BOREHOLES	In minimum 3 Nos. of boreholes	Tests shall be conducted at depths of 1.0m, 3.0m, 5.0m, 8.0m and 12.0m.	
	4	ERT	Minimum 10 Nos.		
	• Depth and location of Boreholes and other field tests (PLT, ERT, field permeability tests etc.) shall be approved by Owner before execution of geotechnical investigation work. • Investigation in any other building / structure / facilities / trestles which are not mentioned above shall also be carried out, if required, by the bidder for the facilities under his scope.				
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2		SUB-SECTION-IV-D CIVIL WORKS	
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Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.1

Co-ordinates E=7937
N=12065

Field Test	Nos	Samples	Nos	Commencement Date :	11/12/2014
Penetrometer (SPT)	6	Undisturbed (UDS)	2	Completion Date :	13/12/2014
Cone (Pc)		Penetrometer (SPT)	6	Bore Hole Diameter :	150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground :	459.320 m.
		Water Sample (WS)	0	Water Struck At :	
				Standing Water Level :	1.65 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 15cm				Ref. No	Depth (m)
0.00m						DS-1	0.50
		3	4	6	10	SPT-1	1.00-1.45
						UDS-1	2.00-2.45
		4	4	8	12	SPT-2	2.45-2.90
						UDS-2	3.50-3.95
		5	6	9	15	SPT-3	3.95-4.40
		22	47	31	>100	SPT-4	5.00-5.34
		100	5.0	cm	Refusal	*SPT-5	5.55-5.60
5.75m		100	5.0	cm	Refusal	*SPT-6	5.75-5.78 5.75
		100	3.0	cm	Refusal	R1	CR=21% RQD=NII
		NX	3.0	cm	Pentn.	R2	CR=29% RQD=NII
					rotary drilling from 5.75m to 32.50m	R3	CR=24% RQD=NII
						R4	CR=33% RQD=NII
						R5	CR=36% RQD=NII
						R6	CR=44% RQD=32%
						R7	CR=53% RQD=37%
						R8	CR=52% RQD=41%
						R9	CR=45% RQD=31%
						R10	CR=51% RQD=47%
						R11	CR=57% RQD=31%
						R12	CR=53% RQD=NII
						R13	CR=57% RQD=32%
						R14	CR=52% RQD=13%

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.2

Co-ordinates E=7925
N=12047

Field Test	Nos	Samples	Nos	Commencement Date : 08/12/2014
Penetrometer (SPT)	4	Undisturbed (UDS)	1	Completion Date : 11/12/2014
Cone (Pc)		Penetrometer (SPT)	4	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 459.70 m.
		Water Sample (WS)	1	Water Struck At :
				Standing Water Level : 1.65 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
0.00m							DS-1	0.50
Stiff, yellowish brown, silty clay / clayey silt. Obs. kankar & sand mixture.		3	5	6	11		SPT-1	1.00-1.45
							WS-1	1.65
1.90m		17	38	45	>100		*UDS-1	2.00-2.10
Hard, brownish grey, silty clay / clayey silt with mica & decomposed rock.					10.0 cm Penetr.		SPT-2	2.10-2.50
		100			Refusal		*SPT-3	2.70-2.74
2.90m		100			Refusal		*SPT-4	2.90-2.93
		100			Refusal		R1	CR=28% RQD=Nil
		3.0 cm Penetr.					R2	CR=36% RQD=32%
		NX rotary drilling from 2.90m to 30.00m					R3	CR=35% RQD=Nil
							R4	CR=39% RQD=Nil
							R5	CR=40% RQD=20%
							R6	CR=41% RQD=Nil
							R7	CR=43% RQD=23%
							R8	CR=45% RQD=Nil
							R9	CR=47% RQD=20%
							R10	CR=51% RQD=27%
							R11	CR=44% RQD=28%
							R12	CR=51% RQD=20%
							R13	CR=55% RQD=13%
							R14	CR=57% RQD=Nil
							R15	CR=52% RQD=13%
							R16	CR=64% RQD=49%
							R17	CR=69% RQD=55%
							R18	CR=61% RQD=31%
9.50m								
Moderately to slightly weathered, brownish grey, medium to fine grained, moderately fractured alternation of sandstone & shale.								
16.30m								

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Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.9

Co-ordinates E=79.39
N=11986

Field Test	Nos	Samples	Nos	Commencement Date : 11/12/2014
Penetrometer (SPT)	4	Undisturbed (UDS)	1	Completion Date : 13/12/2014
Cone (Pc)		Penetrometer (SPT)	4	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.398 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.30 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 15cm				Ref. No	Depth (m)
0.00m						DS-1	0.50
Hard, brownish grey, silty clay / clayey silt with mica & decomposed rock.		12	20	24	44	SPT-1	1.00-1.45
		22	43	35	>100	*UDS-1	2.10-2.20
		100	4.0	cm	Pentn.	SPT-2	2.20-2.54
		100	5.0	cm	Pentn.	*SPT-3	3.00-3.05
		100	4.0	cm	Pentn.	*SPT-4	3.25-3.29
3.25m		NX rotary drilling from 3.25m to 25.00m				R1	CR=29% RQD=Nil
						R2	CR=39% RQD=Nil
						R3	CR=32% RQD=19%
						R4	CR=35% RQD=28%
						R5	CR=44% RQD=31%
						R6	CR=49% RQD=39%
						R7	CR=47% RQD=20%
						R8	CR=48% RQD=Nil
						R9	CR=50% RQD=Nil
10.00m						R10	CR=53% RQD=37%
Moderately to slightly weathered, brownish grey, fine grained, highly to moderately fractured, alternation of sandstone & shale.						R11	CR=63% RQD=55%
						R12	CR=61% RQD=43%
12.25m						R13	CR=64% RQD=59%
Moderately to slightly weathered, light brownish grey, fine grained, moderately fractured alternation of sandstone & shale.						R14	CR=56% RQD=32%
						R15	CR=60% RQD=13%
13.75m						R16	CR=63% RQD=Nil
Moderately to slightly weathered / fresh, brownish grey to light blackish grey, fine grained, medium to slightly fractured, alternation of sandstone & shale.						R17	CR=61% RQD=Nil
							16.00
16.30m							

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand. **CETEST**

Job No : 3401

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Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.9

Co-ordinates E=7939
N=11986

Field Test	Nos	Samples	Nos	Commencement Date : 11/12/2014
Penetrometer (SPT)	4	Undisturbed (UDS)	1	Completion Date : 13/12/2014
Cone (Pc)		Penetrometer (SPT)	4	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.398 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.30 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
Moderately to slightly weathered / fresh, brownish grey to light blackish grey, fine grained, medium to slightly fractured, alternation of sandstone & shale.							R18	CR=64% RQD=13% 16.30m → 16.75
							R19	CR=66% RQD=55% 16.75 → 17.50
							R20	CR=64% RQD=33% 17.50 → 18.25
							R21	CR=69% RQD=35% 18.25 → 19.00
							R22	CR=73% RQD=16% 19.00 → 19.75
							R23	CR=81% RQD=44% 19.75 → 20.50
							R24	CR=84% RQD=80% 20.50 → 21.25
							R25	CR=83% RQD=72% 21.25 → 22.75
							R26	CR=85% RQD=69% 22.75 → 24.25
							R27	CR=88% RQD=75% 24.25 → 25.00

N.B. — '*' means sample could not be recovered.

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Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.13

Co-ordinates E=7937
N=11932

Field Test	Nos	Samples	Nos	Commencement Date : 05/12/2014
Penetrometer (SPT)	5	Undisturbed (UDS)	2	Completion Date : 10/12/2014
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.287 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.10 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
0.00m								
Medium, brownish grey, silty clay / clayey silt. Obs. mica, kankar & sand mixture.		3	3	5	8		DS-1	0.50
							SPT-1	1.00-1.45
2.45m					14		UDS-1	2.00-2.45
Stiff, brownish grey, silty clay with decomposed rock & mica		4	6	8			SPT-2	2.45-2.90
4.05m		29.71			>100		*UDS-2	3.50-3.60
		5.0 cm			Pentn.		SPT-3	3.60-3.80
		100			Refusal		*SPT-4	3.90-3.95
		5.0 cm			Pentn.		*SPT-5	4.05-4.08
4.05m		100			Refusal			
Highly weathered, greyish brown, fine grained, highly fractured alternation of sandstone & shale.		3.0 cm			Pentn.		R1	CR=24% RQD=Nil
5.50m		NX			rotary drilling from 4.05m to 31.50m		R2	CR=28% RQD=Nil
							R3	CR=41% RQD=23%
							R4	CR=35% RQD=20%
							R5	CR=39% RQD=32%
							R6	CR=35% RQD=17%
							R7	CR=41% RQD=Nil
							R8	CR=44% RQD=Nil
							R9	CR=48% RQD=26%
							R10	CR=52% RQD=13%
							R11	CR=49% RQD=Nil
							R12	CR=55% RQD=32%
							R13	CR=51% RQD=24%
							R14	CR=59% RQD=47%
							R15	CR=61% RQD=37%
							R16	CR=60% RQD=17%
12.25m								
Moderately to slightly weathered, brownish grey, fine grained, moderately fractured, alternation of sandstone & shale.								
16.30m								

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TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.13

Co-ordinates E=7937
N=11932

Field Test	Nos	Samples	Nos	Commencement Date : 05/12/2014
Penetrometer (SPT)	5	Undisturbed (UDS)	2	Completion Date : 10/12/2014
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.287 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.10 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
16.30m Moderately to slightly weathered, brownish grey, fine grained, moderately fractured, alternation of sandstone & shale.							R17	CR=55% RQD=24% 16.75
							R18	CR=61% RQD=37% 17.50
							R19	CR=72% RQD=56% 18.25
18.25m Slightly weathered, light greyish brown, fine grained, moderately fractured alternation of sandstone & shale.							R20	CR=67% RQD=45% 19.00
							R21	CR=64% RQD=25% 19.75
							R22	CR=62% RQD=23% 20.50
20.50m Slightly weathered, light blackish grey, fine grained, moderately to slightly fractured, alternation of sandstone & shale.							R23	CR=67% RQD=53% 21.25
							R24	CR=64% RQD=33% 22.00
							R25	CR=70% RQD=48% 22.75
							R26	CR=71% RQD=65% 23.50
							R27	CR=73% RQD=72% 24.25
							R28	CR=70% RQD=36% 25.00
							R29	CR=73% RQD=27% 25.75
							R30	CR=75% RQD=15% 26.50
							R31	CR=73% RQD=69% 27.25
							R32	CR=76% RQD=71% 28.00
28.00m Fresh, light blackish grey, fine grained, moderately fractured alternation of sandstone & shale.							R33	CR=81% RQD=78% 28.75
							R34	CR=84% RQD=73% 29.50
							R35	CR=86% RQD=58% 31.00
31.50m N.B. - '*' means sample could not be recovered.							R36	CR=92% RQD=52% 31.50

CLAUSE NO.	TECHNICAL REQUIREMENTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand. CETEST Job No : 3401Created by : SKDCreated on : 23/12/2014Sheet No: BORE LOG DATA SHEETBORE HOLE NO.15Co-ordinatesE=7925N=11914 <table><tr><td>Field Test</td><td>Nos</td><td>Samples</td><td>Nos</td><td colspan="7">Commencement Date : 10/12/2014</td></tr><tr><td>Penetrometer (SPT)</td><td>5</td><td>Undisturbed (UDS)</td><td>1</td><td colspan="7">Completion Date : 13/12/2014</td></tr><tr><td>Cone (Pc)</td><td></td><td>Penetrometer (SPT)</td><td>5</td><td colspan="7">Bore Hole Diameter : 150mm / NX.</td></tr><tr><td>Vane (V)</td><td></td><td>Disturbed (DS)</td><td>1</td><td colspan="7">Level Of Ground : 460.141 m.</td></tr><tr><td></td><td></td><td>Water Sample (WS)</td><td>0</td><td colspan="7">Water Struck At : Standing Water Level : 3.10 m.</td></tr></table> <table><tr><th rowspan="2">DESCRIPTION</th><th rowspan="2">SYMBOL</th><th colspan="5">N-VALUE</th><th colspan="2">SAMPLES</th></tr><tr><th colspan="5">EACH DIVN. = 15cm</th><th>Ref. No</th><th>Depth (m)</th></tr><tr><td>0.00m Stiff, yellowish brown to brownish grey, silty clay / clayey silt with mica & decomposed rock.</td><td rowspan="3"></td><td></td><td></td><td></td><td></td><td></td><td>DS-1</td><td>0.50</td></tr><tr><td></td><td>2</td><td>5</td><td>6</td><td>11</td><td></td><td>SPT-1</td><td>1.00-1.45</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>2.09m Hard, brownish grey, silty clay / clayey silt with mica & decomposed rock.</td><td rowspan="3"></td><td>13</td><td>22</td><td>31</td><td>53</td><td></td><td>*UDS-1</td><td>2.00-2.09</td></tr><tr><td></td><td>34</td><td>66</td><td>>100</td><td></td><td></td><td>SPT-2</td><td>2.09-2.54</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>3.50m</td><td rowspan="3"></td><td>100</td><td>9.0 cm</td><td>Pentn.</td><td></td><td></td><td>SPT-3</td><td>2.90-3.14</td></tr><tr><td></td><td>100</td><td>4.0 cm</td><td>Pentn.</td><td></td><td></td><td>SPT-4</td><td>3.30-3.34</td></tr><tr><td></td><td>100</td><td>3.0 cm</td><td>Pentn.</td><td></td><td></td><td>SPT-5</td><td>3.50-3.53</td></tr><tr><td></td><td></td><td colspan="5">NX rotary drilling from 3.50m to 30.00m</td><td>R1</td><td>3.50</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=26% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R2</td><td>4.25</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=29% RQD=13%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R3</td><td>5.00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=28% RQD=15%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R4</td><td>5.75</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=36% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R5</td><td>6.50</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=35% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R6</td><td>7.25</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=47% RQD=17%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R7</td><td>8.00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=37% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R8</td><td>8.75</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=41% RQD=13%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R9</td><td>9.50</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=45% RQD=35%</td></tr><tr><td>10.25m</td><td></td><td></td><td></td><td></td><td></td><td></td><td>R10</td><td>10.25</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=41% RQD=Nil</td></tr><tr><td>11.00m</td><td></td><td></td><td></td><td></td><td></td><td></td><td>R11</td><td>11.00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=52% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R12</td><td>11.75</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=52% RQD=47%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R13</td><td>12.50</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=65% RQD=42%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R14</td><td>13.25</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=52% RQD=47%</td></tr><tr><td>14.00m</td><td></td><td></td><td></td><td></td><td></td><td></td><td>R15</td><td>14.00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=56% RQD=32%</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R16</td><td>14.75</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=57% RQD=Nil</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R17</td><td>15.50</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>CR=60% RQD=Nil</td></tr><tr><td>16.30m</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>16.25</td></tr></table> Page 31/385 BH-15/Sheet-1											Field Test	Nos	Samples	Nos	Commencement Date : 10/12/2014							Penetrometer (SPT)	5	Undisturbed (UDS)	1	Completion Date : 13/12/2014							Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.							Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.141 m.									Water Sample (WS)	0	Water Struck At : Standing Water Level : 3.10 m.							DESCRIPTION	SYMBOL	N-VALUE					SAMPLES		EACH DIVN. = 15cm					Ref. No	Depth (m)	0.00m Stiff, yellowish brown to brownish grey, silty clay / clayey silt with mica & decomposed rock.							DS-1	0.50		2	5	6	11		SPT-1	1.00-1.45									2.09m Hard, brownish grey, silty clay / clayey silt with mica & decomposed rock.		13	22	31	53		*UDS-1	2.00-2.09		34	66	>100			SPT-2	2.09-2.54									3.50m		100	9.0 cm	Pentn.			SPT-3	2.90-3.14		100	4.0 cm	Pentn.			SPT-4	3.30-3.34		100	3.0 cm	Pentn.			SPT-5	3.50-3.53			NX rotary drilling from 3.50m to 30.00m					R1	3.50									CR=26% RQD=Nil								R2	4.25									CR=29% RQD=13%								R3	5.00									CR=28% RQD=15%								R4	5.75									CR=36% RQD=Nil								R5	6.50									CR=35% RQD=Nil								R6	7.25									CR=47% RQD=17%								R7	8.00									CR=37% RQD=Nil								R8	8.75									CR=41% RQD=13%								R9	9.50									CR=45% RQD=35%	10.25m							R10	10.25									CR=41% RQD=Nil	11.00m							R11	11.00									CR=52% RQD=Nil								R12	11.75									CR=52% RQD=47%								R13	12.50									CR=65% RQD=42%								R14	13.25									CR=52% RQD=47%	14.00m							R15	14.00									CR=56% RQD=32%								R16	14.75									CR=57% RQD=Nil								R17	15.50									CR=60% RQD=Nil	16.30m								16.25
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NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-4410-109-2			SUB-SECTION-IV-D CIVIL WORKS			PAGE 95 OF 114																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.15

Co-ordinates E=7925
N=11914

Field Test	Nos	Samples	Nos	Commencement Date : 10/12/2014
Penetrometer (SPT)	5	Undisturbed (UDS)	1	Completion Date : 13/12/2014
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.141 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.10 m.

DESCRIPTION	SYMBOL	N-VALUE							SAMPLES				
		EACH	DIVN.	= 15cm					Ref. No	Depth (m)			
Moderately to slightly weathered / fresh, brownish grey to light blackish grey, fine grained, moderately fractured, alternation of sandstone & shale.	16.30m									R18	CR=61% RQD=35%	17.00	
											R19	CR=64% RQD=44%	17.75
											R20	CR=63% RQD=Nil	18.50
											R21	CR=60% RQD=33%	19.25
											R22	CR=67% RQD=40%	20.00
											R23	CR=64% RQD=24%	20.75
											R24	CR=68% RQD=56%	21.50
											R25	CR=73% RQD=65%	22.25
											R26	CR=70% RQD=32%	23.00
											R27	CR=80% RQD=24%	23.75
											R28	CR=83% RQD=Nil	24.50
											R29	CR=85% RQD=36%	26.00
											R30	CR=82% RQD=15%	27.50
											R31	CR=84% RQD=13%	28.50
											R32	CR=87% RQD=56%	30.00
	30.00m												
N.B. — '*' means sample could not be recovered.													

N.B. - '*' means sample could not be recovered.

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.18

Co-ordinates E=7939
N=11853

Field Test	Nos	Samples	Nos	Commencement Date : 14/12/2014
Penetrometer (SPT)	6	Undisturbed (UDS)	1	Completion Date : 15/12/2014
Cone (Pc)		Penetrometer (SPT)	6	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 458.447 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.40 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
0.00m							DS-1	0.50
Stiff, yellowish brown, silty clay / clayey silt. Observed kankar.		4	6	8	14		SPT-1	1.00-1.45
					14		UDS-1	2.00-2.45
		4	5	9			SPT-2	2.45-2.90
2.90m					43		SPT-3	3.30-3.75
Hard, brownish grey, silty clay / clayey silt with decomposed rock & mica.		7	15	28	>100		SPT-4	4.00-4.20
		31	69		5.0 cm Pentn.		*SPT-5	4.30-4.35
		100			Refusal		*SPT-6	4.45-4.48
4.45m					5.0 cm Pentn.		R1	CR=23% RQD=Nil
Highly weathered, brownish grey, medium grained, highly fractured, alternation of sandstone & shale.		100			Refusal		R2	CR=28% RQD=Nil
5.00m					3.0 cm Pentn.		R3	CR=29% RQD=16%
					NX rotary drilling from 4.45m to 25.00m		R4	CR=24% RQD=Nil
							R5	CR=30% RQD=16%
							R6	CR=34% RQD=22%
							R7	CR=38% RQD=16%
							R8	CR=40% RQD=Nil
							R9	CR=45% RQD=Nil
							R10	CR=48% RQD=20%
							R11	CR=44% RQD=32%
							R12	CR=52% RQD=16%
							R13	CR=48% RQD=Nil
							R14	CR=58% RQD=49%
							R15	CR=52% RQD=32%
							R16	CR=50% RQD=45%
14.00m								14.00
Moderately weathered, brownish grey to light blackish grey, medium to fine grained, highly to moderately fractured, alternation of sandstone & shale.								14.75
15.50m								15.50
								16.25
16.30m								

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.18

Co-ordinates E=7939
N=11853

Field Test	Nos	Samples	Nos	Commencement Date : 14/12/2014
Penetrometer (SPT)	6	Undisturbed (UDS)	1	Completion Date : 15/12/2014
Cone (Pc)		Penetrometer (SPT)	6	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 458.447 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.40 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
Moderately weathered, brownish grey to light blackish grey, medium to fine grained, highly to moderately fractured, alternation of sandstone & shale.	16.30m						R17	CR=52% RQD=NII 17.00
							R18	CR=50% RQD=NII 17.75
							R19	CR=52% RQD=17% 18.50
							R20	CR=50% RQD=32% 19.25
							R21	CR=52% RQD=13% 20.00
							R22	CR=57% RQD=NII 20.75
Moderately to slightly weathered, light blackish grey, fine grained, moderately fractured, alternation of sandstone & shale.	17.75m						R23	CR=56% RQD=13% 21.50
							R24	CR=62% RQD=25% 22.25
							R25	CR=65% RQD=25% 23.00
							R26	CR=67% RQD=21% 23.75
							R27	CR=66% RQD=24% 24.50
							R28	CR=68% RQD=29% 25.00
	25.00m							

N.B. - '*' means sample could not be recovered.

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand. **CETEST**

Job No : 3401

Created by : SKD

Created on : 17/12/2014

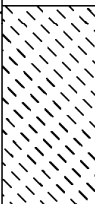
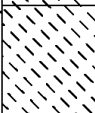
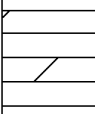
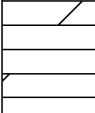
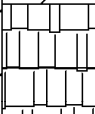
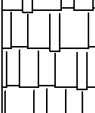
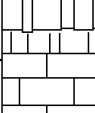
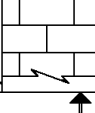
Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.22

Co-ordinates E=79.37
N=117.98

Field Test	Nos	Samples	Nos	Commencement Date : 01/12/2014
Penetrometer (SPT)	5	Undisturbed (UDS)	2	Completion Date : 05/12/2014
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 457.457 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.3 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
0.00m							DS-1	0.50
Stiff, yellowish brown, silty clay / clayey silt. Observed kankar & sand mixture.		3	4	5	9		SPT-1	1.00-1.45
							UDS-1	2.00-2.45
		3	5	6	11		SPT-2	2.45-2.90
3.70m		24	76		>100		*UDS-2	3.60-3.70
Hard, brownish grey, silty clay / clayey silt with decomposed rock.		11.0	cm	Pentn.	Refusa.		SPT-3	3.70-3.96
		5.0	cm	Pentn.	Refusa.		*SPT-4	4.60-4.65
		3.0	cm	Pentn.	Refusa.		*SPT-5	5.00-5.03
5.00m							R1	5.00
Highly weathered, brownish grey, fine grained, highly fractured sand stone.		NX rotary drilling from 5.00m to 29.50m						
							R2	5.75
							R3	6.50
							R4	7.25
							R5	8.00
							R6	8.75
							R7	9.50
							R8	10.25
							R9	11.00
							R10	11.75
							R11	12.50
							R12	13.25
							R13	14.00
7.25m								14.75
Completely to highly weathered, brownish grey, fine grained sand stone.								
9.50m								
Highly weathered, brownish grey, fine grained sand stone.								
10.25m								
Highly weathered, light grey, fine grained, highly fractured sand stone.								
12.50m								
Moderately weathered, light blackish grey, fine grained, moderately fractured alternation of sandstone & shale.								
13.25m								
Moderately to slightly weathered to fresh, light blackish grey, fine grained, medium to slightly fractured alternation of sandstone & shale.								
15.10m								

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 23/12/2014

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.24

Co-ordinates E=7925
N=11783

Field Test	Nos	Samples	Nos	Commencement Date : 06/12/2014
Penetrometer (SPT)	7	Undisturbed (UDS)	3	Completion Date : 10/12/2014
Cone (Pc)		Penetrometer (SPT)	7	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 457.219 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.40 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 15cm				Ref. No	Depth (m)
0.00m						DS-1	0.50
Stiff, brownish grey, silty clay / clayey silt. Observed kankar & sand mixture.		2	3	5	8	SPT-1	1.00-1.45
						UDS-1	2.00-2.45
		3	5	5	10	SPT-2	2.45-2.90
		3	5	6	11	UDS-2	3.50-3.95
5.10m						SPT-3	3.95-4.40
→ Hard, brownish grey, silty clay / clayey silt with mica & decomposed rock.		11	19	22	41	*UDS-3	5.20-5.32
		17	36	47	>100	SPT-4	5.32-5.77
7.00m		100			10.0 cm Pentn.	SPT-5	6.20-6.60
Highly weathered, brownish grey, fine grained, highly fractured sandstone.					Refusal	*SPT-6	6.80-6.85
					5.0 cm Pentn.	*SPT-7	7.00-7.03
7.75m		100			Refusal	R1	CR=23% ROD=Nil
Highly to moderately weathered, brownish grey, fine grained, highly fractured sandstone.					3.0 cm Pentn.	R2	CR=27% ROD=13%
					NX rotary drilling from 7.00m to 30.00m	R3	CR=28% ROD=Nil
						R4	CR=29% ROD=Nil
						R5	CR=25% ROD=Nil
						R6	CR=32% ROD=Nil
						R7	CR=35% ROD=Nil
						R8	CR=36% ROD=13%
						R9	CR=49% ROD=Nil
						R10	CR=40% ROD=Nil
						R11	CR=49% ROD=Nil
						R12	CR=56% ROD=29%
							16.00

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand. **CETEST**

Job No : 3401

Created by : SKD

Created on : 23/12/2014

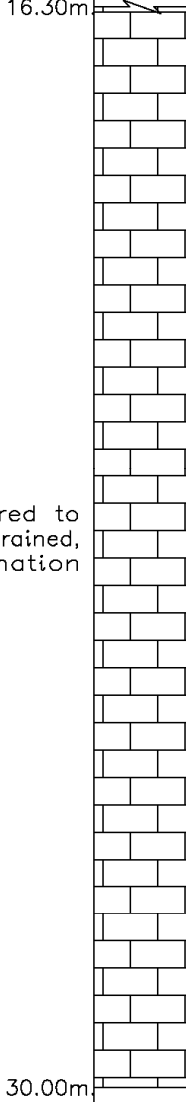
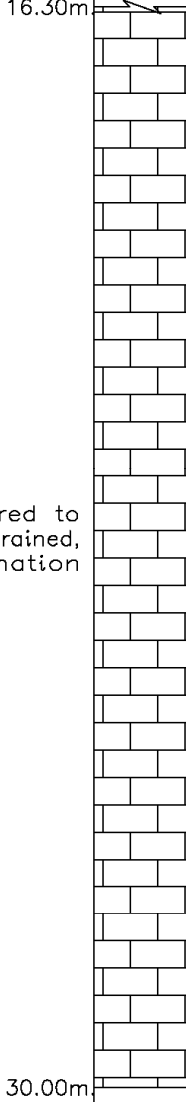
Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.24

Co-ordinates E=7925
N=11783

Field Test	Nos	Samples	Nos	Commencement Date : 06/12/2014
Penetrometer (SPT)	7	Undisturbed (UDS)	3	Completion Date : 10/12/2014
Cone (Pc)		Penetrometer (SPT)	7	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 457.219 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.40 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 15cm					Ref. No	Depth (m)
16.30m  Moderately to slightly weathered to fresh, light blackish grey, fine grained, moderately fractured, alternation of sandstone & shale.	 30.00m						R13	CR=63% RQD=43% 16.75
							R14	CR=67% RQD=51% 17.50
							R15	CR=69% RQD=65% 18.25
							R16	CR=65% RQD=16% 19.00
							R17	CR=71% RQD=48% 19.75
							R18	CR=65% RQD=16% 20.50
							R19	CR=69% RQD=Nil 21.25
							R20	CR=72% RQD=Nil 22.00
							R21	CR=76% RQD=Nil 22.75
							R22	CR=80% RQD=45% 23.50
							R23	CR=76% RQD=50% 24.25
							R24	CR=78% RQD=46% 25.00
							R25	CR=77% RQD=29% 25.75
							R26	CR=80% RQD=37% 26.50
							R27	CR=81% RQD=20% 27.25
							R28	CR=79% RQD=22% 28.00
							R29	CR=82% RQD=34% 28.75
							R30	CR=81% RQD=40% 30.00

N.B. — '*' means sample could not be recovered.

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 31/01/2015

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.105

Co-ordinates E=7774
N=11928

Field Test	Nos	Samples	Nos	Commencement Date :	10/01/2015
Penetrometer (SPT)	5	Undisturbed (UDS)	2	Completion Date :	11/01/2015
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter :	150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground :	461.519 m.
		Water Sample (WS)	0	Water Struck At :	
				Standing Water Level :	3.0 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 15cm				Ref. No	Depth (m)
0.00m						DS-1	0.50
Very stiff, yellowish brown, silty clay. Observed kankar & sand mixture.		4	6	11	17	SPT-1	1.00-1.45
		5	8	13	21	UDS-1	2.00-2.45
						SPT-2	2.45-2.90
		25	52	23	>100	*UDS-2	3.50-3.60
3.20m						SPT-3	3.60-3.94
Hard, brownish grey, silty clay / clayey silt. Obs. decomposed rock.		100	4.0	cm	Pentn.	*SPT-4	4.20-4.25
4.50m		5.0	cm	Pentn.		*SPT-5	4.50-4.53
Highly weathered, greyish brown, fine grained, highly fractured alternation of sandstone & shale.		100	3.0	cm	Pentn.	R1	4.50-4.53
Highly to moderately weathered, greyish brown, fine grained, highly fractured alternation of sandstone & shale.		NX rotary drilling from 4.50m to 20.00m				R2	5.25
						R3	6.00
						R4	6.75
						R5	7.50
						R6	8.25
						R7	9.00
						R8	9.75
						R9	10.50
						R10	11.25
						R11	12.00
						R12	12.75
						R13	13.50
						R14	14.25
						R15	15.00
						R16	15.75
						R17	16.50
Moderately weathered, brownish grey, fine grained, highly fractured alternation of sandstone & shale.						R18	17.25
						R19	18.00
						R20	18.75
						R21	19.50
N.B. - '*' means sample could not be recovered.							20.00

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project : G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No : 3401

Created by : SKD

Created on : 31/01/2015

Sheet No:

BORE LOG DATA SHEET

BORE HOLE NO.109

Co-ordinates E=7763
N=12110

Field Test	Nos	Samples	Nos	Commencement Date : 08/01/2015
Penetrometer (SPT)	5	Undisturbed (UDS)	1	Completion Date : 09/01/2015
Cone (Pc)		Penetrometer (SPT)	5	Bore Hole Diameter : 150mm / NX.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 460.577 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.0 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 15cm				Ref. No	Depth (m)
0.00m							
Stiff, yellowish brown, silty clay. Observed kankar.				11		DS-1	0.50
		3	4	7		SPT-1	1.00-1.45
1.90m				14		UDS-1	2.00-2.45
Stiff, yellowish brown, silty clay / clayey silt with sand mixture & mica. Obs. decomposed rock.		3	6	8		SPT-2	2.45-2.90
		31	67	>100		SPT-3	3.20-3.48
		100	13.0 cm	Refusal		*SPT-4	3.60-3.65
3.75m		100	5.0 cm	Refusal		*SPT-5	3.75-3.78
Highly weathered, brownish grey, fine grained, highly fractured sandstone.		100	3.0 cm	Refusal		R1	CR=25% RQD=NII
		100	3.0 cm	Refusal		R2	CR=28% RQD=NII
				NX rotary drilling from 3.75m to 15.00m		R3	CR=31% RQD=NII
						R4	CR=27% RQD=NII
						R5	CR=28% RQD=NII
						R6	CR=27% RQD=NII
Highly weathered, brownish grey to light blackish grey, fine grained, highly fractured alternation of sandstone & shale.						R7	CR=30% RQD=NII
						R8	CR=33% RQD=NII
						R9	CR=35% RQD=NII
						R10	CR=36% RQD=NII
Highly weathered, brownish grey to light blackish grey, fine grained, highly fractured sandstone.						R11	CR=38% RQD=NII
						R12	CR=41% RQD=NII
						R13	CR=45% RQD=NII
Moderately weathered, greyish brown, fine grained, highly fractured sandstone.						R14	CR=47% RQD=18%
						R15	CR=48% RQD=14%
15.00m							

N.B. - '*' means sample could not be recovered.

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/T for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No.: 3401

Sheet No.

Res-340101 / Page 1

Bore Hole Number	Sample Depth M	Sample Description	Bulk		Dry Dens. gms/cc	Spec. Grav.	Nat. Mois. %	Void Ratio	Strength Test Results					After Limits			IS			Grain Size			Test Method
			Dens. gms/cc	Dens. gms/cc					Pc/Pa kg/sqcm	Shear kg/sqcm	Cohesion kg/sqcm	Frictn Deg	LL %	PL %	SL %	Clasifi %	Fractio %	Gravel %	Sand %	Silt %	Clay %		
BH01 UD-S01	2.00	Brownish grey, silty clay with traces of kankars.	2.00	1.63	1.63	2.67	23 T	0.630	TS&SH-UT	0.57	0	0	42	20	12	CI*	3	88	9	See the Note			
							24 C		3.0	0.669													
									2.0	0.537													
									1.0	0.514													
BH01 UD-S02	3.50	Brownish grey, silty clay with traces of sand mixture & kankars	2.16	1.87	1.87	2.69	16 S		UNCONFD	1.30	0	0	42	20	12	CI	20	76	4	Do			
							16 T		0.0	1.024													
									0.0	1.395													
									0.0	1.465	0												
									REMOULD	0.95	0												
									0.0	0.966													
									0.0	0.902													
									0.0	0.978													
BH01 SF-T04	5.00	Yellowish grey, silty clay with traces of fine sand mixture.														CI*	6	94	(Silt+Clay)	Do			
BH02 SF-T01	1.00	Yellowish grey, silty clay.										42	22			CI				Do			
BH02 SF-T02	2.10	Brownish grey, silty clay / clayey silt with sand mixture.														CI*	35	65	(Silt+Clay)	Do			
BH03 UD-S01	1.90	Brownish grey, silty clay / clayey silt with traces of rusty spots.	1.94	1.62	1.62	2.73	19 S	0.650	TS&SH-UT	1.16	8	8	40	25	25	CI	23	75	2	Do			
							20 T		3.0	1.840													
							20 C		2.0	1.725													
									1.0	1.508													
BH04 SF-T04	5.22	Brownish grey, silty clay / clayey silt with sand mixture.														CI*	28	72	(Silt+Clay)	Do			
BH05 SF-T02	2.13	Brownish grey, silty clay with de composed rock.														CI*	26	74	(Silt+Clay)	Do			
BH06 SF-T02	2.12	Brownish grey, silty clay / clayey silt with de composed rock.														CI*	29	71	(Silt+Clay)	Do			
BH07 SF-T02	2.13	Brownish grey, silty clay with de composed rock.										38	15			CI				Do			

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No. : 3401

Sheet No.

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Bore Hole Number	Sample Depth M	Sample Description	Bulk Dens.		Spec. Grav.	Nat. Mois. %	Void Ratio	Strength Test Results				Atter Limits				IS Classification				Test Method
			Dens. gms/cc	Dry Dens. gms/cc				Pc/Pn kg/sqcm	Shear kg/sqcm	Cohesion kg/sqcm	Frictn Deg.	LL %	PL %	SL %	% fctatio	Gravel %	Sand %	Silt %	Clay %	
BH12 UD S01	2.00	Brownish grey, silty clay / clayey silt with traces of kaolins.	1.94	1.55	2.63	26 S 26 T		UNCONFD	0.17	0	0	39	20	19	CI	22	73	5	Do	
								0.0 0.179												
								0.0 0.155												
								0.0 0.163												
								REMOULD		0.11	0									
								0.0 0.112												
								0.0 0.101												
								0.0 0.104												
BH14 SP T02	2.10	Brownish grey, silty clay with sandstones.													CI*	35	65	(Silt+Clay)	Do	
BH15 SP T02	2.00	Brownish grey, silty clay with sandstone & mica.													CI*	21	79	(Silt+Clay)	Do	
BH16 UD S01	2.00	Brownish grey, silty clay / clayey silt with traces of sandstone.	1.96	1.68	2.70	16 S 16 T 17 C	0.495	TS:SH:UU	0.44	0	0	30	17	17	CL	37	62	1	Do	
								3.0 0.498												
								2.0 0.428												
								1.0 0.380												
BH17 UD S01	2.00	Yellowish brown, silty clay / clayey silt with traces of kaolins.	1.97	1.58	2.64	26 S 25 T		TS:SH:UU	1.52	0	0				CI*	33	64	3	Do	
								3.0 1.694												
								2.0 1.528												
								1.0 1.346												
BH18 UD S01	2.00	Yellowish brown, silty clay / clayey silt with traces of kaolins.	1.68	1.41	2.69	19 S 19 T		UNCONFD	0.41	0	0	43	19	14	CI	21	77	2	Do	
								0.0 0.342												
								0.0 0.433												
								0.0 0.440												
								REMOULD		0.29	0									
								0.0 0.244												
								0.0 0.313												
								0.0 0.301												
BH19 UD S01	2.00	Brownish grey, silty clay with traces of kaolins.	2.12	1.85	2.65	13 S 15 T		UNCONFD	1.72	0	0	38	18	CI	8	81	11	Do		
								0.0 1.416												
								0.0 2.100												
								0.0 1.653												
								REMOULD		1.30	0									
								0.0 1.406												
								0.0 1.302												
								0.0 1.186												

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No. : 3401

Sheet No.

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Bore Hole Number	Sample Depth M	Sample Description	Bulk Dens. gms/cc	Dry Dens. gms/cc	Spec. Grav.	Nat. Mois. %	Void Ratio	Strength Test Results				After Limits				IS Class	Grain Size				Test Method
								Po/Pn kg/sqcm	Shear kg/sqcm	Cohesion kg/sqcm	Frictn Deg.	LL %	PL %	SL %	FI ratio %		Crswl %	Sand %	Silt %	Clay %	
CI*																			Do		
BBH19	SP T06	6.00 Brownish grey, silty clay / clayey silt with sand mixtures.																			
BBH20	UD S01	2.00 Yellowish grey, silty clay / clayey silt with traces of sand mixtures.	2.01	1.71	2.70	18 S 18 T		UNCONFED	0.99	0	0	35	19	18	CI		23	71	6	Do	
								0.0 1.217													
								0.0 0.838													
								0.0 0.884													
								REMOULD	0.64	0											
								0.0 0.649													
								0.0 0.646													
								0.0 0.641													
BBH21	UD S01	2.00 Yellowish grey, silty clay / clayey silt with traces of sand mixtures.	2.11	1.75	2.50	21 S 21 T		UNCONFED	0.51	0	0	38	17	12	CI		30	66	4	Do	
								0.0 0.527													
								0.0 0.531													
								0.0 0.475													
								REMOULD	0.35	0											
								0.0 0.362													
								0.0 0.357													
								0.0 0.328													
BBH22	UD S01	2.00 Brownish grey, silty clay with traces of sand mixture.	2.06	1.78	2.64	16 S 16 T 17 C	0.534	TRSH-UU	0.71	12	0	30	16	17	CL		37	60	3	Do	
								3.0 1.617													
								2.0 1.594													
								1.0 1.104													
								UNCONFED	0.99	0											
								0.0 1.013													
								0.0 1.038													
								0.0 0.905													
								REMOULD	0.66	0											
								0.0 0.694													
								0.0 0.674													
								0.0 0.612													
BBH22	SP T03	3.70 Brownish grey, clayey silt with sand mixture & mica.													CI*		36	64 (Silt+Clay)		Do	
BBH23	UD S01	2.00 Brownish grey clayey silt / silty clay with traces of lankars.	2.11	1.84	2.72	14 S 15 T 18 C	0.542	TRSH-UU	1.84	0	0	40	16	14	CI		15	80	5	Do	
								3.0 1.911													
								2.0 1.831													
								1.0 1.774													

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No.: 3401

Sheet No.

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Bore Hole Number	Sample Depth M	Sample Description	Bulk Dens. gms/cc	Dry Dens. gms/cc	Spec. Grav. %	Nat. Mois. %	Void Ratio	Strength Test Results				After Limits			IS Class	Grain Size				Test Method
								Pcfm kg/cm	Shear kg/cm	Cohesion kg/cm	Frictn Deg.	LL %	PL %	SH %		Coar. %	Sand %	Silt %	Clay %	
BH23	UD802	3.50 Brownish grey clayey silt / silty clay with traces of kaolins.	2.16	1.89	2.70	15 S		UNCONF	1.55	0		50	20	18	CH		12	86	2	Do
								0.0	1.767											
								0.0	1.306											
								0.0	1.577											
								REMOULD	1.09	0										
								0.0	1.207											
								0.0	1.075											
								0.0	0.998											
BH23	SP705	5.60 Brownish grey, clayey silt with sand mixtures & traces of mica.													CI*		42	58 (Silt-Clay)		Do
BH24	UD801	2.00 Yellowish grey, silty clay / clayey silt with traces of sand mixtures.	2.15	1.85	2.66	16 S 16 T 15 C	0.384	TRSH-UTU 3.0 3.126 2.0 2.913 1.0 2.833	2.35	7		38	17	13	CI		20	70	10	Do
BH24	UD802	3.50 Brownish grey, silty clay / clayey silt.				19 S		UNCONF	0.52	0		38	16	12	CI					Do
								0.0	0.499											
								0.0	0.555											
								0.0	0.498											
								REMOULD	0.35	0										
								0.0	0.337											
								0.0	0.385											
								0.0	0.317								34	66 (Silt-Clay)		Do
BH24	SP704	5.32 Brownish grey, silty clay / clayey silt with sand mixtures.													CI*					
BH25	UD801	2.00 Brownish grey, silty clay with traces of kaolins.	2.01	1.67	2.67	20 S 20 T 22 C	0.550	TRSH-UTU 3.0 1.345 2.0 1.054 1.0 0.988	0.62	9		47	21	11	CI		6	80	14	Do
BH25	SP703	3.62 Brownish grey, silty clay / clayey silt with sand mixtures and mica.			2.69										CI*		32	62	6	Do
BH26	UD801	2.00 Brownish grey, silty clay with traces of rusty spots & kaolins.	2.06	1.66	2.66	23 S 24 T		UNCONF	0.65	0		48	21	16	CI		17	70	13	Do
								0.0	0.626											
								0.0	0.693											
								0.0	0.633											
								REMOULD	0.48	0										
								0.0	0.451											
								0.0	0.510											
								0.0	0.471											

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.

CETEST

Job No. : 3401

Sheet No.

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Bore Hole Number	Sample Depth M	Sample Description	Bulk Dens. gms/cc	Dry Dens. gms/cc	Spec. Grav.	Nat. Mois. %	Void Ratio	Strength Test Results				Atter. Limits			IS Class	Grain Size			Test Method
								Po/Fn kg/sqcm	Shear kg/sqcm	Cohesion kg/sqcm	Frictn Deg.	LL %	PL %	Sh ratio %		Gravel %	Sand %	Silt %	
BH103 UD S01	2.00	Yellowish brown, silty clay with decompacted rock and mica.	2.03	1.74	2.68	17 S		UNCONFED	0.86	0					CI*	37	57	6	Do
						17 T		0.0	0.883										
								0.0	0.874										
								0.0	0.853										
								REMOULD	0.58	0									
								0.0	0.603										
								0.0	0.566										
								0.0	0.557										
BH105 SP T03	3.60	Light grey, silty clay with fine sand mixture & mica.										37	24		CI				Do
BH106 SP T01	1.00	Yellowish grey, silty clay.										44	23		CI				Do
BH106 SP T02	2.30	Light grey, silty clay / clayey silt with fine sand mixture & mica.													CI*	21	79	(Silt+Clay)	Do
BH107 UD S01	2.00	Yellowish brown, silty clay / clayey silt with traces of kaolins.	2.04	1.64	2.67	24 S						43	19		13 CI	13	80	7	Do
						24 T													
BH107 SP T03	3.62	Brownish grey, silty clay / clayey silt with sand mixture & mica.													CI*	39	61	(Silt+Clay)	Do
BH108 UD S01	2.00	Brownish grey, silty clay / clayey silt with traces of kaolins.	2.02	1.73		17 T		UNCONFED	1.84	0					CI*				Do
								0.0	1.817										
								0.0	1.849										
								0.0	1.859										
								REMOULD	1.26	0									
								0.0	1.242										
								0.0	1.286										
								0.0	1.268										
BH109 SP T02	2.45	Greyish brown, silty clay.										43	21		CI				Do
BH110 SP T03	3.40	Greyish brown, silty clay / clayey silt with mica.													SM	64	36	(Silt+Clay)	Do

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.



Job No. : 3401

Sheet No.

LABORATORY ROCK TEST RESULTS

BH No.	Run No.	Depth (M)	Density (gm/cc)		Water Content (%)	Porosity %	Specific Gravity	Unconfined Compressive strength (kg/sqcm)		Coefficient of softening	Point Load Strength Index (kg/sqcm)	Slake Durability Index (%)	Hardness (based on Mohr Scale)	Soundness (%) Loss	Deformability (kg/sqcm)	Test Method
			Bulk	Dry				In-situ	Saturated							
1	1	5.75-6.00	1.983	1.911	3.743	7.155	2.748	102	20	0.196	0.83	24.72	2.50-3.00	8.25	5883	as per the Notes
1	10	12.50-13.25	2.001	1.930	2.630	5.129	2.713				0.90	45.48	3.00-3.50			Do
2	3	4.25-5.00	2.117	2.045	3.560	7.278	2.605	27			0.88		3.00-3.50	2.48		Do
3	5	6.00-6.75	2.187	1.804	0.724	1.307					0.90	29.43			1995	Do
4	2	6.75-7.50	2.285	2.239	2.053	4.598	2.347	186	50	0.269	0.94	63.28	3.50-4.00	4.90		Do
4	12	14.25-15.00									1.21			1.25	5778	Do
5	8	9.00-9.75										11.11		10.00		
6	2	4.50-5.25									0.84		3.00-3.50	4.75		
6	8	9.00-9.75										0.00		17.29		
7	15	14.25-15.00	2.222	2.185	1.693	4.021	2.619	100	17	0.170	1.00	2.25	3.00-3.50			
8	22	19.00-19.75	2.259	2.223	1.596	3.548	2.673	122	87	0.714	3.25	61.48	3.50-4.00	8.29	4752	Do
9	19	16.75-17.50	2.252	2.171	3.748	8.136	2.363	176	24	0.136		63.96	3.00-3.50		6020	Do
10	1	3.00-3.75	2.013	1.972	2.081	4.105	2.037				1.25			11.25		Do
11	3	5.50-6.25										0.00		13.49		
12	11	11.50-12.25	2.167	2.092	3.611	7.553	2.563	75	40	0.533	1.75	44.47	2.50-3.00	9.96	2726	Do
13	7	8.50-9.25	2.242	2.193	2.228	4.885	2.305				0.97		3.00-3.50			Do
14	30	25.00-25.75	2.196	2.147	2.303	4.944	2.480	120	102	0.846	4.33	92.48	3.50-4.00	5.75	5183	Do
15	16	14.75-15.50	2.225	2.156	3.179	6.855	2.610				2.15			4.29		Do
16	14	14.50-15.25	2.254	2.183	3.248	7.092	2.330	38			1.00	70.00	3.00-3.50		4433	Do
17	15	14.00-14.75	2.257	2.215	1.905	4.221	2.499				9.57	66.67		10.00		Do
18	4	6.50-7.25	2.398	2.383	0.627	1.495	2.420				0.94		3.00-3.50			Do

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.



Job No. : 3401

Sheet No. .

BH No.	Bm No.	Depth (M)	Density (gm/cc)		Water Content (%)	Porosity %	Specific Gravity	Unconfined Compressive strength (kg/cm ²)		Coefficient of softening	Point Load Strength Index (kg/cm ²)	Slake Durability Index (%)	Hardness (based on Mohr Scale)	Soundness (%) Loss	Deformability (kg/cm ²)	Test Method
			Bulk	Dry				In-situ	Saturated							
18	20	18.25-19.25	2.250	2.214	1.627	3.601	2.498	147	39		4.65	72.48	3.00-3.30	11.21	4705	Do
19	19	20.50-21.25	2.165	2.094	3.367	7.052	2.675	106	41	0.386				10.63	4290	Do
20	2	5.75-6.50									0.81	11.92	2.00-2.30			Do
21	15	15.00-15.75	2.343	2.283	2.627	5.998	2.428	335			5.46	86.48	3.00-3.30	4.29	12325	Do
22	2	5.75-6.50	2.165	2.123	1.996	4.238	2.630				0.95	3.69		11.92		Do
23	15	16.50-17.25	2.449	2.409	1.660	3.259	2.692	254	142		4.42	82.36	3.50-4.00		11543	
24	8	12.25-13.00	1.949	1.882	3.561	6.701	2.017	52				39.63			1344	Do
25	8	11.25-12.00	2.159	2.114	2.143	4.531	2.650	59	25		1.00	64.44	3.00-3.30	11.25	3353	Do
26	15	16.25-17.00	2.225	2.163	2.853	6.172	2.306		47		3.21			4.82	3149	Do
27	17	15.25-16.00	2.150	2.091	2.797	5.850	2.221	86	42	0.488		31.92	3.00-3.30		2895	Do
28	3	5.50-6.50	2.068	2.041	1.346	2.747	2.098				0.84			3.36		Do
29	26	28.75-29.25	2.334	2.298	1.591	3.656	2.385	243	196	0.810	10.49	91.11	3.00-3.30	4.83	13423	Do
30	1	7.25-8.00	1.885	1.847	2.048	3.783	2.649				0.82		3.00-3.30			Do
30	8	12.50-13.25	2.169	2.132	1.713	3.652	2.213	151	27	0.179		41.48			5078	Do
31	4	6.25-7.00	1.985	1.944	2.090	4.063	2.027				0.94	49.73		3.63		Do
32	20	25.75-27.25	2.333	2.304	1.241	2.859	2.372	335	100	0.298		58.99	3.00-3.30		11441	Do
33	11	11.50-12.25	2.143	2.087	2.715	5.665	2.482				1.25	44.47	3.00-3.30	4.92		Do
34	13	12.75-13.50	2.112	2.045	3.247	6.641	2.191	102	25	0.245	1.00		3.50-4.00		3001	Do
35	3	4.75-5.50	2.110	2.078	1.565	3.252	2.419				0.94	11.43	2.50-3.0	12.00		Do
36	30	24.75-25.50	2.290	2.260	1.343	3.035	2.330	264	138	0.523		72.49	3.00-3.30		15501	Do
37	28	25.25-26.00	2.351	2.314	1.988	3.674	2.402	242	140	0.579	4.82	63.48	3.00-3.30	7.63	7559	Do
38	17	14.75-15.50	2.324	2.277	2.046	4.658	2.388	172	48	0.279					7815	Do

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand.



Job No. : 3401

Sheet No. .

BH No.	Run No.	Depth (M)	Density (gm/cc)		Water Content (%)	Porosity %	Specific Gravity	Unconfined Compressive strength (kg/cm ²)		Coefficient of softening	Point Load Strength Index (kg/cm ²)	Shale Durability Index (%)	Hardness (based on Mohr Scale)	Soundness (%) Loss	Deformability (kg/cm ²)	Test Method
			Bulk	Dry				In-situ	Saturated							
89	21	19.00-20.00	2.390	2.337	2.241	5.237	2.751		31		0.93	74.85	3.00-3.30		5757	Do
90	22	18.25-19.00	2.163	2.146	0.762	1.637	2.336	183	75	0.410	0.90	0.00	2.50-3.00	15.29	2597	Do
91	3	5.50-6.25									0.92	5.00	2.50-3.00	8.29		Do
96	6	9.25-10.00										0.00		13.00		Do
98	2	4.25-5.00									0.82	7.25	3.00-3.30	7.76		Do
99	2	5.25-6.00	2.144	2.087	2.731	6.444	2.444					0.00	3.00-3.30	14.50		Do
100	2	4.00-4.75									0.82	44.48		7.72		Do
109	1	3.75-4.50									0.82		2.00-2.30			Do
109	6	7.50-8.25										0.00	3.00-3.30	12.25		Do
111	9	10.00-10.75	2.171	2.133	1.818	3.877	2.600	184			0.82	63.56	3.00-3.30		6593	Do
112	26	27.50-28.50	2.280	2.261	1.304	2.947	2.630	349	87	0.248			3.50-4.00		7346	Do
113	22	18.75-19.50	2.103	1.922	9.382	18.036	2.345				0.92	63.91		4.30		Do
114	23	19.50-20.25	2.274	2.220	2.463	5.466	2.348	166	49	0.295	1.33		3.50-4.00		6902	Do
115	16	14.25-15.00	1.693	1.639	3.290	5.391					1.04	42.36		5.33		Do
116	20	17.00-17.75	2.241	2.166	3.445	7.462	2.341	144	9	0.063	1.25		3.00-3.30		407	Do
117	18	17.50-18.25	2.278	2.233	1.988	4.439	2.543	120	38	0.317			3.00-3.30	2.36	5633	Do
119	10	9.75-10.50	2.126	2.064	3.024	6.341	2.201				1.04	42.57		1.00		Do

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CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand

CETEST

Job No. : 3401

Sheet No.

APPARENT RESISTIVITY VALUESERT No. 01

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	32.14	33.53	31.76	32.08	32.38
2	2.0	25.89	30.67	28.79	26.52	27.97
3	3.0	22.63	31.87	29.43	23.20	26.78
4	4.0	25.64	33.94	27.91	28.16	28.91
5	5.0	22.63	34.89	31.74	28.29	29.39
6	7.0	23.76	36.08	32.56	19.80	28.05
7	10.0	27.03	39.60	37.09	20.12	30.96

Mean Resistivity at ERT-01 is 29.21 m.

ERT No. 02

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	47.18	49.82	43.72	45.29	46.50
2	2.0	42.86	36.70	21.62	26.40	31.90
3	3.0	28.67	20.76	36.40	19.43	26.32
4	4.0	30.67	31.93	26.40	24.64	28.41
5	5.0	30.80	28.29	30.49	28.29	29.47
6	7.0	35.64	29.48	30.36	30.80	31.57
7	10.0	37.72	32.06	28.82	33.32	32.98

Mean Resistivity at ERT-02 is 32.45 m.

ERT No. 03

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	35.16	16.10	33.34	32.70	29.33
2	2.0	30.42	27.65	35.20	27.65	30.23
3	3.0	35.46	26.03	47.15	26.40	33.76
4	4.0	32.43	27.65	41.73	41.48	35.82
5	5.0	37.72	19.17	40.23	40.86	34.50
6	7.0	29.92	24.64	61.16	42.68	39.60
7	10.0	32.69	19.49	62.23	21.37	33.95

Mean Resistivity at ERT-03 is 33.88 m.

ERT No. 04

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	23.96	26.17	21.07	21.70	23.23
2	2.0	24.51	24.51	23.00	23.88	23.98
3	3.0	26.40	26.78	26.97	27.72	26.97
4	4.0	28.91	30.67	28.66	28.16	29.10
5	5.0	29.86	40.23	33.32	29.23	33.16
6	7.0	30.36	41.36	34.76	38.72	36.30
7	10.0	31.43	39.60	37.09	40.23	37.09

Mean Resistivity at ERT-04 is 29.97 m.

CLAUSE NO.

TECHNICAL REQUIREMENTS

Project: G/I for 3x660MW North Karanpura Super Thermal Power Project, Jharkhand



Job No. : 3401

Sheet No.

ERT No. 05

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	21.83	21.57	23.71	20.25	21.84
2	2.0	20.74	18.60	18.60	18.23	19.04
3	3.0	17.92	16.79	18.11	18.67	17.87
4	4.0	20.11	19.86	19.36	19.36	19.67
5	5.0	21.06	20.74	19.80	18.54	20.04
6	7.0	24.64	22.88	22.88	21.12	22.88
7	10.0	23.89	23.89	27.66	24.52	24.99

Mean Resistivity at ERT-05 is 20.90 m.

ERT No. 06

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	16.17	16.23	19.00	16.23	16.91
2	2.0	16.47	16.59	17.10	17.22	16.85
3	3.0	17.54	21.50	22.63	36.59	24.57
4	4.0	21.12	26.15	23.13	20.87	22.82
5	5.0	24.83	27.66	23.26	20.74	24.12
6	7.0	27.28	30.36	26.40	27.28	27.83
7	10.0	29.54	28.29	30.80	29.54	29.54

Mean Resistivity at ERT-06 is 23.23 m.

ERT No. 07

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	18.81	19.18	20.76	19.81	19.64
2	2.0	22.75	20.87	23.00	23.63	22.56
3	3.0	24.90	26.03	25.46	25.84	25.56
4	4.0	25.14	22.63	26.65	44.50	29.73
5	5.0	26.09	26.72	28.60	29.23	27.66
6	7.0	32.56	22.44	26.40	27.72	27.28
7	10.0	33.94	30.17	33.32	32.69	32.53

Mean Resistivity at ERT-07 is 26.42 m.

ERT No. 08

Sl No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	1.0	38.43	36.92	32.27	36.48	36.03
2	2.0	23.13	14.83	15.84	15.46	17.32
3	3.0	21.50	21.12	18.48	21.50	20.65
4	4.0	19.86	21.12	18.60	25.14	21.18
5	5.0	15.40	20.74	21.37	26.40	20.98
6	7.0	20.24	26.40	25.08	28.16	24.97
7	10.0	23.89	26.40	34.57	25.14	27.50

Mean Resistivity at ERT-08 is 24.09 m.

SUB-SECTION-V-QD1

CIVIL WORKS

**NORTH KARANPURA SUPER THERMAL POWER PROJECT
(3X660 MW)
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-4410-109-2**

TENDER NO.: F SER: SCT: NRP-CT1914: 19					
Clause No	QUALITY ASSURANCE PROGRAMME				
	SAMPLING, TESTING AND QUALITY ASSURANCE FOR CIVIL WORKS				
1.0.0	INTRODUCTION				
1.1.0	This part of the specification covers the sampling, testing and quality assurance requirement (including construction tolerances and acceptance criteria) for all civil and structural works covered in this specification including excavation and filling, cast in situ concrete and allied works, fabrication and erection of structural steel works, masonry / sheeting and allied works, finishing items etc.				
1.2.0	This part of the technical specification shall be read in conjunction with other Parts of the technical specifications, general technical requirements & erection conditions of the contract. Wherever IS code or standards have been referred they shall be the latest revisions.				
1.3.0	All tests required for all materials (bought by Contractor) and workmanship shall be done / got done by the contractor at his own cost. The rate for respective items of work or price shall include the cost for all works, activities, equipment, instrument, personnel, material etc. whatsoever associated to comply with sampling, testing and quality assurance requirement including construction tolerances and acceptance criteria and as specified in subsequent clauses of this part.				
1.4.0	The Contractor shall provide the facilities whatsoever required and also bear the cost for all sampling, testing and quality assurance in the field and in the laboratory. The Contractor shall carry out all sampling and testing in accordance with the relevant Indian standards and / or international standards and this technical specification. Where no specific testing procedure is mentioned, the tests shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer. All sampling shall be done in the presence of the Engineer or his authorised representative. The Contractor shall establish the QA&QC laboratory at site and all field tests shall be done in the presence of the Engineer and / or his authorised representative. The tests which cannot be carried out in the field laboratory shall be done at a laboratory of repute such as CSMRS, NCBM, IITs, National Test House, Kolkata etc. as agreed by the Engineer. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by FQA representative of the engineer. The cost of transportation and other associative cost including the test charges shall be borne by the contractor. These cost shall deemed to be included in the respective item of work in the contract. If the Engineer desires to witness such tests at laboratory, Contractor shall arrange to conduct the test in his presence.				
1.5.0	The recommendations and suitability of material for concreting and other building materials like brick, cement, aggregates etc., shall be ascertained by contractor prior to start of work. Preliminary evaluation of aggregate and its evaluation for potential alkali-aggregate reactivity as per following scope of work shall be done:-				
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TENDER NO.: PSER/SC/INRF-C/19/4-19					
Clause No	QUALITY ASSURANCE PROGRAMME				
	A. <u>Evaluation of Aggregates:</u> I. To carry out different tests on coarse aggregate sample i.e. specific gravity, water absorption, sieve analysis, deleterious material; soundness, crushing value, impact value, abrasion value, elongation index and flakiness index, as per IS: 2386. II. To carry out different tests on fine aggregate sample i.e. specific gravity, water absorption, sieve analysis soundness, deleterious material, silt content, clay content and organic impurities as per IS: 2386. III. To prepare evaluation report based on test results of I) and ii) above and to advise regarding suitability of fine and coarse aggregates. B. <u>Evaluation of Aggregates for Potential Alkali-Aggregate Reactivity:</u> Evaluation for Potential Alkali-Aggregate reactivity as per following scope of work: I. To carry out petrographic analysis and accelerated Mortar bar Test on aggregate samples (1N NaOH at 80 deg. Centigrade for 14 days as per ASTM 1260, or the method established/ developed by CSMRS for 22days test. II. To prepare a report based on test results of I) above and to advise regarding suitability of aggregates and further testing required if any. The contractor shall initiate the action with regard to the above mentioned evaluation of aggregates and other building material, so as to ensure timely completion of these tests thereby not affecting any project work. All records shall be submitted, unless specified otherwise, as per the format developed by the Contractor and approved by the Engineer.				
1.6.0	The Contractor shall enclose a comprehensive list of bought out items (BOIs) envisaged in the contract for carrying out fabrication/ manufacturing/ erection/ construction/ commissioning activities, procurement of forged, cast, semi-finished and finished components/equipment etc and shall indicate the names of reputed manufacturers for each of them in their bid proposal. The items envisaged by the Contractor to be procured from these manufacturers shall meet the specification requirement. An indicative list of major bought out items (not exhaustive) for civil works is enclosed at Annexure-I, for which the contractor shall submit the requisite details / lists of manufacturer's in their bid proposal.				
1.7.0	The list of manufacturers / sub-vendors of each of the BOIs identified / indicated by the Contractor shall be discussed / reviewed by the NTPC during post bid discussions and the list of proposed manufacturers / sub-vendors for each of the BOI shall be agreed/ approved. The list of manufacturers for all the BOIs envisaged in contract shall be included in the bid proposal and the same shall be discussed for finalization during the post bid discussions before placement of award. Where the manufacturers are placed in "DR" (Details required) category, the details of the manufacturers / sub-vendors placed in the "DR" category shall be submitted to the NTPC for approval within the period agreed at the time of post bid discussions. The Contractor's proposal shall include vendor's site facilities, expertise, facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified sub-Contractors proposed. The formats for furnishing above details				
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TENDER NO.: F SER. SCT. NRP-CT/19/4-19					
Clause No	QUALITY ASSURANCE PROGRAMME				
	shall be given to the Contractor at post bid discussion stage. Monthly progress reports on sub-Contractor detail submission / approval shall be furnished on format no. QS-01-QAI-P-02/F1. The NTPC shall furnish other relevant formats for information/ clarification for manufacturers / sub-vendors approval to the Contractor at the time of post bid discussions (Main supplier's evaluation report Format No: QA-01-QAI-P-04/F1-R0 and Sub supplier questionnaire Format no: QA-01-QAI-P-04/F2-R0). Such manufacturers / sub-vendors approval shall not relieve the Contractor from any obligation, duty or responsibility under the contract.				
1.8.0	Structural steel and Reinforcement steel supply if in the scope of the contractor shall be procured from Main Steel Producers enlisted by NTPC from time to time. Currently, Main Steel Producers enlisted by NTPC are SAIL, JSW Steel Ltd, Jindal Steel & Power, Tata steel Ltd. (for Reinforcement steel/TMT bars), RINL (for long products/Rolled sections and Reinforcement steel/TMT bars), Essar Steel India Ltd. (for Flat products/ Steel Plates), Electrosteel steel Ltd. (for Reinforcement steel/TMT bars) and Monnet Ispat and Energy Ltd. (for long products/Rolled sections and Reinforcement steel/TMT bars). Subsequently, if any new Main Steel Producer/s are enlisted, they may also be considered for procurement during execution of the contract if proposed by the Contractor.				
1.9.0	The Field Quality Plans shall detail out all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site. The contractor shall furnish complete QA & QC programme (QAP) for the work envisaged which may include the following:- • The organisation structure for the management and implementation of the proposed Quality Assurance Programme. • Documentation Control System • The procedure for procurement of materials and source inspection. • System for site controls including process controls. • Control of non-conforming items and systems for corrective action • Inspection and test procedures for site activities • System for indication and appraisal of inspection status • System for maintenance of records • System for handling, storage and delivery. • Quality Plan detailing out quality practices and procedures, relevant standards and acceptance levels for all types of work under the scope of this contract. The Contractor shall appoint a dedicated, experienced and competent quality management representative on site, preferably directly reporting to the Project Manager, supported by experienced personnel, to ensure the effective implementation of the approved quality assurance programme.				
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Clause No	QUALITY ASSURANCE PROGRAMME				
	The onsite quality management representative shall have the organisational freedom and authority to implement the requirements of these quality assurance arrangements, free from commercial and programme restraints. The QA & QC setup of the contractor shall consist of qualified and experienced engineers, with their supporting staff. The QA&QC set up in addition to requisite mechanical & electrical engineers shall consist sufficient graduate civil engineers & supervisors to take care of quality assurance activities of both site & laboratory. An indicative QA & QC organization chart is attached at Annexure-III. The deployment of man power for QA & QC set up shall be affected on the basis of agreed manpower deployment schedule, which shall be prepared by the contractor based on the L-2 network and the same shall be submitted to the Engineer-in-charge for acceptance. Based on the schedule of work agreed with the Engineer-in-charge and the approved FQP, the Contractor shall prepare a schedule of tests and submit them to the Engineer-in-charge and organise to carry out the tests as scheduled/ agreed. The QA&QC laboratory shall have all necessary equipment, instruments and shall be managed by a qualified / experienced person. An indicative list of test equipment is attached at Annexure-II. All these testing equipment shall be provided by the contractor at his own cost. The contractor shall maintain the equipment in good working condition along with valid calibration certificates, for the duration of the contract. Any other equipment though required for testing but not listed in the equipment list shall be provided / arranged by the contractor at his own cost. QA&QC laboratory building shall be constructed by the Contractor at their own cost. The laboratory building shall be constructed and installed with the appropriate facilities. Temperature and humidity controls shall be available wherever necessary during testing of samples.				
1.10.0	The contractor shall prepare and obtain approval of the Owner of the Field Quality Plan (FQP) well before the start of the work. This FQP shall cover for all the items / activities covered in the contract/schedule of items and required for completion of the work.				
1.11.0	All materials / components and equipment covered under the scope of work which are to be manufactured at shop/ factory of the vendor/subvendor shall be covered under a comprehensive quality assurance programme. The detailed quality plan for manufacturing shall be drawn up by the contractor and will be submitted to the owner for approval in the prescribed format for manufacturing quality plan. Manufacturing Quality Plan (MQP) shall detail out all the components and equipment, various test/inspection, to be carried out as per the requirements of this specification and standards mentioned therein. The quality practices and procedures followed by Bidder's/Sub-Bidder's/ sub-supplier's Quality Control Organization shall include , the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of material procurement, manufacture, assembly and final testing / performance testing . The quality plan shall be submitted in electronic media e.g. CD or E-mail in addition to hard copy, for review and approval. After approval the same shall be finally submitted in compiled form on CD.				
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Clause No	QUALITY ASSURANCE PROGRAMME				
1.12.0	The contractor shall store and handle the materials as per the requirements of the relevant standards at his own cost.				
1.13.0	All the equipment shall be duly calibrated by NABL/ NPL accredited laboratories/accreditation agencies.				
1.14.0	The Contractor shall submit to the NTPC Field Welding Schedule for field welding activities in the format No.: QS-01-CQA-W11/F1, this format shall be furnished to the Contractor at pre-award stage. The field-welding schedule shall be submitted to the NTPC along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site. The Contractor shall submit Welding Procedure Specification (WPS) in the format No: QS-01-QAI-W-06/F1 for NTPC approval/ acceptance, this format shall be furnished to the Contractor during post bid discussion stage. All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the NTPC. All welding/brazing procedures shall be submitted to the NTPC or its authorized representative for approval prior to carrying out the welding/brazing. All brazers, welders and welding operators employed on any part of the contract either in the Contractor's/ sub-Contractor's works or at site or elsewhere shall be qualified as per AWS D1.1/ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the NTPC. Welding procedure qualification and Welder qualification test results shall be furnished to the NTPC for approval. However, where required by the NTPC, tests shall be conducted in presence of NTPC/authorized representative. No welding shall be carried out on cast iron components for repair. All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes. All Non-destructive examination shall be performed in accordance with written procedures as per International Standards and as mentioned elsewhere in the technical specification; The NDT operator shall be qualified as per SNT-TC-1A (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job. The records of RT (Films) and UT (inspection records or printed reports if possible) shall be documented and produced to NTPC.				
1.15.0	The Contractor shall associate themselves with the reputed specialized blasting agency such as CMRI, NIRM for trials blasts, design blasts, blasting pattern, monitoring of blast during the blasting operations at site. The blasting operation				
<table><tr><td>NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2</td><td>SUB-SECTION-V-QD1 CIVIL WORKS</td><td>Page 5 of 38</td></tr></table>		NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 5 of 38
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Clause No	QUALITY ASSURANCE PROGRAMME	
1.16.0	shall remain in charge of a responsible, competent, authorized and experienced supervisor (Man-In-Charge) and thoroughly acquainted workmen. All blasting work shall be done as per approved blasting scheme/ design/ pattern in line with the technical specification requirements and all statutory laws, rules, regulations, relevant standards pertaining to the acquisition, transport, storage, handling along with use of explosives shall be strictly followed by the Contractor. The Contractor shall install and operate equipments (such as tri-axial seismograph) for continuous monitoring and control of blast induced vibrations, noise level/ air pressure, dust, silica and noxious gases during all blasting operations in line with the Technical Specification requirements in association with the specialized blasting agency. The contractor shall submit the un-priced copy of the award on the specialized blasting agencies to NTPC, highlighting the scope of services/ work awarded to them by contractor. The services of such specialized blasting agency shall be available through out the period in which the blasting work is undertaken at site.	
	ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME: i. Field Quality Plan Format No.: QS-01-QAI-P-09/F2-R1 ii. Indicative list of Field Quality Laboratory and Survey equipment list (Annexure-II) iii. Indicative QA&QC Manpower requirements (Annexure-III) iv. Indicative Field Quality Plan for Civil Works (Annexure-IV) v. Indicative Field Quality Plan for Structural Steel Works (Annexure-V) vi. Manufacturing Quality Plan Format No.: QS-01-QAI-P-09/F1-R1 vii. Status of items requiring Quality Plan and sub supplier approval. Format No.: QS-01-QAI-P-02/F1-R0 viii. List of items requiring quality plan and sub supplier approval. Format No.: QS-01-QAI-P-01/F3-R0 ix. Field Welding Schedule Format No.: QS-01-CQA-W-11/F1-R0 x. Welding Procedure Specification (WPS) Format No.: QS-01-QAI-W-06/F1-R0 xi. Main supplier's evaluation report Format No: QA-01-QAI-P-04/F1-R2 xii. Sub supplier questionnaire Format no: QA-01-QAI-P-04/F2-R1 (Note: The field quality plan attached is indicative and the contractor shall prepare the field Quality plan covering the entire scope of work in the contract and submit the same to corporate QA for acceptance/approval. However any addition or deletion in the scope of work, during detailed engineering shall be accordingly added/ deducted from the Field Quality Plan)	
	2.0.0	GENERAL QA REQUIREMENTS
	2.1.0	STORAGE AND HANDLING OF COMMON BUILDING MATERIALS All materials shall be stacked and stored by the Contractor as per IS-4082 and as per the requirements specified in NTPC Technical Specification.
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2 SUB-SECTION-V-QD1 CIVIL WORKS Page 6 of 38		

TENDER NO.: F SER. SCT. NRP-CT/174-19	
Clause No	QUALITY ASSURANCE PROGRAMME
2.2.0	EXCAVATION AND FILLING WORKS The contractor shall submit a work methodology covering various items of works for all stages of excavation and filling works. This methodology shall broadly include the quantity wise and classification wise identification of source of excavation and filling, suitability tests as per specification requirements, method of stockpiling, transportation, placement, spreading , compaction, equipment, list of protocols, in-situ tests, third party lab test if required, acceptance checks for final clearance. For blasting work at site if required, the contractor shall associate themselves with the reputed specialized blasting agency such as CMRI, NIRM for trials blasts, design blasts, blasting pattern, monitoring of blast during the blasting operations at site. The contractor shall install and operate equipment (such as tri-axial seismograph) for continuous monitoring and control of blast induced vibrations, noise level/ air pressure, dust, silica and noxious gases during all blasting operations in line with the technical specification requirements in association with the specialized blasting agency. The contractor shall submit the un-priced copy of the award on the specialized blasting agencies to NTPC, highlighting the scope of services / work awarded to them by contractor. The services of such specialized blasting agency shall be available through out the period in which the blasting work is undertaken at site. The blasting operation shall remain in charge of a responsible, competent, authorized and experienced supervisor (man-in-charge) and thoroughly acquainted workmen. All blasting work shall be done as per approved blasting scheme/ design/ pattern in line with the technical specification requirements and all statutory laws, rules, regulations, relevant standards pertaining to the acquisition, transport, storage, handling along with use of explosives shall be strictly followed by the contractor. Tolerance for finished surface level shall be within 20 mm of the level shown in the drawing. For an unimportant area, tolerance up to +75mm shall be acceptable at the discretion of the engineer. However, these tolerances shall be applicable for localized areas only. Acceptance criteria shall be a) When only one set of sample is tested, then all individual samples collected and tested should pass without any deviation b) For retest of any sample two additional samples shall be collected and tested, and both should pass without any deviation. c) Where a large number of samples are tested for a particular test then 9 samples out of every 10 consecutive samples tested shall meet the specification requirement.
2.3.0	MASONRY AND ALLIED WORKS The execution, finishing, testing and acceptance of masonry related works shall be as per the provisions of technical specifications / relevant practices IS code. Local
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2 SUB-SECTION-V-QD1 CIVIL WORKS Page 7 of 38	

TENDER NO.: P/SER/SC/1/NRF-C/19/4-19																												
Clause No	QUALITY ASSURANCE PROGRAMME																											
	depressions on account of faulty workmanship, broken / chipped edges shall not be acceptable. All masonry shall be built true and plumb within the tolerances prescribed as below. Care shall be taken to keep the perpends properly aligned. Unless specified otherwise the tolerances in construction of masonry works shall be as below:																											
	<table><tr><th>Sl. No.</th><th>Type of Check</th><th>Tolerance</th></tr><tr><td></td><td>Deviation in verticality in total height of any wall of a building</td><td>Shall not exceed $\pm 12.5\text{mm}$ (more than one storey) $\pm 6\text{mm}$ per 3m height (within a storey)</td></tr><tr><td></td><td>Deviation from the position shown on the plan of any brickwork</td><td>Shall not exceed 12.5mm (more than one storey)</td></tr><tr><td></td><td>Relative displacement between load bearing walls in adjacent storeys intended to be in vertical alignment</td><td>Shall not exceed 6mm</td></tr><tr><td></td><td>Deviation of bed joint from horizontal in any length, and it</td><td>Shall not exceed 6mm (upto 12m) Shall not exceed 12.5mm total (in any length over 12m)</td></tr><tr><td></td><td>Deviation from the specified thickness of bed-joints, cross-joints or perpends</td><td>Shall not exceed $\pm 3\text{mm}$</td></tr><tr><td></td><td>Finished plastered surface</td><td>Deviation not more than 4 mm when checked with a straight edge of 2 m length placed against the surface</td></tr><tr><td></td><td>The average thickness of plaster</td><td>Not be less than the specified thickness</td></tr><tr><td></td><td>The minimum thickness over any portion of the surface</td><td>Not less than the specified thickness by more than 3 mm for plaster thickness above 12mm and 1 mm for ceiling plaster</td></tr></table>	Sl. No.	Type of Check	Tolerance		Deviation in verticality in total height of any wall of a building	Shall not exceed $\pm 12.5\text{mm}$ (more than one storey) $\pm 6\text{mm}$ per 3m height (within a storey)		Deviation from the position shown on the plan of any brickwork	Shall not exceed 12.5mm (more than one storey)		Relative displacement between load bearing walls in adjacent storeys intended to be in vertical alignment	Shall not exceed 6mm		Deviation of bed joint from horizontal in any length, and it	Shall not exceed 6mm (upto 12m) Shall not exceed 12.5mm total (in any length over 12m)		Deviation from the specified thickness of bed-joints, cross-joints or perpends	Shall not exceed $\pm 3\text{mm}$		Finished plastered surface	Deviation not more than 4 mm when checked with a straight edge of 2 m length placed against the surface		The average thickness of plaster	Not be less than the specified thickness		The minimum thickness over any portion of the surface	Not less than the specified thickness by more than 3 mm for plaster thickness above 12mm and 1 mm for ceiling plaster
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2.4.0	CONCRETE WORKS For concreting works provisions of technical specifications and IS: 456 shall apply. A detailed methodology for concrete works shall be submitted by the contractor to NTPC for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted. The methodology for concrete works shall broadly contain the suitability of source of aggregates, cement, admixture, water and reinforcement steel, etc. The available																											
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NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 8 of 38																									

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	concrete mix design recommended from a specialist institute, results of trial mix carried out at site, method / control of batching, mixing, transportation, layer wise placement, compaction, fixing / removal of form work, staging, fixing of water stops at appropriate locations along with specials, expansion joints, contraction joints and construction joints, cover blocks and method of curing, methodology of repair of newly placed hardened concrete, testing and sampling of concrete during production and placement and acceptance checks for final clearance. The equipment, deployment of manpower and machinery shall arranged by the contractor to ensure the continuous rate of placement of specified grade of concrete so as to prevent segregation, bleeding, formation of cold joints, temperature control for concreting in extreme weather conditions and for mass concreting works. Exposed surfaces of concrete shall be kept continuously in a damp or wet condition for at least seven days from the date of placing concrete in case of ordinary Portland cement, not be less than 10 days for concrete exposed to dry and hot weather conditions, at least 10 days or period may be extended to 14 days where mineral admixtures or blended cements are used. Approved curing compounds may be used in lieu of moist curing with the permission of engineer-in-charge. Reinforcement steel shall conform to relevant IS codes. Lapping / spacing of reinforcement shall be so staggered that under no circumstances more than 50% of bars at any cross section shall be lapped. Corrosion resistance Steel shall be used for the foundations wherever specified in the technical specification. Sample test for 3% of the number of mechanical bars grips subject to a minimum of three, shall be carried out up to the yield strength of reinforcement of bars. Test shall be conducted for the water tightness of the liquid retaining structures as per technical specifications, IS 3370 and IS 6494. All the materials, equipments, processes used in pre cast concrete work shall conform to the requirements for the cast-in-situ concrete. If fly ash is used in concrete, source of supply shall be checked for suitability as per IS 3812 (Part-I). Routine tests for retention of particles on 45µ sieve and loss on ignition shall be carried out on each lot of fly ash before its use. The storage of fly ash shall be similar to that of cement. Separate Silo for fly ash shall be provided in the batching plant. Validation of Mix design using fly ash shall be carried out by an approved specialist agency, before start of concrete production. The acceptance criteria of concrete shall be in accordance with clause no.16 of IS 456. However in exceptional circumstances and that too in non-critical areas, the engineer may accept concrete work which is marginally unacceptable as per the criteria laid down in IS 456. For such accepted work, payment shall be made at a reduced rate pro rata to the concrete cube strength obtained, against that stipulated. All records of concreting, reinforcement, testing of materials, as-built dimensions, the details of the rectification, etc, shall be maintained as given below. Four copies of such record in a bound form shall be submitted to owner for their record and future reference. i. Testing data / report of aggregates including petrographic examination & potential reactivity of aggregate and repeated temperature cycle tests wherever specified ii. Mix design details and record of trial mixes carried out at site		
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 9 of 38

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		iii. Testing records of admixture as per IS-9103 / ASTM C494 including third party test reports. iv. Approved scheme for concreting v. Hourly records of concreting including pour card vi. Protocol indicating the dimensional tolerance and details of inserts vii. Records giving the details of rectification giving the location of grouting, the quantity of grout used at each location, type of grout used viii. Bar bending schedule ix. Location and details of mechanical anchoring used for reinforcement x. Protocol giving the details of checking of reinforcements before concreting and conformance to the reinforcement details as shown in the construction drawings xi. Photographs showing the areas where rectification works have been carried out. Photographs should be taken before and after rectification xii. Temperature control record of concrete at the time of placement if applicable. xiii. Details of curing, staging and fixing / removal of formwork, checklist for formwork as per Clause 9.9 and Annexure-C of IS 14687 including all machine foundations xiv. Batching Plant shall be calibrated regularly at least once in a 3 months. Computerized output shall be taken for each batch of production of concrete. For concreting works of ash pipe pedestals, mixer with weight batcher may be used. Production and supply of concrete from batching plant shall conform to the provisions of IS 4926 xv. Dimensions (length, cross sectional dimensions, straightness, squareness, and flatness) and tolerances for pre cast members as per NTPC Technical Specification. Load test on Pre cast members (except pre- cast tiles to be laid in the reservoir) shall be carried out @ 1% up to 1000 nos., @0.5% from more than 1000 nos. precast members of one type. The load test shall be carried out as per the provisions of IS-456 and relevant IS code.																																	
		<table><tr><th colspan="4">TOLERANCES</th></tr><tr><th colspan="2">Description of Item/ Structural Element</th><th>Max (mm)</th><th>Min (mm)</th></tr><tr><td colspan="2">Cast In Situ Concrete</td><td></td><td></td></tr><tr><td>1.</td><td>Faces of concrete in foundations and structural members against which back fill is placed</td><td>+25</td><td>-10</td></tr><tr><td>2.</td><td>Eccentricity of footing as percentage of footing width in the direction of placement</td><td colspan="2">2% but limited to 50mm</td></tr><tr><td>3.</td><td>Top surfaces of slabs and of concrete to receive base plates to be grouted</td><td>+5</td><td>-5</td></tr><tr><td>4.</td><td>Alignment of beams, lintels, columns, walls, slabs and similar structural elements</td><td>+5</td><td>-5</td></tr><tr><td>5.</td><td>Cross sectional dimensions of walls, slabs and similar structural elements</td><td>+5</td><td>-5</td></tr></table>		TOLERANCES				Description of Item/ Structural Element		Max (mm)	Min (mm)	Cast In Situ Concrete				1.	Faces of concrete in foundations and structural members against which back fill is placed	+25	-10	2.	Eccentricity of footing as percentage of footing width in the direction of placement	2% but limited to 50mm		3.	Top surfaces of slabs and of concrete to receive base plates to be grouted	+5	-5	4.	Alignment of beams, lintels, columns, walls, slabs and similar structural elements	+5	-5	5.	Cross sectional dimensions of walls, slabs and similar structural elements	+5	-5
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NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS Page 10 of 38																																

Clause No		QUALITY ASSURANCE PROGRAMME				
2.5.0	TOLERANCES					
	Description of Item/ Structural Element			Max (mm)	Min (mm)	
	6.	Deviation from specified dimensions of cross-section of columns and beams			+12	-6
	7.	Alignment of holding down bolts without sleeves			+1.5	-1.5
	8.	Alignment of holding down bolts with sleeves			+5	-5
	9.	Level of holding down bolt assemblies			+10	-10
	10.	Embedded Parts (in any direction).			+5	-5
	11.	Level of embedment for equipment support			+1.5	0
	12.	Level of embedment for other embedded parts			+5	-5
	13.	Centers of pockets or holes with greatest lateral dimension not exceeding 150mm			+10	-10
	14.	Variation in steps • Riser • Tread			+1.5 +3.0	-1.5 -3.0
	Pre- Cast Concrete					
	15.	Length:	+/- 0.1 percent	+/- 5	+ 10	
	16.	Straightness or Bow	1/750 of the length	+/- 5	+/- 10	
	17.	Cross-sectional dimensions	+/- 3 mm or +/- 0.1 percent whichever is greater			
	18.	Squareness:	When considering the squareness of the corner the length of the two adjacent sides being checked shall be taken as the base line. The shorter side shall not vary in length from the perpendicular by more than 5 mm.			
	19.	Flatness:	The maximum deviation from a 1.5m straight edge placed in any position on a nominal plant surface shall not exceed 5 mm.			
	Placing of reinforcement and for cover (Cover blocks shall be of same grade of concrete in which these would be embedded)			Clause 12.3.1 and 12.3.2 of IS 456		
	Formwork			Clause 9.6 of IS 14687 and 11.1 of IS 456		
	Batching			Clause 10.2.2 of IS 456		
	STRUCTURAL STEEL WORK					
	For structural steel works provisions of technical specifications and IS: 800 shall apply. A detailed methodology for structural steel works shall be submitted by the contractor to NTPC for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted.					
	The contractor shall submit the welding procedures specification (WPS), heat treatment procedures, NDT procedures etc. at least ninety days before scheduled start of erection work at site. All welding and brazing shall be submitted to the NTPC					
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2		SUB-SECTION-V-QD1 CIVIL WORKS		
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Clause No	QUALITY ASSURANCE PROGRAMME																										
	and carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the NTPC. All brazers, welders and welding operators employed on any part of the contract either in the contractor's / sub-contractor's works or at site or elsewhere shall be qualified as per AWS D1.1/ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the NTPC. The records of welding procedure qualification and welder qualification test results shall be furnished to the NTPC for approval. However, where required by the NTPC, the tests shall be conducted in presence of NTPC / authorized representative. No welding shall be carried out on cast iron components for repair. All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes. All Non-destructive examination shall be performed in accordance with written procedures as per International Standards and as mentioned elsewhere in the technical specification. The NDT operator shall be qualified as per SNT-TC-1A (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job. The records of RT (Films) and UT (inspection records or printed reports if possible) shall be documented and produced to NTPC. Low hydrogen electrode (AWS E-7018) for welding of High/Medium tensile steel, for M.S (IS 2062 Gr. A/Gr. B, IS 8500) sections thickness above 20mm shall be used. Preheating and Post weld heat treatment requirements shall be complied as specified in the technical specification / approved WPS. The requirements of pre-heating shall be <table><tr><td>Thickness of thickest part at the area of welding / heat affected zone</td><td>Welding using other than low hydrogen welding electrodes IS 2062</td><td>Welding using low hydrogen welding electrodes or submerged arc welding IS 2062</td></tr><tr><td>Upto 20 mm (including)</td><td>None</td><td>None</td></tr><tr><td>Over 20 mm to 40 mm (including)</td><td>Not allowed</td><td>200 C</td></tr><tr><td>Over 40 mm to 63 mm (including)</td><td>Not allowed</td><td>660 C</td></tr><tr><td>Over 63 mm</td><td>Not allowed</td><td>1100 C</td></tr></table> The following tests / checks shall be carried out for structural steel works <table><tr><td>SL. NO.</td><td>TESTS / CHECKS</td><td>QUANTUM / STANDARD</td></tr><tr><td></td><td>Physical and chemical properties of material if supply in the scope of contractor</td><td>As per relevant codes, review of correlated mill test certificates or check testing in absence of MTC</td></tr><tr><td></td><td>Ultrasonic test on plates above 40mm</td><td>As per ASTM A435</td></tr></table>			Thickness of thickest part at the area of welding / heat affected zone	Welding using other than low hydrogen welding electrodes IS 2062	Welding using low hydrogen welding electrodes or submerged arc welding IS 2062	Upto 20 mm (including)	None	None	Over 20 mm to 40 mm (including)	Not allowed	200 C	Over 40 mm to 63 mm (including)	Not allowed	660 C	Over 63 mm	Not allowed	1100 C	SL. NO.	TESTS / CHECKS	QUANTUM / STANDARD		Physical and chemical properties of material if supply in the scope of contractor	As per relevant codes, review of correlated mill test certificates or check testing in absence of MTC		Ultrasonic test on plates above 40mm	As per ASTM A435
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NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS																								
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Clause No	QUALITY ASSURANCE PROGRAMME		
	SL. NO.	TESTS / CHECKS	QUANTUM / STANDARD
		Welding procedure & welders qualification test	AWSD1.1/ASME Section-IX or BS-4871 or other equivalent International Standards
	Fillet Weld		
		Macro-etch examination on production test coupons for main fillet welds	Minimum one joint per built up beams, columns and crane girder etc.
		Tension member of crane girder	Dye penetration test on 25% weld length
		All other fillet welds	DPT on 5% of weld length with minimum 300mm at each location
	Butt Weld		
		DPT	100% after back gouging on all butt welds
		Mechanical testing of production test coupons	Minimum one joint per built up beam, column and crane girder.
		Radiography test on butt welds (In case of failure of any welds in SPOT/RT or UT the % of retesting shall be doubled at that particular location. Acceptance criteria of NDT on welds shall be as per AWS D1.1. Wherever RT is not feasible UT to be carried out with the approval of the engineer)	100% RT on butt welds of tension flange (bottom flange) of crane girders 10% RT weld length of each welder on butt welds,
		Ultrasonic testing on full penetration welds (other than butt welds)	100% UT on the web to flange joint of crane girder 10% UT on other full penetration joints
		Control assembly check in shop before erection	1st and further every 10th set of identical structure
		Dimensional tolerances during fabrication and erection	as per IS-7215 and IS-12843
		Surface Preparation and Paint thickness	SA 2 1/2 , By elcometer random after each coat, each member
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2.6.0	PAINTING WORKS Painting works shall be carried out as per the provisions of technical specifications. A detailed methodology for painting works shall be submitted by the contractor to NTPC for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted. The methodology for painting works shall broadly contain the source of approved brand of paints, shot / sand blasting as specified, minimum acceptable size of shot used for blasting, application of primer, intermediate coat and final coat, experience of applicator, etc. testing of painting work and acceptance checks for final clearance.
	2.7.0 SHEETING WORKS All bought out items shall be procured from the manufacturer's approved by engineer and tested as per relevant IS Codes/ Specification. Raw material of colour coated sheets shall meet the chemical & physical properties as per relevant standards / codes referred in the approved data sheet. It shall be tested for colour match, bare metal thickness, weight of Z/AZ coating, thickness of painting system, reverse impact, T-Bend adhesion, scratch resistance, salt spray test for 1000 Hrs and any other test / properties as specified in the technical specifications. Colour coated sheets shall be marked with video jet printing at the interval not more than 2m bearing manufacturer's name, date and time of manufacturing. Fasteners shall also be tested for 1000 hrs salt spray test as per the requirement of technical specifications. Bonded Mineral Wool Insulation shall meet the requirements of thickness, density, thermal Conductivity, all other tests as per the technical specifications and IS-8183. For sheet installation no gas cut opening shall be allowed at the site, whenever opening is specified these shall be properly cut in the factory and shall be filled with lipping / flashing for true shape / dimension etc. The sheets/ packets shall be stacked neatly clear off the ground at an angle to the ground, over a base pallet to provide drainage. Water / moisture should not be allowed to stagnate on surface, or in between layers. This can damage the coating, and cause corrosion.
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2.8.0	TILE WORKS The contractor shall submit the work methodology which shall include the type, grade and make of materials along with their technical data sheets, details, etc, clearance from E-I-C regarding leak proofness and damp proofness of parent concrete surface, surface preparation, the procedure of application, curing, testing and acceptance. The agencies having adequate experience to execute the acid / alkali resistant lining works shall be engaged for executing the acid / alkali resistant lining works after obtaining the approval from the E-I-C. The execution, finishing, testing and acceptance of tile works shall be as per the provisions of technical specifications. The material for tile works shall be procured from the NTPC approved brand / source. Local depressions on account of faulty workmanship, tiles / natural stones with cracked or broken / chipped edges shall not be acceptable. The tests shall be carried out on acid resistant bricks / tile- water absorption, compressive strength, resistance to acid, flexural strength, dimensions and all other tests as per IS 4860 and IS 4457, bitumastic ready mixed paint as per IS 158, bitumastic as per IS 9510, potassium silicate, resin type and sulphur type mortars as per IS 4832, part I, II and III, surface preparation for painting as per IS 2395, epoxy painting shall be carried for required coating thickness and dry film thickness.				
	2.9.0 FIRE PROOF DOORS Fire Proof doors shall be tested for the requirements mentioned in the Technical Specification. The type test of the doors shall be carried out at CBRI Roorkee for minimum 2 hours fire rating and its Fabrication drawing shall also be approved by CBRI, Roorkee. DFT of paint of Fire Proof Doors and its fittings and fixtures as per BOQ shall be checked. The doors shall be finished with suitable fire retardant painting system				
	2.10.0 WATER PROOFING The execution, finishing, testing and acceptance of water proofing works shall be as per the provisions of technical specifications. The material for the works shall be procured from the NTPC approved brand / source and the works shall be executed by the authorized applicator of the supplier. Water proofing shall be tested for water tightness by creating a pond of water minimum 25 mm height on area of 6 m x 6 m, for the period of 48 hrs on fully dried elastomeric membrane surfaces. Minimum 5% area of the roof shall be subjected to water tightness test. Such test necessarily be conducted on vulnerable areas like drain channel / drain head. No dampness shall be visible on the underneath side of roof (i.e. ceiling), parapet and well junctions etc. which have been subjected for testing. The above testing shall be carried out prior to application of wearing course.				
<table><tr><td>NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2</td><td>SUB-SECTION-V-QD1 CIVIL WORKS</td><td>Page 15 of 38</td></tr></table>		NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 15 of 38
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2.11.0	PILING WORK (If Applicable)			
	For piling works provisions of technical specifications, approved drawings, BOQs and relevant IS codes / standards shall apply. The piling works shall be executed by the agency meeting the qualifying requirements as specified. A detailed methodology for piling works shall be submitted by the contractor to NTPC for approval. The methodology may require change / modification based on the site conditions, for which suitable revisions shall be submitted. The methodology for piling works shall broadly contain the method of boring, stability of bore hole, termination criteria, tests / checks for termination level, fabrication of cage, cage lowering, concrete batching / mixing, transportation, placing, recording of the time of construction operations, method of conducting initial and routine load tests, testing and sampling of concrete during production and placement and acceptance checks on piles for final clearance. The equipment, deployment of manpower and machinery shall be arranged by the contractor to prevent the collapse of bore hole and to ensure continuous rate of placement of specified grade of concrete. The piling works shall be executed as per the technical specifications, approved drawings, relevant codes / standards, FQP and BOQ. In addition to the requirements of technical specifications, the following shall also be ensured while execution of piling works: a) Time gap between completion of pile boring and start of concreting should be kept to the minimum. However the maximum time gap shall not be more than 6 hours. b) Muck Debris should be removed from the pile bore by air lift technique(by keeping the tremie & air pipe as close as to bottom of pile bore) i.e. after completion of boring, after completion of SPT(whenever applicable), after lowering reinforcement cage, but before start of concreting. c) Density of bentonite slurry shall be checked from the sample taken from the bottom of pile bore(not at 1.0 m above the bottom of the pile bore) d) Minimum two welding sets shall be kept ready to join the two cages of reinforcement by engaging 3 or more welders. This will ensure the lowering of R/F cage in minimum time. e) While lowering the R/F cage into the pile bore, two hooks shall always be used to ensure balanced/symmetrical insertion of cage into the pile bore. f) Concrete cover blocks at the junction of two R/F cage shall be ensured before lowering the second segment. g) Surge concreting of about 1.0 cum shall be ensured at the start of concreting (i.e. in the first pour), by suddenly allowing to fall through the tremie pipe from the funnel. This will help in displacing left out muck/debris in the pile bore (by the impact). h) Continuous feeding of concrete shall be ensured by deploying at least two transit concrete mixers (if required to be deployed) and mixing done through concrete batching plant (if deployed). Cold joints in the pile shall be avoided.			
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 16 of 38

TENDER NO.: P-SER-SC1-NRP-C1974-19	
Clause No	QUALITY ASSURANCE PROGRAMME
	i) In a pile group, SPT shall be carried out at termination level in the pile, taken up first.
	j) Bentonite slurry circulation to be ensured from start of boring to start of concreting. Flushing of bentonite slurry will only ensure maintaining of density of bentonite slurry uniformly and will not allow bentonite jelly to settle at the bottom, whereas air lift technique with bentonite circulation will ensure removal of muck debris from the bottom of pile bore.
	k) Properties of drilling mud shall be checked prior to commencement of the piling work and thereafter, minimum once per week or as found necessary by the engineer. One sample consisting of 3 specimens shall be tested for the above.
	l) Low strain pile integrity test on all job piles and test piles shall be conducted as specified in the Technical Specification. This test shall be suitably used to identify the piles for routine tests. High Strain dynamic test shall be done as per the technical specification. The frequency of the test shall be as per the BOQ
	m) For Working Piles: Minimum one sample consisting of 6 test cubes shall be made for first ten piles. Out of these 3 shall be tested for 7 days cube strength and 3 for 28 days cube strength. Minimum one sample of 6 test cubes for every 25 nos. of piles shall be tested, out of these 3 shall be tested for 7 days cube strength and 3 for 28 days cube strength
	PILE LOAD TEST
	Pile load testing shall conform to the requirements of IS-2911 (Part IV) and the technical specification. Initial load tests as specified in the contract documents shall be conducted to assess the safe load carrying capacity of pile before start of work. To verify the load carrying capacity of the working piles, routine load test shall be conducted. Pile load-testing procedure and the test setup / scheme shall be submitted for approval of NTPC. The contractor shall use the test setup having arrangement for anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge for both vertical compression and uplift (tension) Load test (initial) on piles. The cost of reaction system / piles shall deem to be included in the cost of test piles All the gauges and instruments shall be calibrated before the start of the tests on test piles and working piles and the calibration record shall be verified before start of execution of the test.
2.12.0	WATER SUPPLY, DRAINAGE & SANITATION
	Material used for sanitary and plumbing fittings and fixtures shall conform to and be tested as per the requirements of relevant IS Codes specified in NTPC technical specification. The obstructions in sewer lines shall be checked by inserting a smooth ball, of diameter 13 mm less than the pipe bore at the high end of the sewer or drain. If
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2 SUB-SECTION-V-QD1 CIVIL WORKS Page 17 of 38	

TENDER NO.: F SER. SCT. NRP-CT/19/4.19					
Clause No	QUALITY ASSURANCE PROGRAMME				
2.13.0	absence of any obstructions, such as yarn or mortar projecting through the joints, ball shall roll down the invert of the pipe and emerge at the lower end. The straightness shall be checked by means of a mirror at one end of the line and lamp at the other. If the pipeline is straight, the full circle of the light may be observed. The mirror will also indicate obstruction in the barrel, if the pipeline is not straight. The service pipes shall be slowly and carefully charged with water, allowing all air to escape avoiding all shock or water hammer. The service pipe shall then be inspected under test / working condition of pressure and flow, when all draw-off taps are closed. The service pipes shall be checked for satisfactory support and protection from damage, corrosion and frost. ARCHITECTURAL & MISC. WORKS Material used for sanitary and plumbing fittings and fixtures, floor finishes and allied work shall conform and tested as per the requirements of relevant IS Codes specified in NTPC technical specification. Fabricated item like metal doors, windows, ventilators, louvers, rolling shutters and grills etc. shall be checked for correctness of locations and smoothness of operation and fixtures. All controls and locking devices shall give fault free performance. Door and window shutters shall operate without jamming. The clearance at head and jamb for door shutters shall not exceed 1.5 mm. For double leaf doors, the gap at the meeting stiles shall not be more than 2.5 mm. Materials used in glass and glazing shall be procured from source approved by NTPC and shall conform to the requirements of the Technical Specification and IS Codes. False ceiling panels shall be best quality material in thickness and properties called for in the specification / schedule of items. Material Test Certificate to be submitted before bulk supply. All bought items covered in the scope of contract shall be procured from sources approved by NTPC and shall conform to the requirements of the technical specifications and referred standards /codes.				
	2.14.0	PRE CAST CONCRETE WORKS 1. All the materials used in Pre cast Concrete work shall be tested and conform to the requirements of IS codes and NTPC Tech. Specification. 2. Concrete mix for Pre cast members shall conform to IS-456-2000. 3. All relevant QA requirements pertaining to cast insitu concrete shall be applicable. 4. Pre Cast Concrete member shall be checked for dimensions (length, cross sectional dimensions, straightness, squareness, and flatness) and tolerances shall be as per NTPC Technical Specification.			
<table><tr><td>NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2</td><td>SUB-SECTION-V-QD1 CIVIL WORKS</td><td>Page 18 of 38</td></tr></table>		NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2	SUB-SECTION-V-QD1 CIVIL WORKS	Page 18 of 38
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TENDER NO.: F SER. SCT. NRP-CT/1974-19	
Clause No	QUALITY ASSURANCE PROGRAMME
2.15.0	FABRIC EXPANSION COMPENSATOR: Each layer of fabric Compensator shall be checked for thickness, unit weight, tensile strength & elongation, composite layer of the expansion joint shall be tested for temperature withstand ability test. Thermal Insulation shall be checked for thickness, density, thermal conductivity test and all other tests as per IS:8183. Tests and checks on all other items shall be carried out as per relevant codes.
2.16.0	SLIPFORM SHUTTERING 1. The monitoring of the leveling of the yoke and the platform of the slip form shuttering to be done in each shift to avoid tilt during the casting of the chimney shell. 2. Manning of each shift shall be done by at least two experienced operators and a foreman particularly in night shift. 3. Suitable removal/ reduction of overhung / excess yoke beam length shall be affected with the decrease in the diameter of Chimney shell, as per the approved plan. 4. The laser centering method to be deployed for chimney alignment and Monitoring of chimney centre should be done by laser instruments at least two points. Monitoring/Recording of the same shall be done in each shift of 8 hours 5. Shuttering plates to be used for slip form shall be new and the grade of steel shall conform to the specification requirements. 6. The outage of the alignment of chimney centre shall be prevented by creating a counterbalance for alignment purpose to avoid differential loading, arising out of placement of reinforcement bars at one side or unloading of concrete in a hopper at one side of the platform for slip form shuttering.
NORTH KARANPURASUPER THERMAL POWER PROJECT (3X660MW) FLUE GAS DESULPHURISATION SYSTEM PACKAGE TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO CS-4410-109-2 SUB-SECTION-V-QD1 CIVIL WORKS Page 19 of 38	

	PROJECT: North Karanpura STPP (3X660)	LIST AND STATUS OF ITEM REQUIRING QP AND SUB-SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: FLUE GAS DESULPHURISATION SYSTEM PACKAGE					REV. NO.	0
	MAIN SUPPLIER:					DATE	
	CONTRACT NO.:						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS	REMARKS
1	CEMENT						
2	CONSTRUCTION CHEMICALS - ADMIXTURES, PLASTISIZERS, RETARDERS, WATER PROOFING COMPOUNDS, GROUTS, RESINS, EPOXY ETC.						
3	COLOUR COATED SHEET(FOR COIL)						
4	PROFILERS FOR DECKING/CLADDING SHEETS						
5	ELECTROFORGED GRATING						
6	PAINT AND PAINTING SYSTEM						
7	GI PIPES						
8	INSULATION WOOL FOR CHIMNEY						
9	NON-METALLIC EXPANSION JOINT						
10	PVC WATER STOP						
11	PLASTIC/ PVC PIPES						
12	FLOOR TILES						
13	FIRE PROOF DOORS						
14	PARTICLE BOARDS, PLYWOOD, MDF						
15	ROOF WATER PROOFING						
16	RCC PIPES						
17	FALSE CEILING - GLASS REINFORCED GYPSUM						
18	BITUMEN ASPHALT						
19	BITUMEN IMPREGNATED FIBER BOARD JOINT						
20	SANITARY ITEMS						
21	CP BRASS TAP AND OTHER SANITARY FITTINGS						
22	POLYTHENE WATER STORAGE TANKS - IS 12701						
23	CHIMNEY ELEVATOR						
24	PTFE BEARING / ELASTOMERIC BEARING						
25	FOUNDATION BOLTS						

LEGENDS:

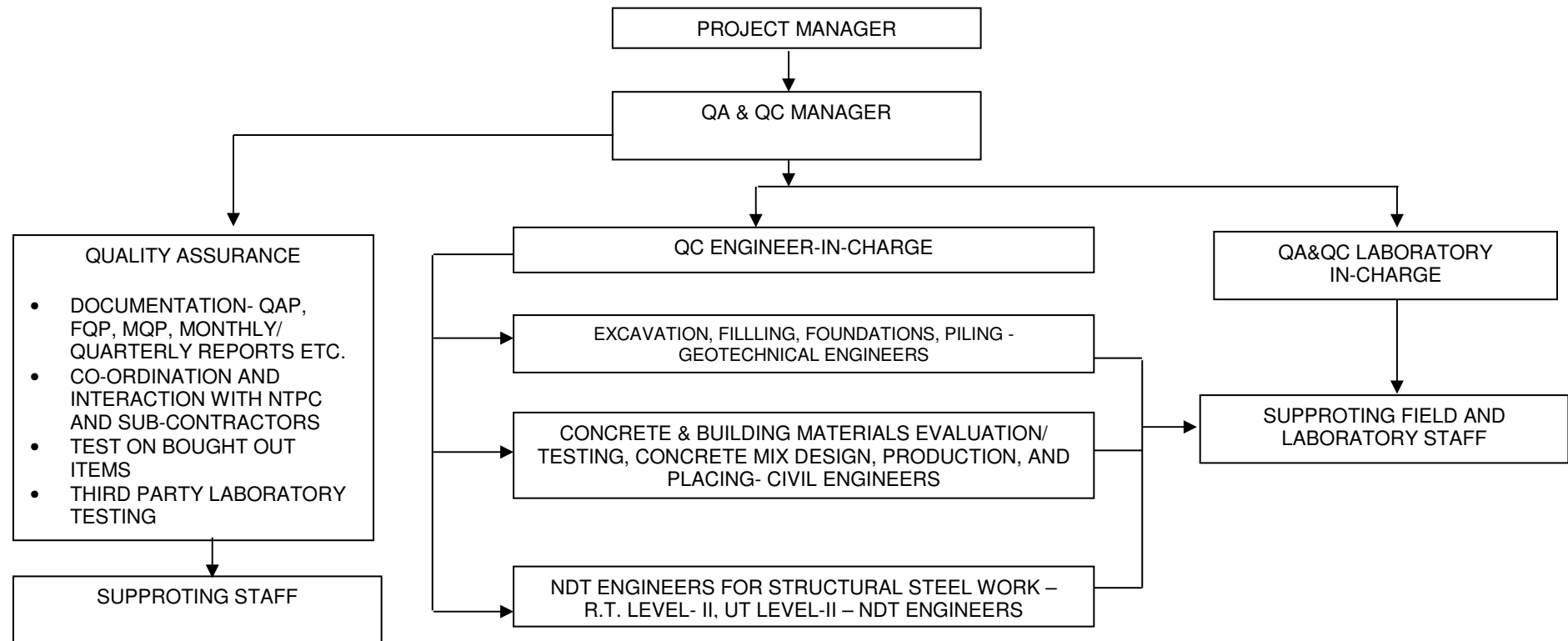
1. SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter “A” in the list along with the condition of approval, if any

2. QP/INSPN CATEGORY:
CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved
CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.
UNITS/ WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTE: For the items placed in CAT-III for Civil Works, the review and final acceptance shall be done by NTPC-EIC/ FQA on the basis of certificate of conformance submitted by the main supplier/ main contractor.

Clause No	QUALITY ASSURANCE PROGRAMME																																																																																																																							
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Clause No	QUALITY ASSURANCE PROGRAMME		
	Note : 1. The equipments listed above are indicative and required to be mobilised as minimum requirement. additional equipment if any ,required for successful completion of work shall be provided /arranged by the contractor. 2. All test reports/ inspection reports have to be computerized and maintained on LAN with an access to the owner 3. Computers - 2 Nos shall be deployed with Windows operating system and connected to the NTPC server 4. Based on the schedule (L2/L3 Network), Quality control & Quality Assurance work plan shall be finalized by the contractor and the same shall be submitted to the engineer-in-charge for acceptance/approval. The Finalized work plan shall be maintained on the computer to be accessed by the owner for database and day to day monitoring.		
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INDICATIVE FIELD QA & QC MANPOWER STRUCTURE**NOTE:**

1. The above organization setup is minimum, however their deployment shall be as per the agreed deployment schedule. The contractor shall prepare a manpower deployment schedule in line with the finalized work plan and the same shall be submitted to the engineer-in charge for acceptance/ approval.
2. The contractor shall mobilize the QA& QC manpower in line with the finalized manpower deployment schedule and shall ensure their availability well in advance (15 days approx.) of the beginning of the concerned activity/ work.
3. The contractor shall further mobilize required number of skilled & supporting staff and additional resources, if any to meet the work schedule.

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LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.	QP NO. : REV. NO. : DATE : PAGE :	1 0		PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	North Karanpura STPP (3X660) FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / Instruments	Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks	
1	2	3	4	5	6	7	8	9	D*	10
1.00	GENERAL REQUIREMENTS									
A	Setting up of Field QA&QC laboratory		As agreed / required	A	Physical	Once prior to start of work	Tech Specs and Const. Drawings	SR	✓	Functioning of laboratory equipment in proper working condition to be verified on monthly basis
B	Availability of requisite laboratory set up and equipment in good working condition well before commencement of concerned activity		As agreed / required	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings	SR	✓	
C	Submission of QA & QC manpower deployment schedule based on agreed L-2 network .		-	A	Physical	Once prior to start of work	Tech Specs and Const. Drawings		✓	
D	Availability of QA& QC manpower based on deployment schedule .		-	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings	SR	✓	
E	Sampling for testing of building materials, concrete mix design etc.		As agreed / required	A	Physical	Once per each source prior to start of concern work	Tech Specs and Const. Drawings	SR	✓	Test report along with the recommendations from specialist agency to be submitted to NTPC.
F	Submission of schedule of tests to be done monthly / quarterly and maintenance of the same on a computer connected to LAN of NTPC for monitoring		-	A	Physical	Once prior to start of work and thereof monthly	Tech Specs and Const. Drawings	SR	✓	
2.00	EXCAVATION AND FILLING IN FOUNDATION WORKS									
	Excavations-									
1		Check for the Nature, type of soil/rock before and during excavations	As agreed / required	B	Visual	Random in eah shift	Tech Specs and Const. Drawings	SR		
2		Check for the Initial ground level before start of excavations	As agreed / required	B	Measurement	100%	Tech Specs and Const. Drawings	SR		
3		Check for the final shape and Dimensions of excavations.	As agreed / required	B	Measurement	100%	Tech Specs and Const. Drawings	SR		
4		Check for the Final excavation levels	As agreed / required	B	Measurement	100%	Tech Specs and Const. Drawings	SR		
5		Check for the Side slope of final excavation	As agreed / required	B	Measurement	Random in eah shift	Tech Specs and Const. Drawings	SR		
6		Excavation in Hard Rock.								
i		Receipt, Storage, accountability of Explosive	As agreed / required	B	Physical	Random in each week	Indian Explosive Act 1940/all statutory norms, Tech Specs and Const. Drawings	SR	✓	NTPC approved specialist blasting agency such as CMRI, NIRM shall be deployed at site for trial blasts, design blasts, blast vibration monitoring etc. Seismographs shall be deployed at site for monitoring of blast operation vibrations.
ii		Execution of Blasting Operation	As agreed / required	B	Physical	Random in eah shift	IS:4081, Tech Specs and Const. Drawings	SR	✓	
iii		Submission of Blasting report to EIC	As agreed / required	C	Physical	Each blast	Tech Specs and Const. Drawings		✓	
7		Excavation in Hard Rock (Blasting Prohibited)	As agreed / required	B	Physical	100%	As per approved drawing/ scheme, Tech Specs and Const. Drawings	SR	✓	
	Fill/ Backfill -									
8	Suitability of fill material									
i		Grain size analysis	As required/ agreed	B	Physical	One in every 2000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV), Tech Specs and Const. Drawings	SR/TR	✓	
ii		Liquid & plastic limit	As required/ agreed	B	Physical	One in every 2000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV) , Tech Specs and Const. Drawings	SR/TR	✓	
iii		Shrinkage limit	As required/ agreed	B	Physical	One in every 5000 cum for each type and source of fill materials subject to a min. of 2 samples	IS:2720 (Pt.IV), Tech Specs and Const. Drawings	SR/TR	✓	
iv		Free Swell Index	As required/ agreed	B	Physical	One in every 5000 cum for each type and source of fill materials	IS:2720 (Pt.XI), Tech Specs and Const. Drawings	SR/TR	✓	
9	Standard proctor Test	Optimum moisture content and max. dry density before fill	As required/ agreed	A	Physical	One in every 2000 cum for each type and source of fill materials	IS 2720 (Pt.VII), Tech Specs and Const. Drawings	SR/TR	✓	
10	Moisture content	Moisture content of fill before compaction	As required/ agreed	A	Physical	One in every 2000 cum for each type and source of fill materials	IS 2720 (Pt.II), Tech Specs and Const. Drawings	SR/TR	✓	
11	Degree Of Compaction Of Fill / Backfill									
i		Dry density by core cutter method ---- OR ---- Dry density in place by sand displacement method	As required/ agreed	A	Physical	i) For foundation fill/ backfill one for every 10 foundations for each compacted layer. ii) For area filling, one every 1000 SQM area for each compacted layer.	IS 2720 (Pt. XXIX), Tech Specs and Const. Drawings IS 2720 (Pt. XXVIII), Tech Specs and Const. Drawings	SR/TR	✓	
ii		Relative density (Density Index)	As required/ agreed	A	Physical	----do----- (i) & (ii) above	IS 2720 (Pt. XIV), Tech Specs and Const. Drawings	SR/TR	✓	

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Sl. No	Activity and operation	Characteristics / Instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record		Remarks
1	2	3		4	5	6	7	8	9	D*	10
iii		Dry Density by proctor needle penetration	As required/ agreed	B	Physical	Random checks to be carried out for each compacted layer	Tech Specs and Const. Drawings		SR/TR	✓	
3.00	CAST-IN-SITU CONCRETE										
	MATERIALS										
1	Cement										
i		Initial & Final Setting Time	as per IS:4031	A	Physical	Each Lot	IS:4031	As per relevant IS Codes	SR/LB/ Test Report	✓	Each consignment of cement shall be duly correlated with manufactureres TC, If cement is stored more than 90 days in godown of contractor same shall be retested for comp. Strength & setting time.
ii		Compressive strength @ 3, 7 & 28 days	as per IS:4031	A	Physical	Each Lot	IS:4031	As per relevant IS Codes	SR/LB/ Test Report	✓	
2	Coarse Aggregate										
i		Moisture content		B	Physical	Once for each stack of 100 Cum. or part there of Except during monsoon when this has to be done every day before start of concreting	IS:2386 Part-III, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/LB		Accordingly water content of the concrete will be adjusted
ii		Specific gravity, bulk density, voids, water absorption,	As required/ agreed	B	Physical	Once for each source & for every change of source	IS:2386 Part-III, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/TR		These tests will be carried out white establishing design mix and the results to be intimated to NTPC.
iii		Particle, size & Shape-(Sieve analysis, determination of material finer than 75 micron, flakiness index, elongation index, angularity number)	As required/ agreed	B	Physical	One per 100 cum., or part thereof/change of source whichever is earlier	IS:2386 Part-I, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/LB		-do-
iv		Deleterious materials & organic impurities (determination of clay lumps, fine silt, fine dust , light weight pieces , soft particle & estimation of organic impurities.)	As required/ agreed	B	Physical	Once per source/ on every change of source	IS:2386 Part-II, IS : 456, IS : 383/Tech Spec, Tech Specs and Const. Drawings		SR/TR		Experts opinion regarding suitability of the aggregates shall be obtained from the specialist agency such as NCB BalbhGarh etc. finalised during preaward. Results will be reported nearest to 0.1% of clay lumps.
v		Soundness	As required/ agreed	B	Physical	Once per source/ on every change of source	IS: 2386 Part-V, IS:383 , Tech Specs and Const. Drawings		SR/TR		Experts opinion regarding suitability of the aggregates shall be obtained from the specialist agency such as NCB BalbhGarh etc. finalised during preaward.
vi		Alkali aggregate reactivity	As required/ agreed	A	Physical	Once per source/ on every change of source	ASTM C 1260 , Tech Specs and Const. Drawings		SR/TR	✓	the quantity of dissolved silica , and reduction in alkalinity to be reported and hence the aggregate type (deleterious /innocuous)result should be supported by petrographic examination
vii		Petrographic examination	As required/ agreed	A	Physical	Once per source/ on every change of source	IS: 2386 Part-VIII, IS:383 , Tech Specs and Const. Drawings		SR/TR	✓	Reporting of petrographic examination shall be done as illustrated in IS 2386 (part-VIII)-1963. petrographic report shall be supported by the analysis and recommendation by a specialist insttute.
viii		Crushing value abrasion value and impact value	As required/ agreed	A	Physical	Once per source/ on every change of source	IS:383, IS-2386 Part IV/, Tech Specs and Const. Drawings		SR/TR		-do-
3	Fine Aggregate										
i		Moisture content	As agreed / required	B	Physical	To be done every day before start of work	IS: 2386 Part-III Specs and Const. Drawings	IS:383 , Tech	SR/TR		Weight of sand and weight of water shall be adjusted as per moisture content.
ii		Silt, Clay content and organic impurities	As agreed / required	B	Physical	Once per source& for on every change of source	IS: 2386 Part-II, IS:383 , Tech Specs and Const. Drawings		SR/TR		Acceptance limit as per relevant IS code
iii		All other tests similar to coarse aggregates as mentioned above.	As agreed / required	B	As above	Refer S.No. 2.01.02	IS-2386, IS-383, Tech Specs and Const. Drawings		SR/TR		
4	Water										
i		Test for sulphates and chlorides	As required/ agreed	B	Testing	Once per each source thereof yearly.	IS:3025 part 22 and 23 (for test procedure) , IS:456(for acceptance criteria) , Tech Specs		SR/TR		
ii		Tests for ascertaining limit of solids	As required/ agreed	B	Physical	Once per each source thereof yearly.	IS:3025 part 18 (organic),IS:456 , Tech Specs and Const. Drawings		SR/TR		
iii		Tests for pH Value	As required/ agreed	B	Testing	Once per each source thereof yearly.	IS:3025, IS:456, Tech Specs and Const. Drawings		SR/TR		
iv	Check for initial set time for used water and distilled water	vicat appratus		A	Physical	See Remarks	See Remarks, Tech Specs and Const. Drawings		See Remarks	✓	Initial set time with used water should not be less than that with distilled water. This check is to be carried out only if the results of the tests mentioned at sl. no. 3.00, 4 i),ii)& iii) mentioned above

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v	Check for Concrete compressive strength with used water and distilled water	standard sand and compression testing machine	As agreed / required	A	Physical	See Remarks	See Remarks, Tech Specs and Const. Drawings	See Remarks	✓	This check is to be carried out only if the results of the tests mentioned at sl. no. 3.00, .4 i), ii) & iii) mentioned above
5	CONCRETE PRODUCTION									
i		Check for the proportions of materials for nominal mix concrete as per Table-9 of IS 456	As agreed / required	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings	SR/TR		
ii		Trial mix (Cubes compressive strength) as per Mix Design	As agreed / required	A	Physical	Min. 4 Trial Mixes with admixtures and Without admixtures With fly ash.	IS: 516 & IS:456, IS:10262, Tech Specs and Const. Drawings	SR/TR	✓	For trial mix min. of 6 cubes for each mix, 3 specimen shall be tested at 7 days remaining 3 shall be for 28 days comp. Strength. Mix design shall carried out at agency finalised during pre award)
iii		Crushing strength (works Tests cubes)	As agreed / required	A	Physical	One set of 6 cubes per 50 M3 or part thereof for each grade of concrete per shift whichever is earlier.	IS:516, IS:456, Tech Specs and Const. Drawings	SR/TR	✓	Min. of 6 cubes for each mix, 3 specimen shall be tested at 7 days remaining 3 shall be for 28 days comp. Strength.
iv		Workability - slump test	As required/ agreed	B	Physical	One sample every 2 hrs. from every mixing plant	IS:456, Tech Specs and Const. Drawings	SR/TR		Slump test for medium and high workability, Compaction factor test for medium and low workability, V.B. test for low to Very low workability
v		Cement content	As agreed / required	B	Physical	At random at the time of batching.	IS:1199 , Tech Specs and Const. Drawings	SR/TR		
vi		Admixtures for Concrete from approved sources	As agreed / required	A	Review of MTC	Random in each shift	IS:456 , Tech Specs and Const. Drawings	SR/TR	✓	Admixture of appd. Brand and tested quality shall be used.
vii		Water Tightness Test for Water Retaining Structures	As agreed / required	B	Physical	100%	IS:3370 (Tanks and Revision) , Tech Specs and Const. Drawings	SR	✓	
viii		Dimensions and visual examination of finished structure	As agreed / required	B	Physical/ visual	100%	As per Tech. Specification./Appd. Drg./IS-456	SR		
6	CONCRETE CONVEYING, PLACING & COMPACTION									
i	Mixing of concrete	mixing of concrete shall be done in a approved mixer such as to produce a homogenous mix	As required/ agreed			To be calibrated at the time of starting and subsequently once in three months, and shall confirm to IS:4925	Review of calibration chart/ Certificate, IS 457, Tech Specs and Const. Drawings			time of mixing will be as given in IS 457
ii		Calibration of Batching Plant	As required/ agreed	A	Physical	To be calibrated at the time of starting and subsequently once in three months, and shall confirm to IS:4925	Review of calibration chart/ Certificate, Tech Specs and Const. Drawings	SR/TR	✓	Cement consumption at batching plant shall also be obtained through comp. Output.Provision of online printer is mandatory
iii		Handling and Transportation of concrete	As required/ agreed	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings	SR		Free fall or drop shall be limited to 150 cm unless permitted concrete should be placed within 30 min of its removal from mixture . Construction methodology to be approved one week prior to start of work.
iv		Placement of concrete	As required/ agreed	B	Physical	Random in each shift	IS:456, Tech Specs and Const. Drawings	SR		No concrete shall be placed until the place of deposit has been thoroughly inspected and approved, the concrete shall be deposited in such a manner to maintain, until completion of unit, a plastic horizontal surface throughout
v		Check for compaction and Curing	As required/ agreed	B	Physical	Random in each shift	Check for period of curing as per IS 456 , Tech Specs and Const. Drawings	SR		Exposed concrete surface shall be protected against heating and drying for atleast 72 hrs after placement, curing compound may be used
vi		Cleanliness, provision of chute and arrangement for transportation & placement of concrete.	As agreed / required	C	Visual	100%	IS:456, Tech Specs and Const. Drawings	SR		
x		check for segregation	As agreed / required	C	Visual	100%	IS:456, Tech Specs and Const. Drawings			
7	TEST/CHECK ON RCC STRUCTURE IN HARDENED CONDITIONS									
i		Core Test	As agreed / required	A	Physical	As required by NTPC Engineer.	As per IS:456, IS 516, Tech Specs and Const. Drawings	SR/LB/ Test Report	✓	Acceptable if average equivalent cube strength of the cores is equal to at least 85% of the cube strength of the grade of concrete specified for the corresponding age and no individual conc has result less than 75%'
ii		Dimensional check on finished structures & Dimensional tolerances	As agreed / required	B	Measurement	Approved Drawing	As per IS:456, Tech Specs and Const. Drawings	SR/LB		
iii		Rebound Hammer test	As agreed / required	A	physical	As required by the NTPC engineer	Tech Specs and Const. Drawings	SR/LB	✓	
8	REINFORCEMENT STEEL									
i		Physical and Chemical Properties for each lot as per relevant IS codes	As required/ agreed	A	Review of MTC	Each batch of delivery	IS : 1786, IS:432, IS:1566, Tech Specs and Const. Drawings	MTC	✓	Applicable if steel is procured by Contractor
ii		Cutting tolerance	As agreed / required	B	Measurement	Random in each shift	IS : 1852, IS: 432, IS:1786, Tech Specs and Const. Drawings	SR/LB		Tolerance as per specifications

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iii		Freedom from cracks surface flaws, Lamination.	As agreed / required	B	Visual	Random in each shift	IS: 1852, IS:432, IS:1786, Tech Specs and Const. Drawings	SR/LB		To be checked at site. Steel collected from source should be free from excessive rust. To be stored as per Technical Specs.
9	PLACEMENT OF REINFORCEMENT STEEL									
i		Check for bar bending schedule with necessary laps. Spacers & Chairs	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings	SR		
ii		Check for cover, spacing of bars	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings	SR		
iii		Check for bending of bars	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings	SR		
iv		Check for spacers and chairs after the reinforcement cage is put inside the formwork	As agreed / required	B	Visual & Measurement	Random in each shift	Approved Drawings, Tech Specs and Const. Drawings	SR		
v		Acceptance of placement of reinforcement before start of concreting	As agreed / required	B	Visual & Measurement	before start of each concreting	IS : 456/ Drawings & approved bar bending, Tech Specs and Const. Drawings schedule	SR		
10	STAGING AND FORMS									
i		Materials and accessories	As agreed / required	B	Visual	Once before start of work	As per relevant IS, Tech Specs and Const. Drawings	SR		Proper care should be taken in order to combat corrosion. Proper care should be taken while cleaning, moving and stacking the scaffolds
ii		Soundness of staging, shuttering and scaffolding	As agreed / required	B	Visual	Once before start of work	As per manufacturer's spec.and as per 3696,4014, 4990, Tech Specs and Const.	SR		
iii		Acceptance of formwork before start concreting		B	Physical / visual	before start of each concreting	As per provisions and tolerances, Tech Specs	SR		
11	EMBEDDED PART(INCLUDING LAYING OF RAILS & ANCHOR FASTENERS)									
i		Position and levels of embedded parts	As agreed / required	B	Physical/ measurement	100%	As per drawing, Tech Specs and Const. Drawings	SR		Exposed surface of the embedded parts other than holding down bolts are to be painted with primer ,chlorinated , rubber baed zinc phosphate
ii		Position depth and size of bolt hole	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings	SR		
iii		Location verticality of pipe sleeve/opening of bolt hold	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings	SR		
iv		Laying of rails under supervision of NTPCs specialised agency.	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings	SR		
v		Welding / tying of embeddment to reinforce-ment	As agreed / required	B	Physical/ measurement	Random in each shift	As per drawing, Tech Specs and Const. Drawings	SR		
12	PRE-CAST CONCRETE									
i		Crushing strength	As required/ agreed	A	Physical	one sample of six cubes per 50 cum or part thereof	IS:516&IS: 456, Tech Specs and Const. Drawings	SR/LB	✓	a minimum of three specimen shall be tested for 28 days comp. strength
ii		Workmanship free from visual defects	As required/ agreed	B	Physical	100%	Tech Specs and Const. Drawings	SR		The precast units shall be free from defects like honeycombing, reinforcement exposure and should have good finish. All relevant tests like workability, cube test shall be carried out as per IS 456-2000 Same as applicable to cast in situ concrete.
iii		Dimension of finish structure	As required/ agreed	B	Measurement	100%	As per IS:456, Tech Specs and Const. Drawings	SR		If the material already tested of the cast-in-situ concrete and part of the same is used for precast concrete, further testing is not required, otherwise testing is required for every 50 Cum. Of Concrete.
iv		Workability	slump test apparatus	B	Physical	one sample every two hrs from mixing plant	IS:1199 &IS:456, Tech Specs and Const. Drawings	SR/LB		According to the mix design
v		Water cement ratio	As agreed / required	B	Physical	At random at the time of batching	IS:1199 , Tech Specs and Const. Drawings	SR/LB		According to the mix design
vi		Cement content	As agreed / required	B	Physical	At random at the time of batching	IS:1199 /tech spec, Tech Specs and Const. Drawings	SR		According to the mix design
vii		Load Test	As agreed / required	A	Physical	5% or as desired by EIC	IS:456/ As decided by NTPC Site Engr. Incharge., Tech Specs and Const. Drawings	SR	✓	These tests shall also be carried out, in case of doubt regarding grade of concrete and poor quality.
13	JOINTS IN CONCRETE									
i		Check for the joint material - bitumen impregnated fibre board, PVC water stops, Sealing compound, Expanded polystyrene board, Hydrophilic strip, Acrylic polymer etc.	As per manufacturer Standards	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings, IS 1838, IS 1834, IS12200	MTC	✓	
ii		Acceptance of installation of materials for Joints in concrete	As agreed / required	B	Acceptance	Each installation randomly	As per technical specifications and construction drawings			
14	DAMP PROOF COURSE									
i		Check for the material - Hot bitumen and water proofing materials etc	As agreed / required	A	Review of MTC	Each batch of delivery at site	Tech Specs and Const. Drawings, IS 702	SR	✓	
ii		Acceptance of damp proof course	As agreed / required	B	Acceptance	100%	As per technical specifications and construction drawings	SR		

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15	GROUTING									
i		Check for the material	As agreed / required	A	Review of MTC	Each batch of delivery	As per technical specifications and construction drawings	SR	✓	Check for chemical, epoxy, resin grouts etc
ii		Check for the type of mix - fluid mix, plastic mix, stiff mix etc.	As agreed / required	B	Physical	Prior to start of work	As per technical specifications and construction drawings			
iii		Check for the mixing, placement, application and grout pressure	As agreed / required	B	Physical	Random in each shift	As per technical specifications and construction drawings	SR		
iv		Check for the compressive strength	As agreed / required	A	Physical	Each batch of delivery	As per technical specifications and construction drawings	SR	✓	
v		Acceptance of the grouts	As agreed / required	B	Physical	Each grout section	As per technical specifications and construction drawings	SR		
16	SLIPFORM SHUTTERING									
i		Submission of Slipform Work system to be used	-	B	Submission	Before Comencement of work	As per specifications	SR		
ii		Check for the Slipform shutters	As required	B	Physical	Before Comencement of work	As per specifications	SR		Check for water level system, Controls, Walkways etc.
iii		Details Positions and arrangement of Jack rods	-	B	Approval	Before Comencement of work	As per specifications	SR		Submitted to Engineer for approval
iv		Details of Proposed arrangement for continuous readings	-	B	Approval	Before Comencement of work	As per specifications	SR		Submitted to Engineer for approval
v		Check for All type of openings, Chases, Fixing of Blocks and similar built-up features	As required	B	Physical	100% during execution	Construction Drawings and specifications	SR		No any type of openings ,chases , blocks other than shown in the construction drawings or approved by Engineer shall be executed in the concrete.
vi		Details of proposed method for concrete curing and protection	-	B	Approval	Before Comencement of work	Construction Drawings and specifications	SR		Submitted to Engineer for approval
vii		Check of Concrete Curing and Protection	As required	B	Physical	At Random	Construction Drawings and specifications	SR		Concrete shall not remain uncured for period longer than 12 hours
viii		Check for Sliding Operation	As required	B	Physical	Each Sliding	As per specifications	SR		Rate of Sliding, Delays in sliding, Discontinuity or stop strat sliding to be checked
ix		Monitoring of Sliding Portion Progress Height	As required	B	Physical	Six hourly intervals	As per specifications	SR		To be recorded in tabular form and on graphs immediately after each monitoring
x		Centre line in relation to the centers at the base	As required	A	Physical	Six hourly intervals	As per specifications	SR	✓	To be recorded in tabular form and on graphs immediately after each monitoring
xi		Internal wall faces in relation to the concrete at the base	As required	B	Physical	Six hourly intervals	As per specifications	SR		To be recorded in tabular form and on graphs immediately after each monitoring
xii		Wall thickness	As required	B	Physical	Six hourly intervals	As per specifications	SR	✓	To be recorded in tabular form and on graphs immediately after each monitoring
xiii		Twist	As required	B	Physical	Six hourly intervals	As per specifications	SR	✓	To be recorded in tabular form and on graphs immediately after each monitoring
xiv		Verticality of the structure	Optical Theodolight	B	Physical	Every day in morning	As per specifications	SR		To be recorded in tabular form and on graphs immediately after each monitoring
xv		Check for Tolerances for chimney construction	As required	B	Physical	For every day monitoring	As per specifications	SR		
4.00	BRICK MASONARY									
1	Test on Bricks									
i		Check for Dimensions , shape	As required/ agreed	A	Measurement/ Physical Test	As per relevant IS Code/ One Sample for 30,000 Nos. or part thereof	IS: 1077, Tech Specs and Const. Drawings	Inspection Report	✓	Efflorescence shall be checked at each source.
ii		compressive strength, water absorption, warpage efflorescence.	As required/ agreed	B	Measurement/ Physical Test	As per relevant IS Code/ One Sample for 30,000 Nos. or part thereof	IS: 1077, IS:3495 part I (Compressive Strength) Part II (Water Absorption) Part III(Efflorescence) Part IV (War page), Tech Specs		✓	Preconditioning of brick shall be done as per IS. For compressive strength, warpage and water absorption
2	Test on Mortar	Compressive strength, consistency and water retentivity for each portion of walls, plasters and ceilings.	As required/ agreed	B	Test	At random	IS 2250-1981, Tech Specs and Const. Drawings	LB		Cement used in mortar shall confirm to either IS 269: 1976 or IS 455- 1976 sand shall confirm to IS 2116 -1980
3	Masonry construction	Acceptance of Workmanship, verticality and alignment	As agreed / required	B	Visual/ Physical	100%	IS 2212, IS 1905 , Tech Specs and Const. Drawings	SR/LB		
5.00	FINISHING AND ALLIED WORKS									
1	MATERIALS- FINE SAND, SAND FOR PLASTERING									
i		Deleterious Material	As agreed / required	B	Physical	Once per source	IS : 2386 (Part-I &II) & IS :2116, Tech Specs and Const. Drawings	SR		
ii		Grading	As agreed / required	B	Physical	50 Cum./or part thereof	IS:3150,1542& Apprd. drgs, Tech Specs and Const. Drawings	SR		Table –I of IS:2116

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iii		Galvanized hexagonal wire netting for lath plastering	As agreed / required	B	Review of MTC	Each batch of delivery	, Tech Specs and Const. Drawings		SR		
iv		Check for the thickness and finishing of plaster	As agreed / required	B	Visual/ Measurement	Random in each shift	As per IS 1661 , Tech Specs and Const. Drawings		SR/LB		
2	PLASTERING										
i		Check for defects and the remedial measure for bond filler , blistering , cracking and crazing , efflorescence and irregularity of surface texture	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings, IS: 1661		SR		
ii		Trueness of plastering system	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings		SR		finished plaster surface shall not show any deviation more than 4 mm when checked with straight edge of 2 m length
iii		Acceptance of Grooves and finishing	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings		SR		
3	STONE GRIT PLASTER/ GRANULAR TEXTURED COAT FINISH										
i		Check for Preparation of surface	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings		SR		
ii		Check for material - Size of chips	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings		SR		
iii		Acceptance of Grooves and finishing	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings		SR		
4	WATER PROOFING SYSTEM										
i		Check for the material	As agreed / required	A	Physical and Review of MTC	Each lot of delivery	Tech Specs and Const. Drawings,		SR/ MTC	✓	
ii		Acceptance of water proofing system - Application, fixing, laying	As agreed / required	B	Physical	100%	Tech Specs and Const. Drawings		SR		Water pounding test shall be done
5	FALSE CEILING										
i)		Check for the Materials - Glass Reinforced Gypsum (GRG), Pre-painted coil coated steel false ceiling system etc.	As agreed / required	A	Physical and MTC Review	Each batch of delivery	As per relevant IS and Tech. Specs / Manufacturer's TC		-do-	✓	
ii)		Acceptance of installation	As agreed / required	B	Physical / measurements	Each installation	-do-		-do-		All supports , hangers , accessories shall be as per Tech. Specifications/ approved manufacturer's recommendations
6.00	PAINING SYSTEM - All surfaces										
1	Check for the Materials and accessories	White wash, Distemper and all types of Primer and Paints - Check for Shade, type from brand and manufacturer as approved by NTPC EIC	As agreed / required	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings		SR/MTC	✓	Mfr.'s T.C. shall be correlated with the consignment received.
2	Check for Surface prepration		As agreed / required	B	Physical /visual	Random in each shift	Tech Specs and Const. Drawings		SR		
3	Check for DFT of painted surfaces		As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR		
4	Acceptance of painted surfaces		As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings		SR		
6.10	CHIMNEY PAINTING										
i		Requirements for Steel Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
ii		Requirements for Cast Iron Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
iii		Requirements for Concrete Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		No of Coats applied and DFT/WFT to be checked as per specified
iv		Material Requirements	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		Requirement of DFT to be checked as per Specifications. Procurement to be done from approved/acceptable manufacturer/source
v		Preparation of Surfaces	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		
vi		Application of Paint	As Required	B	Physical	Randomly	Tech Specs and Const. Drawings		SR		AS per recommendations by Manufacturer along with Relevant IS Codes and Specification requirements
7.00	DOORS . WINDOWS VENTILATORS & GRILL										

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- IV				
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.	QP NO. : REV. NO. : DATE : PAGE :		1 0	PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	North Karanpura STPP (3X660) FLUE GAS DESULPHURISATION SYSTEM PACKAGE				
Sl. No	Activity and operation	Characteristics / Instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks	
1	2	3		4	5	6	7	8	9	D*	10
1	Check for the material/ items for all type of timber, flush doors, Particle doors, wire guage, Aluminium doors, Fire proof doors, windows fittings, Anodized aluminium works, Mortice locks, Automatic operating system etc received at site	Review of MTC / make or/and Physical checks, tests report (if MTC is not available)	As agreed / required	A	Review of MTC/ Physical	for each batch of delivery	Tech Specs and Const. Drawings		SR	✓	
2	Wood work in frames	Wood work in frames - Check for dimensions, surface finish and rebating etc.	As agreed / required	B	Physical	Random for each installation	Tech Specs and Const. Drawings		SR		
3	Wardrobe shutter and show cases										
i		Check for material as per IS 3087 and 3097 - from NTPC approved source	As agreed / required	B	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings, IS 3087 and 3097		SR		
ii		Acceptance of fixing after completion	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings, IS 3087 and 3098		SR		
4	Pelmets										
i		Check for material as per IS 3087/ 3097 - from NTPC approved source	As agreed / required	B	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings, IS 3087/ 3097		SR		
ii		Acceptance of fixing after completion	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings, IS 3087/ 3098		SR		
5	MS Grills										
i		Check for the material for section and weight from NTPC approved source	As agreed / required	A	Physical	one sample for each section for each lot of delivery	Tech Specs and Const. Drawings		SR	✓	
ii		Check for fabrication done at approved workshop	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings		SR		
		Acceptance of fixing of MS Grills	As agreed / required	B	Acceptance	Random	Tech Specs and Const. Drawings		SR		
6	Fitting and fixtures - MS sliding door bolts, tower bolts, pull bolt lock, MS handles, Safety Chains, brass locks, brass latch, hydraulic floor springs & door closers, etc	Check for fitting items as per relevant IS codes, tech specifications and BOQ- from NTPC approved source	As agreed / required	B	Physical and acceptance	Five samples for each item for each lot of delivery	Tech Specs and Const. Drawings		SR		
7	Fitting and fixtures - Aluminium sliding door bolts, tower bolts, pull bolt locks, handles, door stoppers etc.	Check for fitting items as per relevant IS codes, tech specifications and BOQ- from NTPC approved source	As agreed / required	B	Physical and acceptance	Five samples for each item for each lot of delivery	Tech Specs and Const. Drawings		SR		
8	Fire proof doors										
i		a) Check for the Fire Proof Doors	As required/ agreed	A	Review of MTC	Each lot	As per Technical Specifications and approved drawings, IS 3614 Part (I &II), TAC		MTC	✓	
ii		b) Check for DFT and Fire Retardancy of Paint	As required/ agreed	B	Physical	Each Door	As per Technical Specifications and approved drawings, IS 3614 Part (I &II)		SR/LB		
9	Acceptance of all type fittings after fixing	Acceptance of fittings after completion	As agreed / required	B	Physical and acceptance	Random for each type of fitting	Tech Specs and Const. Drawings		SR		
8.00	GENERAL STEEL WORK										
1	Check for Material	Review of MTC/ make / Physical checks, tests (if MTC is not available)	As agreed / required	A	Review of MTC for each delivery	For each batch of delivery	Tech Specs and Const. Drawings		SR	✓	
2	Rolling shutters										
i		Check for surface finish and thickness of plate of rolling shutters of approved make and DFT	As agreed / required	B	Physical	Random for each batch of delivery	Tech Specs and Const. Drawings		SR		
ii		Acceptance of rolling shutters after fixing	As agreed / required	B	Physical and acceptance	Random	Tech Specs and Const. Drawings		SR		
3	Steel Glazed doors and T-iron frames sections										
i		Check for shape, tolerances, thickness, welding and finishing of sections (Check MTC wherever applicable)	As agreed / required	A	Review of MTC for each delivery	Random for each delivery	Tech Specs and Const. Drawings		SR	✓	
ii		Acceptance of Steel Glazed doors and T-iron frames sections after fixing	As agreed / required	B	Physical and acceptance	Random for each installation	Tech Specs and Const. Drawings		SR		
4	Pressed steel pressed frames/ doors										
i		Check for shape, tolerances, thickness, welding and finishing (Check MTC wherever applicable)	As agreed / required	A	Review of MTC for each delivery	Random for each delivery	Tech Specs and Const. Drawings, IS4351, IS2202		SR	✓	
ii		Acceptance of Pressed steel pressed doors after fixing	As agreed / required	B	Physical and acceptance	Random for each installation	Tech Specs and Const. Drawings		SR		
5	Fencing and Gates										

**NORTH KARANPURA STPP ((3X660MW)
FLUE GAS DESULPHURISATION SYSTEM PACKAGE**

**SUB-SECTION-V-QD1
CIVIL WORKS**

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.	QP NO. : REV. NO. : DATE : PAGE :		1 0	PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	North Karanpura STPP (3X660) FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / Instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
	i) Check for Materials for fencing and gates	PVC coated chain link fencing (IS 2720), Welded wire mesh (IS 1566), Reinforced barbed tape galvanised (IS 2629) etc.	As agreed / required	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings	SR/MTC	✓	Mfr.'s T.C. shall be correlated with the consignment received.
	ii) Check for alignments, erection painting, DFT etc.		As agreed / required	B	Physical / measurements	Each installation	Tech Specs and Const. Drawings	SR		Erection shall be as per NTPC Tech. Specs.
	ii) Acceptance of the installation and working		As agreed / required	B	Physical / measurements	Each installation	Tech Specs and Const. Drawings	SR		Erection shall be as per NTPC Tech. Specs.
6	Galvanised Chicken Wire Mesh	Check for Guage and Dimensions from NTPC approved Source	As agreed / required	B	Acceptance	Random for each delivery	Tech Specs and Const. Drawings	SR		
9.00	FLOOR FINISHES AND ALIED WORKS									
1	Cement Concrete Flooring									
	i	Check for execution of concreting	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings	SR		
	ii	Check for providing and fixing glass/ PVC strips in joints	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings	SR		
	iii	Check for laying, polishing, curing, finishing for terrazzo, marble chip flooring	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings	SR		
	iv	Acceptance of lines, levels and finishing	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		
10.00	SANITORY INSTALLATIONS									
1		Check for size and surface finish of all sanitary items and fixtures from NTPC approved sources, (Check MTC wherever applicable)	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	To be procured from NTPC approved source
2		Acceptance of installations of all sanitary items and fixtures	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		
3	SCI, CI, S&S Pipes & Fittings etc									
	i	Check for Work man ship and finish	As agreed / required	B	Visual	Random	Tech Specs and Const. Drawings	SR		
	ii	Check for Unit weight and Dimensions	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings	SR		
	iii	Hydrostatic test	As agreed / required	A	Review of MTC for each delivery	Each lot of delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	
11.00	WATER SUPPLY AND ALL TYPES OF FITTINGS									
1		Check for size and surface finish of all water supply, GI/ MS pipes and fittings, Photo Voltaic Control System etc from NTPC approved sources (Check MTC wherever applicable)	As agreed / required	A	Physical / review of MTC	each delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	To be procured from NTPC approved source
2		Acceptance of installations of all water supply, GI pipes and fittings	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		
3	CI, S&S Pipes & Fittings									
	i	Check for Work man ship and finish	As agreed / required	B	Visual	Random as per Specifications	Tech Specs and Const. Drawings	SR		
	ii	Check for Unit weight and Dimensions	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings	SR		
	iii	Hydrostatic test	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	
4	Polyethylene Water Storage Tanks									
	i	Check for material of tanks from NTPC approved sources	As agreed / required	A	Physical / review of MTC	Each lot of delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	
	ii	Acceptance for instllation and fitting (IS 12701)	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		
12.00	DRAINAGE AND SANITATION									
1	Sanitary appliances									
	i	Check for Viterous China, Glazed, ceramic sanitary appliances (Water closets, Wash basins, urinals) etc.	As agreed / required	A	Physical / review of MTC	each delivery as per Specifications	Tech Specs and Const. Drawings	SR	✓	To be procured from NTPC approved source
	ii	Acceptance of installation of Viterous China, Glazed, ceramic sanitary appliances (Water closets, Wash basins, urinals) etc.	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		
2	SW Pipes and RCC Pipes									
	i	Check for size and surface finish of Pipes from NTPC approved sources	As agreed / required	A	Physical	100% after delivery	Tech Specs and Const. Drawings, IS458, IS 1536	SR	✓	

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.	QP NO. : REV. NO. : DATE : PAGE :	1 0		PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	North Karanpura STPP (3X660) FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / Instruments	Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks	
1	2	3	4	5	6	7	8	9	D*	10
ii		Testing of Joints	As agreed / required	B	Physical	100%	Tech Specs and Const. Drawings	SR		
i		Acceptance of installations of Pipes	As agreed / required	B	Acceptance	100%	Tech Specs and Const. Drawings	SR		Acceptance tests shall be done as per specifications
3	CI Pipes, Covers and Frames									
i		Check for CI and SFRC covers and frames as per IS 1726 and IS 12592 from NTPC approved sources (Check MTC wherever applicable)	As agreed / required	A	Physical / review of MTC	Each lot of delivery	Tech Specs and Const. Drawings, IS 1536, IS 12592	SR	✓	
ii		Acceptance of installations of CI Pipes, Covers and Frames	As agreed / required	B	Acceptance	1	Tech Specs and Const. Drawings	SR		
4	RCC manholes	Acceptance of RCC manholes after completion	As agreed / required	B	Acceptance	1	Tech Specs and Const. Drawings , IS 4111	SR		
13.00	FOUNDATION SYSTEM									
1	SHALLOW FOUNDATIONS									
i		Check for the foundation excavation - Location, Layout, size, depth etc	As required / agreed	B	Physical	Each location	As per technical specifications and construction drawings	SR	✓	lines and levels to be checked
ii		Check for the foundation casting - Layout, Shape, dimensions, Reinforcement, concreting, curing etc	As required / agreed	B	Physical	Each foundation	As per technical specifications and construction drawings	SR		lines and levels to be checked. Concrete Grade to be checked as per Mix Design
14.00	SHEETING AND OTHER WORKS									
1		Check for Material like modular areated panel, permanently colour coated sheets , metal decking , pre-engineered buildings, AC sheeting, Fire proof doors and insulations (all tests as per tehcnical Specifications)	As per manufacturer Standards	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings	MTC	✓	1)FQP for structural steel shall also be applicable.2) For aluminium door/windows, check for anodisation as per Tech. Spec. 3) Fire proof doors shall be procured from TAC Approved parties as per relevant IS/Tech. 4) For aluminium cladding grade of alminium to be checked.
2		Check for Storage at Site	As agreed / required	B	Visual	Random in each shift	Tech Specs and Const. Drawings	SR		
3		Installation, lap alignment & workmanship.	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings	SR		No gas cutting of sheets acceptable . Profile sheets will be kept covered in weather proof storage & stored at accurate height to avoid any exposure of actual water. Principle of first in and first out shall be apply for erecting the sheets.
4		Installation of lining & insulation & check thermal insulationfor wall cladding for thickness , density , thermal conductivityn at 50 deg c and all other tests as per IS:8183	As agreed / required	B	Testing	100%	Tech Specs and Const. Drawings	SR	✓	
5		Check for the installation, alignments, finishing etc	As agreed / required	B	Visual/ Physical	Random in each shift	Tech Specs and Const. Drawings	SR/LB		
6		Fasteners for sheeting work	As agreed / required	B	Review of TC including 1000 hrs salt spray test	100%	Tech Specs and Const. Drawings	SR/LB		
7		Acceptance of each type of installation	As agreed / required	B	Visual/ Physical	Each installation	Tech Specs and Const. Drawings	SR/LB		
15.0	PILING WORK (IF APPLICABLE)									
15.1	Execution									
i		100 mm Dia Borehole	As required	A	Physical	100%	NTPC Tech. Specs	SR/LB	✓	If carried out by the contractor
ii		Pile layout	Total station	B	Measurement	100%	As per appd. Drawings and technical	SR/LB	✓	
iii		Recording ground level	As required	B	Measurement	Random	IS:2911, as per appd. Drawings and technical	SR/LB	✓	
iv		Cleaning/Flushing of pile bore	As required	B	Visual	Random	As per appd. Drawings and technical	SR/LB	✓	
v		Size of bore and During boring of pile record commencement of SPT/ core recovery to ensure socketing length equivalent in terms of the Diameter of the pile below the socketing horizon.	As required	B	Measurement	100%	As per appd. Drawings and technical specification	SR/LB	✓	
vi		Trial mix to ascertain the workability and cube strength	After receiving the recommended mix design from specialist agency,	B	Physical	One for each mix proportion	NTPC tech specification	SR/LB	✓	Necessary correction for moisture content and water absorption according to mix design recommendation may be carried out during the trial mix
vii		Cement content	As required	B	Physical	Once per shift	As per approved design mix.	SR/LB	✓	At batching plant
viii		Pouring of concrete to project above cutoff level.	As required	B	Measurement	100%	As per appd. Drawings and technical specification	SR/LB	✓	
ix		Pile termination level	SPT & core recovery	A	Soil data	As per NTPC specifications	As per appd. Drawings and technical specification	SR	✓	
15.2	Testing									
		Best practice	IS:2720	A	Physical / testing	Once per source	As per IS:2720 / tech. Specs.	SR/LB	✓	Review of test report

**NORTH KARANPURA STPP ((3X660MW)
FLUE GAS DESULPHURISATION SYSTEM PACKAGE**

**SUB-SECTION-V-QD1
CIVIL WORKS**

LOGO	SUPPLIERS NAME AND ADDRESS:		INDICATIVE FIELD QUALITY PLAN				ANNEXURE- IV			
		ITEM : CIVIL WORK SUB-SYSTEM : Foundations, Excavation & Fill, Concrete, Building, Masonry Etc.	QP NO. : REV. NO. : DATE : PAGE :	1 0		PROJECT: PACKAGE: CONTRACT NO. MAIN CONTRACTOR	North Karanpura STPP (3X660) FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
Sl. No	Activity and operation	Characteristics / Instruments	Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks	
1	2	3	4	5	6	7	8	9	10	
ii		Density check on sample of mud collected from pile bore bottom	Sample collection	A	Physical	As per Tech. Spec.	As per NTPC Tech Spec.	SR/LB	✓	Tests to be done before placing concrete. Samples to be collected from pile bore bottom.
iii		Slump test of concrete	IS:1199	B	Physical	Every 2 hrs at pouring point of concrete	IS:2911, As per appd. Drawings and technical specification	SR/LB	✓	
iv		Cube sampling for works cube test	IS:456	B	Physical	One set of 6 cubes per 50 CuM or part thereof for each grade of concrete per shift whichever is earlier.	IS:2911, As per appd. Drawings and technical specification	SR/LB	✓	
v		Initial pile load test, Vertical (Compression), Lateral (horizontal) and pullout (tension).	IS:2911 / as required	A	Testing	100% for 3 nos. for each type or as specified in BOQ / Tech. Spec.	IS:2911, As per appd. Drawings and technical specification	SR/LB	✓	In case of compression test method the loading shall be cyclic.
vi		Routine pile tests, compression and horizontal	Calibrated dial gauges etc. as required.	A	Testing	100% for 0.5% of the total number of piles provided for each type of test/Tech. Spec.	IS:2911, As per appd. Drawings and technical specification	SR/LB	✓	Routine Test shall be conducted by direct loading method.
vii		Integrity Tests	PEM	A	Testing	100%	IS:2911, As per appd. Drawings and technical specification and suppliers manual	Test Report	✓	CHP
16.0 SPECIAL ITEMS										
16.1 Earthing Mat (Grounding System)										
i	Material	Earthing mat	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	As per relevant IS and Tech. Specs / Manufacturer's, IS 3043	SR/MTC	✓	
ii		Weld sizes & length	Visual/Tape	B	Visual/ Measurement	1	Tech Specs and Const. Drawings			NTPC approved electrodes shall be used
iii		D P test	DP test Kit	A	Physical	10% at random of the offered lot	Tech Specs and Const. Drawings	TR	✓	
iv		Earth test	Earthing test kit	A	Physical	1	Tech Specs and Const. Drawings,	SR	✓	
16.2 Bitumen layer for tank foundation										
i	Material	Grade of bitumen	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	As per relevant IS and Tech. Specs /MTC	SR/MTC	✓	
ii	Acceptance and workmanship	Application / workmanship	As agreed / required	B	Physical	Random	Tech Specs and Const. Drawings	SR		
16.3 Composite Aluminium Panels and structural glazing										
i	Material	Type of aluminium panels / structural glazing / fasteners and fixtures / silicon sealant	As agreed / required	A	EIC Approved source and review of MTC/ test reports	Each lot of delivery as per Specifications	Technical specifications / drawings	SR/MTC	✓	MTC shall cover all the properties / parameters as per technical specifications
ii	Acceptance and workmanship	Installation / workmanship	As agreed / required	B	Physical	Random	Technical specifications / drawings	SR		
LEGEND: D * Records, identified with "Tick" (✓) shall be essentially included by supplier in QA documentation.										
Legend to be used: Class # : A = Critical, B=Major, C=Minor; SR, TR, MTC, LB										
Manufact urer/ Sub- supplier	Main-supplier	Categorization Witnessing & Accepting (As per NTPC QA&I System) Category 'A' FQA Engineer in association with Executing Engineer, Category 'B' Executing Engineer, Category 'C' Executing Engineer ;SR = Site Register , TR= Test Report, MTC = Manufacturer's Test Certificate				For NTPC USE				
	Signature	This document shall be read in conjunction with NTPC Tech. Specifications, BOQ, Drawings				REVIEWED BY APPROVED BY APPROVAL SEAL				

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :	2	PROJECT:	North Karanpura STPP (3X660)			
		SUB-SYSTEM : FABRICATION & ERECTION		REV. NO. :	0	PACKAGE:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				DATE :		CONTRACT NO.				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
1.00	MATERIALS									
i		Structural steel procured from NTPC approved sources- Mechanical (YS, UTS, Elg, UT if specified),,and Chemical properties (CE as per IS)		A	Review	For each batch of each section delivered at site	Technical Specification and Construction Drawings, IS 2062	SR	√	Correlated MTC shall be verified. In the event of non submission of MTC , sample shall be selected by FQA for testing
2.00	FIT-UP									
2.01		Marking and Cutting	As agreed / required	B	Visual & Measurement	Each plate/ Section	Tech Specs and Const. Drawings/ Approved cutting plan	SR		
2.02		Match markings for trial assembled components	As agreed / required	B	Physical	Each fit-up	Tech Specs and Const. Drawings	SR		
2.03		Weld Fit Up	As agreed / required	B	Physical	Each fit-up	Tech Specs and Const. Drawings	SR	√	Edge Preparation/ Gap/ Alignment
3.00	PRE HEATING (wherever applicable)									
3.01		Pre-Heating Temperature	As agreed / required	B	Measurement	Each pre-heating	Tech Specs and Const. Drawings, Approved WPS	SR	√	
3.02		Post Weld Heat Treatment (PWHT), if required	As agreed / required	A	Time & Temperature	Each PWHT	Tech Specs and Const. Drawings, Approved WPS	SR	√	
4.00	WELDING REQUIREMENTS									
4.01		PQR and Welder's Qualification	As agreed / required	A	Physical	Each welder	Approved WPS/ PQR, AWS-D1.1/ASME IX, Tech Specs and Const. Drawings	Test Report	√	
4.02		Welding consumables	As agreed / required	B	Physical	Random in each shift	Approved WPS/ Owner Rationalized list of Electrodes.	SR	√	
4.03		Sequence of welding	As agreed / required	B	Physical	Random in each shift	Tech Specs and Const. Drawings, Agreed scheme	SR		
4.04		Removal/ grinding of temporary attachments	As agreed / required	B	Measurement	All cleats/ attachments	Tech Specs and Const. Drawings, IS-7215/Approved Drg.	SR		
4.05		Completeness after welding- Dimensions/ distortion	As agreed / required	B	Visual	Each structure component	Tech Specs and Const. Drawings	SR		
5.00	NON DESTRUCTIVE AND DESTRUCTIVE TESTING									
5.01	Fillet Welds									
5.01.01		Visual	As required/ agreed	B	Visual/ Measurement	Each welded joint	As per technical specifications and construction drawings	SR		As per requirement of Owner Engineer
5.01.02		Macro-Etch Examination	As required/ agreed	B	Physical	Main fillet weld with min one joint per built up beam, columns and crane girders	As per technical specifications and construction drawings	SR	√	

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :		2	PROJECT:	North Karanpura STPP (3X660)		
		SUB-SYSTEM : FABRICATION & ERECTION		REV. NO. :		0	PACKAGE:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE		
				DATE :			CONTRACT NO.			
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
5.01.03		Dye Penetration Test (DPT)	As required/ agreed	B	Physical	25% weld length of tension member of crane girder- For crane girder 5% of Weld length with min. 300mm at each location - Except Crane Girder, for all other Fillet Welds	As per technical specifications and construction drawings		SR	√
5.02	Butt Welds									
5.02.01		Visual	As required/ agreed	B	Visual	Random in each shift	As per technical specifications and construction drawings		SR	
5.02.02		Dye Penetration Test	As required/ agreed	B	Physical	100% DPT after back gouging on all butt welds except for coal bunker bins 10% DPT after back gouging-For coal bunker bins	As per technical specifications and construction drawings		SR	All butt welds to be back gouged before DPT
5.02.03		Mechanical testing on production test coupons	As required/ agreed	A	Physical	Min. one joint per built up beams, coloums and crane girder.	As per technical specifications and construction drawings		SR	√ Test on production test coupons
5.02.04		Radiography Test (RT)	As required/ agreed	A	Physical	100% RT on butt welds of tension flange (bottom flange) of crane girders 5% spot RT on butt welds / at inaccessible locations UT on butt welds- For coal bunker bins 10% RT weld length of each welder on butt welds, except for crane girders and coal bunk	As per technical specifications and construction drawings		SR	√ In case of failure of any welds in SPOT/RT or UT the % of retesting shall be doubled at that particular location. Acceptance criteria of NDT on welds shall be as per AWS D1.1. Wherever RT is not feasible UT to be carried out with the approval of the Engineer
5.03	Full Penetration Welds (Other than butt welds)									

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :	2	PROJECT:	North Karanpura STPP (3X660)			
		SUB-SYSTEM : FABRICATION & ERECTION		REV. NO. :	0	PACKAGE:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				DATE :		CONTRACT NO.				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
5.03.01		Ultrasonic Testing (UT)	As required/ agreed	A	Physical	100% UT on the web to flange joint of crane girder 10% UT on other full penetration joints	As per technical specifications and construction drawings		IR	√ In case of failure of any welds in SPOT/RT or UT the % of retesting shall be doubled at that particular location. Acceptance criteria of NDT on welds shall be as per AWS D1.1.
5.04	NON DESTRUCTIVE AND DESTRUCTIVE TESTING FOR CHIMNEY STEEL LINER									
i		Visual examination	As required/ agreed	B	Visual	100%	As per technical specifications and construction drawings, IS 822, AWS D 1.1		SR	√ As per requirement of NTPC Engineer
ii		DPT	As required/ agreed	B	Physical	100%	As per technical specifications and construction drawings, IS 822, AWS D 1.1		IR	√
iii		RT	As required/ agreed	A	Physical	10% FOR SHOP BUTT WELD AND 15% FOR SITE BUTT WELDS	As per technical specifications and construction drawings, IS 822, AWS D 1.1			
6.00	FOUNDATION CHECKS									
6.01		Dimensions and levels	As agreed / required	B	Physical/ Measurement	Each Foundation	Tech Specs and Const. Drawings		SR	√ Shape, lines (including diagonal checks)
		Foundation Bolts (materials)	As agreed / required	A	Physical and MTC Review	Once for each lot of delivery	Tech Specs and Const. Drawings		SR/MTC	√ Foundation bolts shall conform to IS:5624 and property class shall be 4.6 as per IS:1367 (Part-3).
6.02		Foundation Bolts and Embedments	As agreed / required	B	Physical/ Measurement	Each Foundation	Tech Specs and Const. Drawings		SR	√ Measurement of Verticality, Levels, pitch distance
7.00	PRE-ASSEMBLY CHECKS									
7.01		Punch Erection marks and match marks on members	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings			Markings for - Assembly designation, Part number, Weight, Any other important identifications.
7.02		Pre-assembly as per match mark	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings			
7.03		Camber, sweep and total length after trial assembly of structure.	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings		SR	√
7.04		Control assembly check at shop	As agreed / required	B	Visual/ Physical	Every first and tenth set of identical structure	Tech Specs and Const. Drawings			
8.00	ERECTION CHECKS									
8.01		Alignment, slopes, level, tolerances of erected member	As agreed / required	B	Measurement	Each structural member	Tech Specs and Const. Drawings		SR	√

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :	2	PROJECT:	North Karanpura STPP (3X660)			
		SUB-SYSTEM : FABRICATION & ERECTION		REV. NO. :	0	PACKAGE:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				DATE :		CONTRACT NO.				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
8.02		Tightening of bolts including foundation bolts with lock nuts	As agreed / required	B	Visual/ Physical	Each structural member	Tech Specs and Const. Drawings	SR	√	
8.03		Acceptance of erected structure	As agreed / required	B	Visual/ Physical	Each erected structure	Tech Specs and Const. Drawings, IS 7215 and IS 12843	SR	√	
9.00	INSTALLATION AND ALIGNMENT OF STEEL LINER									
i		Submission of Installation/ Erection Scheme/ methodology for all structures	-	B	Approval	Once prior to erection of each structure	Approved drawings and Technical Specifications	SR	√	
ii		Check for Erection Marks	-	B	Visual	100%	Approved drawings and Technical Specifications	SR		
iii		Check for Installation of Steel Liners	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications	SR		
iv		Check for Site Joints	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications	SR		
v		Check for Installation of Inlet Transition Ducts	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications	SR		
vi		Check for Installation of Insulations and Expansion Compensators	As required	B	Visual, Physical, Acceptance	100%	Approved drawings and Technical Specifications	SR		Each layer of expansion Compensator to be checked at shop for thickness, unit weight, tensile strength & elongation along with temp. withstandability for composite joints
vii		Ensure the Erection of all steel structures along with permissible tolerances and their acceptance	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications	SR		
viii		Check and approval for Dismantling, Modification and Re-erection, if required for any reason	As required	B	Visual/ Acceptance	100%	Approved drawings and Technical Specifications	SR		
10.00	PAINTING SYSTEM									
10.01		Painting Materials and accessories	As agreed / required	A	Review of MTC	Each batch of delivery	Tech Specs and Const. Drawings	SR/MTC	√	Mfr.'s T.C. shall be correlated with the consignment received.
10.02		Surface preparation	As agreed / required	B	Physical /visual	Random in each shift	Tech Specs and Const. Drawings, Relevant code/ standards	SR	√	
10.03		DFT of paint - Over steel surface	As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings	SR	√	
10.04		Acceptance of painted surfaces	As agreed / required	B	Physical	Each surface at random	Tech Specs and Const. Drawings	SR		
11.00	PERMANENT BOLTS AND NUTS AND WASHERS									
11.01		Material	As agreed / required	A	Physical and MTC Review	Once for each lot of delivery	Tech Specs and Const. Drawings	SR/MTC	√	All bolts for connections shall be conforming to IS: 12427 and of property class 5.6 as per IS:1367 (Part 3). Nuts shall conform to IS:1363 (Part 3) of property class 5
11.02		Contact surfaces before bolting	As agreed / required	B	Physical	Random before assembly for bolting	Tech Specs and Const. Drawings, IS 4000	SR		

LOGO	SUPPLIERS NAME AND ADDRESS:	INDICATIVE FIELD QUALITY PLAN					ANNEXURE- V			
		ITEM : STRUCTURAL STEEL WORK		QP NO. :	2	PROJECT:	North Karanpura STPP (3X660)			
		SUB-SYSTEM : FABRICATION & ERECTION		REV. NO.:	0	PACKAGE:	FLUE GAS DESULPHURISATION SYSTEM PACKAGE			
				DATE :		CONTRACT NO.				
				PAGE :		MAIN CONTRACTOR				
Sl. No	Activity and operation	Characteristics / instruments		Class# of check	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Remarks
1	2	3		4	5	6	7	8	9	D* 10
11.03		Inspection of the assembled bolts	As agreed / required	B	Physical	Randomly in each shift for assembled bolts	Tech Specs and Const. Drawings, IS 4000	SR		
11.04		Tensioning	As agreed / required	B	Physical	Randomly during snug tight test and after full tensinoning	Tech Specs and Const. Drawings, IS 4000	SR	√	
11.05		Acceptance of installed bolts	As agreed / required	B	Physical	Each bolt	Tech Specs and Const. Drawings	SR		
12.00	STAINLESS STEEL HAND RAILS									
12.01		Material	As agreed / required	A	Physical/MTC Review(In case procured by contractor)	Once for each lot of delivery	Tech Specs and Const. Drawings	SR/MTC	√	Also check grade of steel
12.02		DPT for welding	As agreed / required	A	Physical	Random for each fabrication	AWS D1.1 / 'Tech Specs and Const. Drawings	SR/LB	√	WPS shall be submitted for Owner approval , electrodes used shall be as specified in WPS
12.03		Acceptance of stainless steel hand rails	As agreed / required	B	Physical	Each installation	Tech Specs and Const. Drawings	SR		
13.00	PTFE SLIDING BEARINGS AND ELASTOMERIC BEARINGS									
13.01		Material from approved source	As agreed / required	A	Physical and MTC Review	Once for each lot of delivery	Tech Specs and Const. Drawings	SR/MTC	√	
13.02		Acceptance of installation of bearings	As agreed / required	B	Physical	Each installation	Tech Specs and Const. Drawings	SR		
LEGEND: D * Records, indentified with "Tick" (√) shall be essentially included by supplier in QA documentation. Legend to be used: Class # : A = Critical, B=Major, C=Minor; SR, TR, MTC, LB							DOC. NO.: REV: 0			
Manufac turer/ Sub-supplier	Main-supplier	Categorization Witnessing & Accepting (As per Owner QA&I System) Category 'A' FQA Engineer in association with Executing Engineer, Category 'B' Executing Engineer, Category 'C' Executing Engineer ;SR = Site Register , TR= Test Report,MfrTC = Manufacturer's Test Certificate					For Owner USE			
		Signature						REVIEWED BY	APPROVED BY	APPROVAL SEAL
This document shall be read in conjunction with Owner Tech. Specifications, BOQ, Drawings										

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	LIST OF CODES AND STANDARDS			
	Indian Standards	Title	International and Internationally recognised standards	
	IS:277	Galvanised steel sheets (plain or corrugated)		
	IS:655	Specification for metal air duct		
	IS:800	Code of practice for use of structural steel in general building construction	BS 449:1969 BS 5950 ASA A57, 1-1952	
	IS:807	Code of practice for design, manufacture, erection and testing (Structural portion) of cranes and hoists 6588 (Issued by Standards Association of Australia). DIN 120:1936 (Sheet 1) DIN 120:1936 (Sheet 2) 327 part-I, 1951 BS 466 part-II, 1960 BS 644:1960 BS 1757:1951 BS 2573:part-I:1960	Draft Revision of A.S. NO. CS.2 SAA Crane and Hoist code Doc:No. BU/4 Rev	
	IS:875	Code of practice for design loads (other than earthquake) for buildings and structures Leading standards (issued by Canadian Standard) DIN-1055-1955 (Issued by ASA)	National Building code of Canada (1953)-Part-IV Design section 4.1	
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 46 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	IS:1239 Part-I	Mild steel tubes	(ISO/R 65-1957) (ISO/R-64-1958) (ISO/R-65-1958) (BS 1387 : 1957)	
	IS:1239 Part-II	Mild steel tubulars and other wrought steel pipe fittings	BS 1387 : 1967 BS 1387 :1967 BS 1740 :1965	
	IS:2825	Code for unfired vessels		
	IS:1520	Horizontal centrifugal pumps for clear cold and fresh water		
	IS:1600	Code for practice for performance of constant speed IC Engines for general purpose		
	IS:1601	Specification for performance of constant speed IC Engines for general Purpose		
	IS:1893	Criteria for earthquake resistant design of structures		
	IS1978-1971	Line Pipe April 1969.	API Standards 5L	
	IS:2254-1970	Dimensions of vertical shaft motor for pumps	IEC Pub 72-1 part I NEMA Pub MG 1 1954	
	IS:2266	Steel wire ropes for general engineering purposes	BS :302 : 1968	
	IS:2312	Propellant type Ventilation fans		
	IS:2365	Steel wire suspension ropes for lifts and hoists	BS : 1957	
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 47 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	IS:3346	Method for the determination of thermal conductivity of thermal insulation materials (two slab guarded hot plate method)	DIN 52612 (Deutscher Normenausschuss) ASTM C 163-1964 (American Society of Testing and materials) ASTM C 167-1974 ASTM C 177-1963	
	IS:3354	Outline dimensions for electric lifts.		
	IS:3401	Silica gel		
	IS:3588	Specification for electrical axial flow fans		
	IS:3589	Electrically welded steel pipes for water, gas and sewage (200mm to 2000 mm Nominal Diametre)		
	IS:3677	Unbonded rock and slag wool for thermal insulation		
	IS:3815	Point hook with shank for general engineering purposes	BS 482 - 1968 Doc.:67/3 1284 (Revision of BS 2903) (Issued BS)	
	IS:3895	Specification for monocry-stallines semiconductor rectifier cells and stacks		
	IS:3963	Roof extractor unit		
	IS:3975	Mild steel wires, strips and tapes for armouring cables		
	IS:4503	Shell and tube type heat Exchanger		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 48 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	IS:4540 IS:4671 IS:4736 IS:4894 IS:5456 IS:5749 IS:6392 IS:6524 Part-I IS:7098 IS:7373 IS:7938 ISO:1217 ASHRAE-33 and air heating coils. ASHRAE-52-76	Specification for monory- stallines rectifire assembly equipment Expanded polystyrene for thermal insulation purpose Hot dip zinc coating on steel tubes Centrifugal fans Code of practice for testing of positive displacement type air compressors and exhauster (For Test Tolerance Only) Forged ramshorn hooks Steel pipe flanges Code of practice for design of tower cranes Static and rail mounted Cross linked Polyethylene insulated PVC sheathed cables Specification for wrought aluminium and aluminium sheet and strips Air receivers for compressed air installation Displacement compressor-Acceptance test Methods of testing for rating of forced circulation air cooling Air cleaning device used in general ventilation for removing particle matter.	 Entwurf DIN 15402 Blett 1 Entwurf DIN 15402 BS 3017-1958 BS 4504 : 1969 BS 2799 : 1956 Standard No. 1 to IPCEA (USA) Pub. No. 5-66-524	
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 49 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	ASHRAE-22-72 Method of testing for rating of water cooled refrigerant condensers. ASHRAE 23-67 Methods of testing for rating of positive displacement refrigerant compressors. ARI-450-6 Standard for water cooled refrigerant condensers. ARI-550 Standard for centrifugal water chilling packages. ARI-410 Standard for forced circulation air cooling and air heating coils ARI-430/435 Central station AHU/Application of Central Station AHU BS:848 (Part-1,2) Fans BS:400 Low carbon steel cylinders for the storage & transport of permanent gases. BS:401 Low carbon steel cylinders for the storage & transport of liquified gases. CTI Code Acceptance test code for Water Cooling Tower. ACT-105 ANSI-31.5 Refrigerant piping ASME-PTC- Atmospheric Water Cooling Equipment 23-1958 AMCA A-21C Test Code for air moving devices API:618 Reciprocating Compressor for general refinery services. HYDRAULIC INSTITUTE STANDARDS. HYDRANT SYSTEM MANUALS OF TAC. TAC MANUALS OF SPRAY SYSTEM NFPA USA/ NSC UK/ UL USA/ FM USA STANDARDS. INDIAN EXPLOSIVES ACT. INDIAN FACTORIES ACT. STANDARD OF TUBULAR EXCHANGER MANUFACTURER'S ASSOCIATION.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 50 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	CODE AND STANDARD FOR CIVIL WORKS Some of the applicable Standards, Codes and references are as follows: Excavation & Filling IS: 2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL) Methods of test for soils-determination for water content etc. IS: 4701 Code of practice for earth work on canals. IS: 9758 Guide lines for Dewatering during construction. IS: 10379 Code of practice for field control of moisture and compaction of soils for embankment and sub-grade. Properties, Storage and Handling of Common Building Materials IS: 269 Specification for ordinary Portland cement, 33 grade. IS: 383 Specification for coarse and fine aggregates from natural sources for concrete. IS: 432 Specification for mild steel and (Parts 1&2) medium tensile steel bars and hard-drawn steel wires for concrete reinforcement. IS: 455 Specification for Portland slag cement. IS: 702 Specification for Industrial bitumen. IS: 712 Specification for building limes. IS: 808 Rolled steel Beam channel and angle sections. IS: 1077 Specification for common burnt clay building bricks. IS: 1161 Specification of steel tubes for structural purposes. IS: 1363 Hexagon head Bolts, Screws and nuts of production grade C. IS: 1364 Hexagon head Bolts, Screws and Nuts of Production grade A & B. IS: 1367 Technical supply conditions for Threaded fasteners. IS: 1489 Specification for Portland-pozzolana cement: (Part-I) Fly ash based.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 51 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	(Part-II) Calcined clay based. IS: 1542 Specification for sand for plaster. IS: 1566 Specification for hard-drawn steel wire fabric for concrete reinforcement. IS: 1786 Specification for high strength deformed bars for concrete reinforcement. IS: 2062 Specification for steel for general structural purposes. IS: 2116 Specification for sand for masonry mortars. IS: 2386 (Parts-I to VIII) Testing of aggregates for concrete. IS: 3150 Hexagonal wire netting for general purpose. IS: 3495 (Parts-I to IV) Methods of tests of burnt clay building bricks. IS: 3812 Specification for fly ash, for use as pozzolana and admixture. IS: 4031 Methods of physical tests for hydraulic cement. IS: 4032 Methods of chemical analysis of hydraulic cement. IS: 4082 Recommendations on stacking and storage of construction materials at site. IS: 8112 Specification for 43 grade ordinary portland cement. IS: 8500 Medium and high strength structural steel. IS: 12269 53 grade ordinary portland cement. IS: 12894 Specification for Fly ash lime bricks. Cast-In-Situ Concrete and Allied Works IS: 280 Specification for mild steel wire for general engineering purposes. IS: 456 Code of practice for plain and reinforced concrete.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 52 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS: 457 Code of practice for general construction of plain & reinforced concrete for dams & other massive structures. IS: 516 Method of test for strength of concrete. IS: 650 Specification for standard sand for testing of cement. IS: 1199 Methods of sampling and analysis of concrete. IS: 1791 General requirements for batch type concrete mixers. IS: 1838 (Part-I) Specification for preformed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type). IS: 2204 Code of practice for construction of reinforced concrete shell roof. IS: 2210 Criteria for the design of reinforced concrete shell structures and folded plates. IS: 2438 Specification for roller pan mixer. IS: 2502 Code of practice for bending and fixing of bars for concrete reinforcement. IS: 2505 General requirements for concrete vibrators, immersion type. IS: 2506 General requirements for concrete vibrators, screed board type. IS: 2514 Specification for concrete vibrating tables. IS: 2645 Specification for Integral cement water proofing compounds. IS: 2722 Specification for portable swing weigh batches for concrete. (single and double bucket type) IS: 2750 Specification for Steel scaffolding. IS: 2751 Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction. IS: 3025 Methods of sampling and test waste water. IS: 3366 Specification for Pan vibrators. IS: 3370 Code of practice for concrete structures for the storage of			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 53 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	(Part I to IV) IS: 3414 IS: 3550 IS: 3558 concrete. IS: 4014 (Parts I & II) IS: 4326 of buildings. IS: 4461 IS: 4656 IS: 4925 IS: 4990 IS: 4995 (Parts I & II) IS: 5256 IS: 5525 concrete work. IS: 5624 IS: 6461 IS: 6494 IS: 6509 IS: 7861 IS: 9012 IS: 9103	liquids. Code of practice for design and installation of joints in buildings. Methods of test for routine control for water used in industry. Code of practice for use of immersion vibrators for consolidating concrete. Code of practice for steel tubular scaffolding. Code of practice for earthquake resistant design and construction of buildings. Code of practice for joints in surface hydro-electric power stations. Specification for form vibrators for concrete. Specification for batching and mixing plant. Specification for plywood for concrete shuttering work. Criteria for design of reinforced concrete bins for the storage of granular and powdery materials. Code or practice for sealing joints in concrete lining on canals. Recommendations for detailing of reinforcement in reinforced concrete work. Specification for foundation bolts. Glossary of terms relating to cement concrete. Code of practice for water proofing of underground water reservoirs and swimming pools. Code of practice for installation of joints in concrete pavements. Code of practice for extreme weather concreting. (Parts I & II) Recommended practice for shot concreting. Specification for admixtures for concrete.	
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 54 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS: 9417 Recommendations for welding cold worked steel bars for reinforced concrete construction. IS: 10262 Recommended guidelines for concrete mix design. IS: 11384 Code of practice for composite construction in structural steel and concrete. IS: 11504 Criteria for structural design of reinforced concrete natural draught cooling towers. IS: 12118 Specification for two-parts poly sulphide. IS: 12200 Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams. IS: 13311 Method of non-destructive testing of concrete. Part-1 Ultrasonic pulse velocity. Part-2 Rebound hammer. SP:23 Handbook of concrete mixes SP: 24 Explanatory Handbook on IS: 456-1978 SP: 34 Handbook on concrete reinforcement and detailing. Precast Concrete Works SP: 7(PartVI/ National Building Code- Structural design of prefabrication and Sec.7) systems building. IS: 10297 Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units. IS: 10505 Code of practice for construction of floors and roofs using pre-cast reinforced concrete units. Masonry and Allied Works IS: 1905 Code of Practice for Structural Safety of Buildings-Masonry walls. IS: 2212 Code of Practice for Brickwork.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2		GENERAL TECHNICAL REQUIREMENTS PAGE 55 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS: 2250 Code of Practice for Preparation and use of Masonry Mortar. SP: 20 Explanatory hand book on masonry code. Sheeting Works IS:277 Galvanised steel sheets (plain or corrugated). IS: 459 Unreinforced corrugated and semi-corrugated asbestos cement sheets. IS: 513 Cold-rolled carbon steel sheets. IS: 730 Specification for fixing accessories for corrugated sheet roofing. IS: 1626 Specification for Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings. IS: 2527 Code of practice for fixing rain water gutters and down pipe for roof drainage. IS: 3007 Code of practice for laying of asbestos cement sheets. IS: 5913 Methods of test for asbestos cement products. IS: 7178 Technical supply conditions for tapping screw. IS: 8183 Bonded mineral wool. IS: 8869 Washers for corrugated sheet roofing. IS: 12093 Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanised steel sheets. IS: 12866 Plastic translucent sheets made from thermosetting polyester resin (glass fibre reinforced). IS: 14246 Specification for continuously pre-painted galvanised steel sheets and coils. Fabrication and Erection of Structural Steel Work IS: 2016 Specification for plain washers.			
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 56 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	IS: 814 IS: 1852 IS: 3502 IS: 6911 IS: 3757 IS: 6623 IS: 6649 IS: 800 IS: 816 IS: 4000 IS: 9595 IS: 817 IS: 1811 IS: 9178 IS: 9006 IS: 7215 IS: 12843 IS: 4353 SP: 6 (Part 1 to 7)	Specification for covered Electrodes for Metal Arc Welding for weld steel. Specification for Rolling and Cutting Tolerances for Hot rolled steel products. Specifications for chequered plate. Specification for stainless steel plate, sheet and strip. Specification for high strength structural bolts Specification for high strength structural nuts. High Tensile friction grip washers. Code of practice for use of structural steel in general building construction. Code of practice for use of Metal Arc Welding for General Construction. Code of practice for assembly of structural joints using high tensile friction grip fasteners. Code of procedure of Manual Metal Arc Welding of Mild Steel. Code of practice for Training and Testing of Metal Arc Welders. Qualifying tests for Metal Arc Welders (engaged in welding structures other than pipes). Criteria for Design of steel bins for storage of Bulk Materials. Recommended Practice for Welding of Clad Steel. Tolerances for fabrication steel structures. Tolerance for erection of structural steel. Recommendations for submerged arc welding of mild steel and low alloy steels. ISI Hand book for structural Engineers.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 57 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	IS: 1608 Method of Tensile Testing of Steel products other than sheets, strip, wire and tube. IS: 1599 Method of Bend Tests for Steel products other than sheet, strip, wire and tube IS : 228 Methods of chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel. IS : 2595 Code of Practice for Radio graphic testing. IS : 1182 Recommended practice for Radiographic Examination of fusion welded butt joints in steel plates. IS : 3664 Code of practice for Ultra sonic Testing by pulse echo method. IS : 3613 Acceptance tests for wire flux combination for submerged Arc Welding. IS : 3658 Code of practice for Liquid penetrant Flaw Detection. IS : 5334 Code of practice for Magnetic Particle Flaw Detection of Welds. Plastering and Allied Works IS : 1635 Code of practice for field slaking of Building lime and preparation of putty. IS : 1661 Application of cement and cement lime plaster finishes. IS : 2333 Plaster-of-paris. IS : 2402 Code of practice for external rendered finishes. IS : 2547 Gypsum building plaster. IS : 3150 Hexagonal wire netting for general purpose. Acid and Alkali Resistant Lining IS : 158 Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting. IS : 412 Specification for expanded metal steel sheets for general purpose.		
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS	PAGE 58 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
	IS : 4441 Code of practice for use of silicate type chemical resistant mortars. IS : 4443 Code of practice for use of resin type chemical resistant mortars. IS : 4456 Method of test for chemical resistant tiles. (Part I & II) IS : 4457 Specification for ceramic unglazed vitreous acid resistant tiles. IS : 4832 Specification for chemical resistant mortars. Part I Silicate type Part II Resin type Part III Sulphur type IS : 4860 Specification for acid resistant bricks. IS : 9510 Specification for bitumasitc, Acid resisting grade. Water Supply, Drainage and Sanitation IS : 458 Specification for concrete pipes. IS : 554 Dimensions for pipe threads, where pressure tight joints are made on thread. IS : 651 Specification for salt glazed stoneware pipes. IS : 774 Flushing cisterns for water closets and urinals. IS : 775 Cast iron brackets and supports for wash basins and sinks. IS : 778 Copper alloy gate, globe and check valves for water works purposes. IS : 781 Cast copper alloy screw down bib taps and stop valves for water services. IS : 782 Caulking lead. IS : 783 Code of practice for laying of concrete pipes.	
NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW) FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-4410-109-2	GENERAL TECHNICAL REQUIREMENTS PAGE 59 OF 82

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS : 1172 Basic requirements for water supply, drainage and sanitation. IS : 1230 Cast iron rain water pipes and fittings. IS : 1239 Mild steel tubes, tubulars and other wrought steel fittings. IS : 1536 Centrifugally cast (Spun) iron pressure pipes for water, gas and sewage. IS : 1537 Vertically cast iron pressure pipes for water, gas and sewage. IS : 1538 Cast iron fittings for pressure pipe for water, gas and sewage. IS : 1703 Ball valves (horizontal plunger type) including float for water supply purposes. IS : 1726 Cast iron manhole covers and frames. IS : 1729 Sand cast iron spigot and socket, soil, water and ventilating pipes, fittings and accessories. IS : 1742 Code of practice for building drainage. IS : 1795 Pillar taps for water supply purposes. IS : 1879 Malleable cast iron pipe fittings. IS : 2064 Code of practice for selection, installation and maintenance of sanitary appliances. IS : 2065 Code of practice for water supply in building. IS : 2326 Automatic flushing cisterns for urinals. IS : 2470 (Part-I & II) Code of practice for installation of septic tanks. IS : 2501 Copper tubes for general engineering purposes. IS : 2548 Plastic seat and cover for water-closets. IS : 2556 (Part 1 to 15) Vitreous sanitary appliances (vitreous china). IS : 2963 Non-ferrous waste fittings for wash basins and sinks.			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	IS : 3114 Code of practice for laying of cast iron pipes. IS : 3311 Waste plug and its accessories for sinks and wash basins. IS : 3438 Silvered glass mirrors for general purposes. IS : 3486 Cast iron spigot and socket drain pipes. IS : 3589 Electrically welded steel pipes for water, gas and sewage (200mm to 2000mm nominal diameter). IS : 3989 Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories. IS : 4111 (Part I to IV) Code of practice for ancillary structure in sewerage system. IS : 4127 Code of practice for laying of glazed stone-ware pipes. IS : 4764 Tolerance limits for sewage effluents discharged into inland-surface waters. IS : 4827 Electro plated coating of nickel and chromium on copper and copper alloys. IS : 5329 Code of practice for sanitary pipe work above ground for buildings. IS : 5382 Rubber sealing rings for gas mains, water mains and sewers. IS : 5822 Code of practice for laying of welded steel pipes for water supply. IS : 5961 Cast iron grating for drainage purpose. IS : 7740 Code of practice for road gullies. IS : 8931 Cast copper alloy fancy bib taps and stop valves for water services. IS : 8934 Cast copper alloy fancy pillar taps for water services. IS : 9762 Polyethylene floats for ball valves. IS : 10446 Glossary of terms for water supply and sanitation.		
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
		IS : 10592 Industrial emergency showers, eye and face fountains and combination units. IS : 12592 Specification for precast concrete manhole covers and frames. IS : 12701 Rotational moulded polyethylene water storage tanks. SP: 35 Hand book on water supply and drainage. - Manual on Sewerage and sewage treatment (Published by CPH & EEO) As updated. Doors, Windows and Allied Works IS : 204 Tower Bolts Part-I Ferrous metals. Part-II Nonferrous metals. IS : 208 Door Handles. IS : 281 Mild steel sliding door bolts for use with padlocks. IS : 362 Parliament Hinges. IS : 420 Specification for putty, for use on metal frames. IS : 1003 Specification for timber panelled and glazed shutters- Part-I door (Part-I) shutters. IS : 1038 Steel doors, windows and ventilators. IS : 1081 Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators. IS : 1341 Steel butt hinges. IS : 1361 Steel windows for industrial buildings. IS : 1823 Floor door stoppers. IS : 1868 Anodic coatings on Aluminium and its alloys. IS : 2202 Specification for wooden flush door shutters (solid core type); (Part-II) particle board face panels and hard board face panels		
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
		IS:2209 Mortice locks (vertical type). IS:2553 Safety glass IS:2835 Flat transparent sheet glass. IS:3548 Code of practice for glazing in buildings. IS:3564 Door closers (Hydraulically regulated). IS : 3614 Fire check doors; plate, metal covered and rolling type. IS:4351 Steel door frames. IS:5187 Flush bolts. IS:5437 Wired and figured glass IS:6248 Metal rolling shutters and rolling grills. IS:6315 Floor springs (hydraulically regulated) for heavy doors. IS:7196 Hold fasts. IS:7452 Hot rolled steel sections for doors, windows and ventilators. IS:10019 Mild steel stays and fasteners. IS:10451 Steel sliding shutters (top hung type). IS:10521 Collapsible gates. R oof Water Proofing and Allied Works IS:1203 Methods of testing tar and bitumen. IS:1322 Specification for bitumen felts for water proofing and damp proofing. IS:1346 Code of practice for water proofing of roofs with bitumen felts. IS:1580 Specification for bituminous compound for water proofing and caulking purposes.		
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS:3067 Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings. IS:3384 Specification for bitumen primer for use in water proofing and damp proofing. Floor Finishes and Allied Works IS:1237 Specification for cement concrete flooring tiles. IS:1443 Code of practice for laying and finishing of cement concrete flooring tiles. IS:2114 Code of practice for laying in-situ terrazzo floor finish. IS:2571 Code of practice for laying in-situ cement concrete flooring. IS:3462 Specification for unbacked flexible PVC flooring. IS:4971 Recommendations for selection of industrial floor finishes. IS:5318 Code of practice for laying of flexible PVC sheet and tile flooring. IS:8042 Specification for white portland cement. IS:13801 Specification for chequered cement concrete flooring tiles. Painting and Allied Works IS:162 Specification for fire resisting silicate type, brushing, for use on wood, colour as required. IS:1477 Code of practice for painting of ferrous metals in buildings. Part-I Pretreatment. Part-II Painting. IS:1650 Specification for colours for building and decorative finishes. IS:2074 Specification for red oxide-zinc chrome, priming, ready mixed paint air drying. IS:2338 Code of practice for finishing of wood and wood based materials. Part-I Operations and workmanship			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	Part-II IS:2395 Part-I Part-II IS:2524 Part-I Part-II IS:2932 IS:2933 IS:4759 IS:5410 IS:5411 (Part-I) IS:6278 IS:10403	Schedules Code of practice for painting concrete, masonry and plaster surfaces. Operations and workmanship. Schedule. Code of practice for painting of nonferrous metals in buildings. Pretreatment. Painting. Specification of synthetic enamel paint, exterior, under-coating and finishing. Specification enamel paint, under coating and finishing. Code of practice for hot dip zinc coating on structural steel and other allied products. Specification for cement paint Specification for plastic emulsion paint-for exterior use Code of practices for white washing and colour washing. Glossary of terms relating to building finishes.	
		Piling and Foundation IS:1080 IS:1904 IS:2911 IS:2950 IS:2974 (Part-I TO V) IS:6403	Code of practice for design and construction of simple spread foundations. Code of practice for design and construction of foundations in Soils; General Requirements. Code of practice for designs and construction of Pile foundations (Relevant Parts). Code of practice for designs and construction of Raft (Part-I) foundation. Code of practice for design and construction of machine foundations. Code of practice for determination of Allowable Bearing pressure on Shallow foundation.
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IS:8009 Code of practice for calculation of settlement of foundation subjected to symmetrical vertical loads. Part-I Shallow foundations. Part-II Deep foundations. IS:12070 Code of practice for design and construction of shallow foundations on rocks. DIN:4024 Flexible supporting structures for machines with rotating machines. VDI:2056 Criteria for assessing mechanical vibrations of machines. VDI:2060 Criteria for assessing rotating imbalances in machines. Stop Log and Trash Rack IS:4622 Recommendations for fixed - wheel gates structural design. IS:5620 Recommendations for structural design criteria for low head slide gates. IS:11388 Recommendations for design of trash rack for intakes. IS:11855 General requirements for rubber seals for hydraulic gates. Roads IRC:5 Standard specifications and Code of practice for road bridges, section-I general Features of Design. IRC:14 Recommended practice of 2cm thick bitumen and tar carpets. IRC:16 Specification for priming of base course with bituminous primers. IRC:19 Standard specifications and code of practice for water bound macadam. IRC:21 Standard specifications and Code of practice for road bridges, section-III - Cement concrete (plain and reinforced). IRC:34 Recommendations for road construction in waterlogged areas. IRC:36 Recommended practice for the construction of earth embankments for road works. IRC:37 Guidelines for the Design of flexible pavements. IRC:56 Recommended practice for treatment of embankment slopes for erosion control. IRC:73 Geometric design standards for rural (non-urban) highways. IRC:86 Geometric Design standards for urban roads in plains.			
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	IRC:SP:13	Guidelines for the design of small bridges & culverts.	
	IRC - Publication	Ministry of Surface Transport (Roads Wing), Specifications for road and bridge works.	
	IS:73	Specification for paving bitumen	
	Loadings		
	IS:875 (Pt. I to V)	Code of practice for design loads other than earthquake) for buildings and structures.	
	IS:1893	Criteria for earthquake resistant design of structures.	
	IS:4091	Code of Practice for design and construction of foundation for transmission line towers & poles.	
	IRC:6	Standard specifications & code of practice for road bridges, Section-II Loads and stresses.	
	M.O.T.	Deptt. of railways Bridge Rules.	
	Safety		
	IS:3696 (Part I & II)	Safety code for scaffolds and ladders.	
	IS:3764	Safety code for excavation work.	
	IS:4081	Safety code for blasting and related drilling operations.	
	IS:4130	Safety code for demolition of buildings.	
	IS:5121	Safety code for piling and other deep foundations.	
	IS:5916	Safety code for construction involving use of hot bituminous materials.	
	IS:7205	Safety code for erection on structural steelwork.	
	IS:7293	Safety code for working with construction machinery.	
	IS:7969	Safety code for handling and storage of building materials	
	IS:11769	Guidelines for safe use of products containing asbestos.	
	- Indian Explosives Act. 1940 as updated.		
	Architectural design of buildings		
	SP:7	National Building Code of India	
	SP:41	Hand book on functional requirements of buildings (other than industrial buildings)	
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 		
	Miscellaneous IS:802 Code of practice for use of structural steel in (Relevant parts) overhead transmission line towers. IS:803 Code of practice for design, fabrication and erection of vertical mild steel cylindrically welded in storage tanks. IS:10430 Criteria for design of lined canals and liner for selection of type of lining. IS:11592 Code of practice for selection and design of belt conveyors. IS:12867 PVC handrails covers. CIRIA Design and construction of buried thin-wall pipes. Publication REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents. Temperature Measurements - Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974). - Temperature measurement - Thermocouples ANSI MC 96.1 - 1982. - Temperature measurement by electrical Resistance thermometers - IS:2806. - Thermometer - element - Platinum resistance - IS:2848. Pressure Measurements - Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964). - Electronic transmitters BS:6447. - Bourdon tube pressure and vacuum gauges - IS:3624 - 1966. - Process operated switch devices (Pr. Switch) BS-6134.		
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	REFERENCE						EXISTING					READ AS				
SI No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line										
1.	VI	E	I	1 OF 2 10 of 14	1.00.00 (B)		SCHEMES					SCHEMES				
							SI . N o	Drawings Title	Drawing s No.	R e v . N o .	No. of She ets	SI . N o	Drawings Title	Drawing s No.	R e v . N o .	No. of She ets
							1)	.....	.....	.	....	1)	.....	.....	.	....
							...			.	...	...			.	...
							3)	LIME STONE FLOW DIAGRAM	4410-000-2-POM-002	A	2	3)	LIME STONE FLOW DIAGRAM	4410-000-2-POM-002	B	2
							..			.	..	..			.	..
												Revised Drawing attached at Annexure V				
2.	VI	A	III-A2	1 of 7	1.01.00		SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT This shall be read in conjunction with Limestone Flow Diagram and the Limestone layout enclosed elsewhere in the specification. ROM Limestone of (-) 250 mm size shall be delivered to North					SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT This shall be read in conjunction with Limestone Flow Diagram and the Limestone layout enclosed elsewhere in the specification. ROM Limestone of (-) 250 mm size shall be delivered to North Karanpura power plant by trucks. Two (2) numbers Truck Tipplers				

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REFERENCE							EXISTING	READ AS
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							Karanpura power plant by trucks. The Limestone shall be unloaded in underground RCC hoppers by means of self-tipping trucks and shall be conveyed though a series of conveyors for further crushing, conveying/storage etc. Alternatively, Bidder may provide complete Truck unloading system comprising of of Bulk material receiving unit and Surface feeder.	capable of handling minimum 40 Ton Capacity Trucks (Gross Weight: 60 Ton) shall be provided. The Limestone shall be unloaded in underground RCC and shall be further conveyed though apron feeder and a series of conveyors for further crushing, conveying/storage etc. Alternatively, Bidder may provide complete Truck unloading system comprising of of Bulk material receiving unit and Surface feeder.
3.	VI	A	III-A2	3 of 7	2.01.01		ading system for unloading of limestone from trucks complete with drives, accessories all mechanical, electrical civil & structural works, including enclosure for dust containment during unloading. The truck unloading system shall comprise of either of the following a. Two number underground RCC Truck hoppers (TH1 & TH2), each of 60 ton capacity, along with access ramp for trucks, grating, dust enclosure etc. Clear access shall be provided for movement of pay loaders/ bulldozers on the paved area and on the hopper grating in order to remove the oversized limestone. Gratings with 300mm X 300mm clear openings over	Two (2) numbers unloading system comprising Two Truck Tippers for unloading of limestone from trucks complete with hydraulic drives, accessories all mechanical, electrical civil & structural works, including enclosure for dust containment during unloading. The truck unloading system shall comprise of either of the following a. Two number underground RCC Truck hoppers (TH1 & TH2), each of 90 ton capacity, along with access ramp for trucks, grating, dust enclosure etc. Clear access shall be provided for movement of pay loaders/ bulldozers of 35MT weight on the paved area and on the hopper grating in order to remove the oversized

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REFERENCE							EXISTING	READ AS
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							unloading hopper shall be placed and designed accordingly. b. Two number bulk receiving units for ROM Limestone of size (-)250 mm each rated for 75TPH along with access ramp as required, receiving hoppers/box feeder/surface feeder, dust enclosure etc. The units shall be complete with drives, accessories all mechanical, electrical civil & structural works	limestone. Gratings with 300mm X 300mm clear openings over unloading hopper shall be placed and designed accordingly. b. Two number bulk receiving units for ROM Limestone of size (-)250 mm each rated for 150 TPH along with access ramp as required, receiving hoppers/box feeder/surface feeder, dust enclosure etc. The units shall be complete with drives, accessories all mechanical, electrical civil & structural works
4.	VI	A	III-A2	1 of 7	1.01.00		<u>Each Apron feeder shall be of 75 MTPH rated capacity.</u> The rated capacity of conveyor 1A/B shall be 150 MTPH. Alternatively two numbers <u>bulk receiving unit along with surface feeders etc. each rated for 75TPH capacity</u> shall be provided.	<u>Each Apron feeder shall be of 150 MTPH rated capacity.</u> The rated capacity of conveyor 1A/B shall be 150 MTPH. Alternatively two numbers <u>bulk receiving unit along with surface feeders etc. each rated for 150 TPH capacity</u> shall be provided.
5.	VI	B	I-M2	2.02.10	3 of 111			Truck Tippler a. Each hydraulic Truck tippler shall consist of heavy duty steel fabricated frame with anti skid chequered plate welded on it, pair of heavy duty hydraulic cylinder for lifting, overturning arrestor, a pair of back stopper and mechanical locking arrangement. b. The hydraulic power pack shall be totally enclosed and consist of hydraulic gear pump, electric motor with starter panel, hydraulic oil tank, control valves,

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REFERENCE							EXISTING	READ AS
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								high pressure pipe line & hoses , control panel fitted with push button switches etc c. Capacity : 60 Ton Max. Tilting angle : 55 Main Structure : Steel IS 2062/IS 1570
6.	VI	A	III-A2	1 of 7	1.01.00		In Crusher house, Limestone from incoming Conveyor 1A will pass through dedicated Vibrating Feeder (VF-1) and dedicated Crushers (CR-1). Similarly Limestone from incoming Conveyor 2B will pass through dedicated Vibrating Screening Feeders (VF-2) and dedicated Crushers (CR-2) respectively. Each dedicated stream shall have a set of Rod gate and Rack & Pinion Gate before Vibrating Feeder. The dedicated Limestone flow stream shall permit maintenance of equipment, hoppers and chutes in one stream without affecting the operation of other stream.	In Crusher house, Limestone from incoming Conveyor 1A will pass through dedicated Vibrating Screening Feeder (VSF-1) and dedicated Crushers (CR-1). Similarly Limestone from incoming Conveyor 2B will pass through dedicated Vibrating Screening Feeders (VSF-2) and dedicated Crushers (CR-2) respectively. Each dedicated stream shall have a set of Rod gate and Rack & Pinion Gate before Vibrating Feeder. The dedicated Limestone flow stream shall permit maintenance of equipment, hoppers and chutes in one stream without affecting the operation of other stream.

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	REFERENCE						EXISTING			READ AS		
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							Each Vibrating Feeder shall be of 150TPH rated capacity. Each crusher shall be of 150 MTPH rated capacity which shall crush limestone to (-) 20mm size. Crushed limestone shall drop on Conveyor 2A/B.			Each Vibrating Screening Feeder shall be of 150TPH rated capacity. Each crusher shall be of 150 MTPH rated capacity which shall crush limestone to (-) 20mm size. Crushed limestone shall drop on Conveyor 2A/B.		
7.	VI	B	I-M2	3 of 112	2.02.03		Design capacities & margins			Design capacities & margins		
SI no							Equipment	Duty requirement	SI no	Equipment	Duty requirement	
1							Crushers	2x50%	1	Crushers	1x100%	
2.							Vibrating screening feeders	2x50%	2.	Vibrating Screening feeders	1x100%	
3.							Paddle feeders	1X100%	3.	Paddle feeders	1X100%	
4							Belt feeder for crusher house	2x50%	4	Belt feeder for crusher house	1x100%	

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
8.	VI	A	III-A2	6 of 7	2.01.27		Service water, cooling water and potable water system for complete limestone handling plant including Pumps ,drives, sumps, piping etc and all mechanical, electrical and civil works.	Service water, cooling water and potable water system for complete limestone handling plant including Pumps ,drives, sumps, piping etc and all mechanical, electrical and civil works. Alternatively, Air cooled type scoop coupling is also acceptable for all conveyors with HT motors for (LHP, GHP) and crusher scoop couplings. Suitable interlock.....
9.	VI	A	III-A2	5 of 7	2.01.23		Two (2) numbers of in line magnetic separators on conveyors 1A/B and two (2) number of suspended magnets on each conveyor 1A/B complete with handling arrangement, reject chutes, reject trolleys, supporting arrangement and all mechanical, electrical, civil, structural works and accessories	Two (2) numbers of in line magnetic separators on conveyors 1A/B and four (4) number of suspended magnets on each conveyor 1A/B & 5A/B complete with handling arrangement, reject chutes, reject trolleys, supporting arrangement and all mechanical, electrical, civil, structural works and accessories
10.	VI	B	I-M2	3 of 112	2.02.06		Crushers, wagon tipplers, apron feeders, side arm j-rail hoists (travel and hoisting) , elevators, rack and pinion gates, all the drives in sampling units, various pumps of DS/DE systems, service water systems, cooling water system, potable water system and sump pumps, Ventilation Fans.	Crushers, apron feeders, elevators, rack and pinion gates, all the drives in sampling units, various pumps of DS/DE systems, service water systems, cooling water system, potable water system and sump pumps, Ventilation Fans.

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11.	VI	A	Functional Guarantees	12 of 16	5.00.00		Guaranteed power consumption of single stream conveyors and associated equipments (vibrating screen , crushers, belt feeders, paddle feeders) for limestone and gypsum handling at rated capacities.	Guaranteed power consumption of single stream conveyors and associated equipments (vibrating screen feeder , crushers, belt feeders, paddle feeders) for limestone and gypsum handling at rated capacities. Duty Factor 0.3 shall be considered for the for Limestone handling system and Duty Factor 1 shall be considered for Gypsum handling system .
12.	VI	A	III-A2	2 OF 7	1.01.00		Stacking Conveyor 3A/B will drop limestone to over ground storage hopper provided within a shed via travelling trippers. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B.	Stacking Conveyor 3A/B will drop limestone to storage hopper (One fourth (1/4 th) of total stipulated crushed limestone storage shall be considered in the hopper, if applicable, and hopper length shall be equal to stockpile length placed along the tripper centerline) provided within a shed via travelling trippers. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B.
13.	VI	A	III-A2	5 OF 7	2.01.22		One (1) number of passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of limestone crusher house.	One (1) number conventional enclosure type passenger cum goods elevator having capacity of 16 persons (1088 kg) complying to IS:14665 (latest edition) with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of lime stone crusher house. Staircase access for machine room shall also be

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								provided by the bidder.
14.	VI	A	III-A2	5 of 7	2.01.18		Two (02) numbers limestone sampling units one each for conveyors 1A/B & 5A/B for sampling of as received limestone and crushed limestone being fed to the FGD System complete with all accessories and electrical, civil, structural works, supporting structures, approach/ maintenance platforms etc.	One (01) numbers limestone sampling units one each for conveyors 1A/B for sampling of as received limestone being fed to the FGD System complete with all accessories and electrical, civil, structural works, supporting structures, approach/maintenance platforms etc.
15.	VI	A	III-A2	4 of 7	2.01.10		Two (2) numbers of vibrating feeders of 150TPH rated capacity in limestone crusher house to feed the limestone to crushers with drives, dust hoods, all mechanical, electrical accessories and supporting structures etc.	Two (2) numbers of vibrating screening feeders of 150TPH rated capacity in limestone crusher house to feed the limestone to crushers with drives, dust hoods, all mechanical, electrical accessories and supporting structures etc.
16.	SECTION-VI/Part-B		I-M4 Fire Detection & Protection System	1 OF 18	3.01.00		<u>HVW and MVW spray system</u> It shall consist of: Spray pumps, pressurization arrangements, water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y-type strainers, spray nozzles /projectors, spray nozzles piping network, detection system,	<u>HVW and MVW spray system</u> It shall consist of water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y-type strainers, spray Nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, local control

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							instrumentation, local control panels, cables etc.	panels, cables etc.
17.	SEC TIO N- VI/ Part -B		I-M3 Air Cond itioni ng & Venti lation Syst em	2 of 27	3.02.00 (iii)		(iii) Battery Rooms & Oil rooms and fumes/odour generating areas - Combination of Supply air fan & Exhaust air fans. Motor shall be flame proof.	(iii) Battery Rooms & Oil Rooms and Other fumes / odour generating areas - Combination of exhaust air fans / roof exhausters and intake louvers fans . Motor shall be flame proof.
18.	SEC TIO N- VI/ Part -B		SUB- SEC TION -I-M3 (AIR CON DITI ONI NG AND VEN TILA TION SYS TEM)	1 of 27 1-2 of 26	3.01.00		Unitary Air Filtration (UAF) units of min. capacity 75,000 m3/hr or capacity calculated considering 8 air changes per hour whichever is higher, shall be provided for Non-Air Conditioned areas of FGD (e.g. Switch gear rooms, cable galleries, etc.)	Modular type Unitary Air Filtration (UAF) units of suitable capacity ((1X100%) shall be provided for non-Air conditioned area of FGD (e.g. Switch gear rooms, cable galleries, etc.). Design condition of evaporative type ventilation system mentioned in clause 7.02.02 sub-Section-V (salient design data, Part-A of technical specification section VI. All non-air conditioned area of FGD (Cable gallery & MCC room shall be positively ventilated and exhaust shall be through gravity.
19.	SEC TIO N- VI/ Part -B		I-M4 Fire Dete ction & Prote	16 of 18	7.06.00		Deluge Valves, Alarm Valves, Foam monitors , Water monitors, Foam Proportioning equipments, Foam makers , etc.	Deluge Valves, Alarm Valves, Water monitors, etc.

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			ction Syst em					
20.	SEC TIO N- VI/ Part -B		SUB SEC TION -I M4 Fire Dete ction & Prot ectio n Syst em	13 of 18	5.15.00 Cabling for fire alarm system NOTES: (3)-		3. Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas . Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system.	3. Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor shall provide all the cables so as to complete the system.
21.	SEC TIO N- VI/ Part -B		SUB SEC TION -I M4 Fire Dete ction & Prot ectio n Syst	14 of 18	5.18.00		Multisensor Detection System ii) Cross zoning of the signal from two adjacent multisensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and MWW spray system of cable galleries.	Multisensor Detection System ii) Cross zoning of the signal from two adjacent multisensor detectors shall be employed to initiate the fire extinguishing system of MWW spray system of cable galleries.

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			em					
22.	Sec tion -VI (TS) Part -A		Sub-section-III-A3 Fire Fighting System	4 of 5	4.00.00, 1.4		Five numbers each type of Portable fire extinguishers consisting of water type, dry chemical powder type, CO2 type shall be provided in various facilities of FGD system.	The contractor shall supply the following quantity (minimum) of fire extinguishers and install the same at various locations of FGD system as per TAC requirement. 1. Pressurized water type (9lit. capacity as per IS 15683): 5 nos 2. CO2 type (4.5 kg Cap IS:15683): 5 nos 3. Dry chemical type (6 kg Cap IS:15683) : 5 nos
23.	VI	A	I	3 of 18	1.03.01		Wet limestone based Flue gas desulphurization(FGD) for 2X 800 MW unit, capable of reducing to the specified limits the emissions of Sulphur Dioxide in flue gas produced by specified coal being fired in boiler....	Wet limestone based Flue gas desulphurization(FGD) for 3X 660 MW unit, capable of reducing to the specified limits the emissions of Sulphur Dioxide in flue gas produced by specified coal being fired in boiler....
24.	VI	A	I	4 of 18	3.00.00		The drawings.....The scope and terminal points of the equipment to be furnished under this steam generator package shall be as identified in these drawings and read in conjunction with text of the specification.....	The drawings.....The scope and terminal points of the equipment to be furnished under this FGD package shall be as identified in these drawings and read in conjunction with text of the specification.....

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
25.	VI	B	I-M1	23 of 49	6.07.02		The limestone slurry pumps shall be designed to meet the requirements stipulated in Cl. No.9.00.00. of this Sub-Section.	The limestone slurry pumps shall be designed to meet the requirements stipulated in Cl. No.8.00.00 of this Sub-Section.
26.	VI	A	I	13 of 18	4.02.04		In case Bidder or its agency do not meet the requirements at 2.1	In case Bidder or its agency do not meet the requirements at 4.02.01
27.	VI	A	III – A1	3 OF 8	3.01.03		Two (2) limestone slurry tanks, each tank sized to meet 12 hrs total limestone slurry storage requirement for two units at Design point, complete with all accessories and Agitator(s).	Two (2) limestone slurry tanks, each tank sized to meet 12 hrs total limestone slurry storage requirement for Three units at Design point, complete with all accessories and Agitator(s).
28.	VI	A	III – A1	4 OF 8	5.01.00		The employer envisages a common gypsum dewatering system for the two (2) units.	Gypsum dewatering system shall be common for all the Three (3) units.
29.	VI	B	I-M1	22 OF 49	6.06.02		The agitators shall be designed to meet the requirements stipulated in Cl. No. 12.00.00 of this Sub-Section.	The agitators shall be designed to meet the requirements stipulated in Cl. No. 11.00.00 of this Sub-Section.
30.	VI	B	I-M1	3 OF 49	1.03.08		In case of a power failure all items of equipment (e.g. minimum one agitator in absorber and limestone slurry tank, flue gas damper upstream & downstream of	In case of a power failure all items of equipment (e.g. minimum one agitator in absorber and limestone slurry tank, flue gas damper upstream of FGD, Process water pump &

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REFERENCE							EXISTING	READ AS
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							FGD, Process water pump & lube oil system of Booster Fan & Ball Mill) which may cause irreversible damage to the FGD System shall be connected to the emergency power supply system to be provided by the Contractor.	lube oil system of Booster Fan & Ball Mill) which may cause irreversible damage to the FGD System shall be connected to the emergency power supply system to be provided by the Contractor. Bidder shall furnish a list of all such Auxiliaries in their bid proposal.
31.	VI	B	I-M1	5 OF 49	3.02.01		The flue gas ducts shall be sized and designed to meet all the criteria as specified in Cl. No 17.00.00 this subsection.	The flue gas ducts shall be sized and designed to meet all the criteria as specified in Cl. No 16.00.00 this subsection.
32.	VI	B	I-M1	20 OF 49	6.03.05		In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of coal.	In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of Limestone .
33.	VI	B	I-M1	22 OF 49	6.06.01		The contractor.....common for all mills. Each tank requirement of the two units operating whichever is lower.	The contractor.....common for all units . Each tank requirement of the three units operating whichever is lower.

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
34.	VI	B	I-M1	32 OF 49	13.03.0 0		2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (total 4 nos. of pumps for 3x660 MW) along with all necessary piping, valves, control & instrumentation shall be provided by the Contractor.	2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (total 6 nos. of pumps for 3x660 MW) along with all necessary piping, valves, control & instrumentation shall be provided by the Contractor.
35.	VI	B	I-M1	15 OF 49	5.04.00		Gypsum Bleed Pump The Pumps shall be designed to meet the stipulation of Clause No. 9.00.00 of this sub-section	Gypsum Bleed Pump The Pumps shall be designed to meet the stipulation of Clause No. 8.00.00 of this sub-section
36.	VI	A	III-A1	8 OF 8	18.00.0 5		A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided.	A common Nickel based alloy material storage/neutralizing tank for the all the three units of storage capacity of 12 hrs of stack condensate of all the three stack shall be provided.
37.	VI	B	I-M1	29 OF 49	10.01.0 0		All the slurry Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor. Tanks suction-side of these pumps shall be	All the slurry Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor. Tanks suction-side of these pumps shall be provided.

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							provided.							
38.	VI	A	V	2 OF 10	3.00.00		Sl. No.	Item	Guaran tee Point	Design Point	Sl. No.	Item	Guaran tee Point	Design Point
							1	--	--	--	1	--	--	--
							2	--	--	--	2	--	--	--
							5	Gas flow at the FGD inlet when firing respective coal (Nm3/sec)	769 (1135 m3/s)	852 (1305 m3/s)	5	Gas flow at the FGD inlet when firing respective coal (Nm3/sec)	748 (1188 m3/s)	800 (1317 m3/s)
							6	--	--	--	6	--	--	--
							7	Flue gas---			7	Flue gas---		
							(i)	O ₂ (% v/v wet)	6.18	5.8	(i)	O ₂ (% v/v wet)	6.23	6.156
							(ii)	CO ₂ (% v/v wet)	9.1	8.92	(ii)	CO ₂ (% v/v wet)	8.9845	8.6910
							(iii)	H ₂ O (% v/v wet)	14.63	17.92	(iii)	H ₂ O (% v/v wet)	14.58	16.9425
							(iv)	SO ₂ (% v/v wet)	0.088	0.087	(iv)	SO ₂ (% v/v wet)	0.0855	0.0845
							(v)	N ₂ (% v/v wet)	70	68.00	(v)	N ₂ (% v/v wet)	70.12	68.13
							(vi)	Inlet SO ₂ (mg/Nm ³ -wet)	2437	2407	(vi)	Inlet SO ₂ (mg/Nm ³ -wet)	2440	2410
							(vii)	--	--	--	(vii)	--	--	--
							(viii)	Dust (mg/Nm ³)	50-200	50-200	(viii)	Dust (mg/Nm ³)	50	50-200
							(iv)	SO ₃ (ppm) (at 6% O ₂ wet)	--	--	(ix)	SO ₃ (ppm) (at 6% O ₂ wet)	--	--

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REFERENCE							EXISTING				READ AS			
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							--	--	--	--	(x)	HCL (ppm) wet	45	45
							--	--	--	--	(xi)	HF (ppm) wet	12	12
							8	--	--	--	8	--	--	--
39.	VI	A	V	3of 10	3.01.00		Wet stack sizing criteria Wet stack shall be sized for the following conditions				Wet stack			
							S	Item	Design Condition		S	Item	Design Condition	
							N				N			
							1	Boiler load in MW (e)	VWO		a) Wet stack sizing criteria A wet stack shall be installed downstream of wet flue gas Desulfurization system by the contractor. Clean gas from the absorber shall be taken to wet stack through three stage mist eliminators. Treated flue gas from the absorber shall be discharged through a wet stack without reheating of the flue gas.			
							2	Gas flow at FGD inlet (m3/sec)	Design point (as given in cl. No. 3.00.00)		The Contractor, shall take into account the entire characteristics of expected combination of fuels to be fired, for the complete load range of operation and the expected numbers of Steam Generator start-ups while designing the wet stack flue liner considering Steam Generator in operation both with & without FGD system in operation. The wet stack fuel liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of wet stack flue liner projecting over the wet stack roof shall be wrapped with 2mm thick Titanium/ C-276 sheet over insulation. The wet stack shall be designed as per the guidelines of ERPI Revised Wet Stack Design Guide. Alternatively, Contractor can also provide wet stack of 8 mm thick (minimum) mild steel with Borosilicate Glass Block lining of minimum 38 mm thickness, which should have been in successful operation for similar application in at least two (2) units, located at different locations, for a period not less than two (2) years as on the date of Techno-commercial bid opening. In such a case, contractor/ Lining supplier shall provide a ten (10) year full replacement guarantee and fulltime onsite QA supervision, during erection & commissioning, by the supplier of the lining system. External surface of wet stack flue liner projecting over the wet stack roof shall be wrapped with 2 mm thick Titanium / C-276 sheet.			
							3	Gas temperature at chimney inlet (deg. C)	To be worked out by bidder considering design point condition.					

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							4	Flue gas velocity (m/sec) (Maximum)	18	1	Boiler load in MW (e)	VWO
										2	Gas flow at FGD inlet (m3/sec)	Design point (as given in cl. No. 3.00.00)
										3	Gas temperature at chimney inlet (deg. C)	To be worked out by bidder considering design point condition.
										4	Flue gas velocity (m/sec) (Maximum)	18
										(b) A wet stack study shall be performed by the Contractor for each unit with a wet stack installation where there does not exist an identical or mirror image installation that has already had a wet stack study performed. A wet stack model study shall consist of the following: (i) Condensation calculations (ii) Minimum 1:12 scale physical flow model for liquid collector design (iii) Computation flow model for plume downwash analysis (iv) Physical or computation flow model for CEMS elevation flow performance (c) Liquid collectors shall be designed and developed experimentally using a physical model. The model shall begin at the outlet of the absorber mist eliminator(s), include the absorber outlet and ducting, the stack breaching duct and a minimum of three (3) diameters of the stack liner above the top of the stack breaching duct. Physical model shall include any internal devices that may affect the gas flow, such as structural members, flow controls, and expansion joints. Liquid collectors shall be located where needed in the absorber outlet, the ductwork between the absorber outlet and		

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								the wet stack liner, in the wet stack liner, and in the exit nozzle. These collectors shall collect liquid from surfaces, prevent re-entrainment, and guide the liquid to location where it can be drained out of the system and prevent the discharge of droplets from the top of the stack that are large enough to rain out to the ground before evaporation.
40.	VI	B	I-M1	6 OF 49	3.02.04		The duct to Absorber inlet thickness. The duct from Absorber outlet to wet stack inlet shall be made of cladded sheet of minimum 2 mm thickness of either Titanium (Grade 2 as per ASME SB265) or C-276 over 8 mm thick (minimum) mild steel base metal. Cladding	The duct to Absorber inlet thickness. The duct from Absorber outlet to wet stack inlet shall be made of Carbon steel of minimum 7 mm thickness cladded with minimum 2 mm thickness of Alloy C-276 / Alloy 59 or better material.

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							shall be done to achieve the required quality as per ASTM B 898-11.	
41.	VI	B	I-M1	26 OF 49	7.07.03		2x100% horizontal centrifugal pumps shall be provided to feed the secondary hydrocyclones. Each pump shall be sized to empty the full storage capacity of the tank in 6 hrs.	2x100% horizontal centrifugal pumps shall be provided to feed the secondary hydrocyclones.
42.	VI	B	I-M1	6 OF 49	3.03.01		The arrangement in operation. Guillotine gate type damper is being provided by the Employer before the suction of each Booster fan. A gas tight outlet of each booster fan. A Pneumatic operated multi louver damper with seal air arrangement shall also be provided by the Contractor in the clean gas duct after GGH.	The arrangement in operation. Guillotine gate type damper shall be provided by the contractor before the suction of each Booster fan. A gas tight..... outlet of each booster fan.
43.	VI	B	I-M1	7 OF 49	3.03.07		A damper in the bypass duct is being provided by the Employer for quick opening to allow.....condition.	A quick acting biplane damper shall be provided by the contractor in the bypass duct (flue gas duct connecting the

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							All the gates.....use of seal air fans of the damper. The dampers shall be 100% leak tight with seal air fans under operation. The gas tightness and size.	existing chimney) for quick opening to allow..... condition. All the gates.....use of seal air fans of the damper & 100 % with seal air fans under operation. The bypass dampers (quick acting biplane) shall have a guaranteed gas tightness efficiency (on flow) of not less than 99.5 % and 100 % leak tight with seal air fans under operation. The gas tightness..... and size.
44.	VI	B	I-M1	7 OF 49	3.03.08		The blades material.	Clause deleted.
45.	VI	B	I-M1	7 OF 49	3.03.09		The dampers..... absorber spray system or the GGH. The dampers hand wheel.	The dampers..... absorber spray system or any emergency condition in FGD system. The dampers hand wheel.

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	REFERENCE						EXISTING	READ AS												
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46.	VI	B	I-M1	7 OF 49	3.03.10		The isolating..... in fully closed position.	The isolating..... in fully open & closed position.												
47.	VI	B	I-M1				Nil	Clause added 3.03.11 Pressurization Fan : a) All the gates shall be provided with 2x100% pressurization fans to achieve 100% sealing efficiency. b) The location and scheme for pressurization system shall be subject to Employer's approval.												
48.	VI	B	I-M1				Nil	Clause added 3.03.12 All gates shall be designed to withstand the operating air and flue gas temperature without distortion.												
49.	VI	B	I-M1				Nil	Clause added 3.03.13 All guillotine gates shall be located in horizontal duct to avoid fly ash build up when in closed position and shall be of top entry type.												
50.	VI	A	III – A1	6 OF 8	6.02.00		The contractor shall provide 1x100% slurry pumps of the contractor.	The contractor shall provide 2x100% slurry pumps..... of the contractor.												
51.	VI	B	I-M1	21 OF 49	6.05.01		There shall be 2X100% tube mills for grinding of limestone. Each occurring together. <table border="1"><tr><td>(i)</td><td>----</td><td>-----</td></tr><tr><td>(ii)</td><td>Flow</td><td>110% of limestone requirement of two absorbers at Design point.</td></tr></table>	(i)	----	-----	(ii)	Flow	110% of limestone requirement of two absorbers at Design point.	There shall be 2X100% Wet ball mills for grinding of limestone. Each occurring together. <table border="1"><tr><td>(i)</td><td>----</td><td>-----</td></tr><tr><td>(ii)</td><td>Flow</td><td>110% of limestone requirement of all the</td></tr></table>	(i)	----	-----	(ii)	Flow	110% of limestone requirement of all the
(i)	----	-----																		
(ii)	Flow	110% of limestone requirement of two absorbers at Design point.																		
(i)	----	-----																		
(ii)	Flow	110% of limestone requirement of all the																		

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							(iii)	---	-----			three absorbers at Design point.
							---	-----	-----	(iii)	----	-----
							--			---	-----	-----
52.	VI	B	I-M1	27 OF 49	7.07.09		Contractor shall provide on-load cleaning system, etc.			Clause deleted.		
53.	VI	B	I-M1	27 OF 49	7.07.10		Bucket conveyors shall in the Contractor's scope.			Clause deleted.		
54.	VI	B	I-M1	27 OF 49	7.07.11		A storage room for provided by the contractor.			Clause deleted.		
55.	VI	A	III-A1	5 OF 8	5.02.00		Each set (suitable for handling /dewatering of one unit) of dewatering equipment wash water line.			Each set (suitable for handling /dewatering of all the three units) of dewatering equipment was h water line.		
56.	VI	B	I-M1	9 of 49	4.01		 Note to 4.01.01 & 4.01.02: Booster fan shall have a minimum stall margin of 10% over the Design duty points.			 Note to 4.01.01 & 4.01.02: 1. Booster fan shall have a minimum stall margin of 10% over the Design duty points.		

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								2. Pressure specified at Booster Fan suction is without DeNox system in service. Suction pressure correction in view of DeNOx system in service has to be considered.
57.	VI	B	I-M1	25 of 49	7.04.09		Gypsum cake being provided by the Employer. The elevation of discharge point of vacuum belt filter shall be at least 10.0 m above GL.	Gypsum cake being provided by the Contractor.
58.	VI	B	I-M1	38 of 49	16.01.08 (b)(ii)		Internal stiffening external stiffeners. Such internal stiffeners for the flue gas duty between boiler and ESP shall be provided with erosion protection shields.	Internal stiffening external stiffeners.
59.	VI	B	I-M1	13 of 49	5.01.00 A(iii)		The slurry recirculation pumps shall have a minimum margin of 10% of flow and head, over the actual size and type.	The slurry recirculation pumps shall have a minimum margin of 10% of flow and frictional head, over the actual size and type.
60.	VI	A	III-A1	5 OF 8	5.02.00		The over flow from the 2X100% vacuum belt filter system.	The gypsum slurry from each Absorber shall be fed to a common Primary hydro cyclone

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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	REFERENCE						EXISTING	READ AS																														
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line																																
								feed tank (sized for minimum 1 hr storage capacity) from where it will be fed to each primary set of hydro cyclone through 2X100% Primary hydro cyclone pumps. The over flow from the 2X100% vacuum belt filter system.																														
61.	VI	B	I-M1	5 of 49	3.01.00		The entire flue conditions:<table><tr><td>1</td><td>Design internal pressure at 67% yield strength (mm wc)</td><td>+660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher.</td></tr><tr><td>2</td><td>--</td><td>--</td></tr><tr><td>-</td><td>--</td><td>--</td></tr><tr><td>-</td><td>--</td><td>--</td></tr><tr><td>6</td><td>--</td><td>--</td></tr></table>	1	Design internal pressure at 67% yield strength (mm wc)	+660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher.	2	--	--	-	--	--	-	--	--	6	--	--	The entire flue conditions:<table><tr><td>1</td><td>Design internal pressure at 67% yield strength (mm wc)</td><td>For upto booster fan inlet ±660 mm wg & +660 and -150 mmwc for booster fan outlet onward or maximum conceivable head of Booster fan, whichever is higher.</td></tr><tr><td>2</td><td>--</td><td>--</td></tr><tr><td>-</td><td>--</td><td>--</td></tr><tr><td>-</td><td>--</td><td>--</td></tr><tr><td>6</td><td>--</td><td>--</td></tr></table>	1	Design internal pressure at 67% yield strength (mm wc)	For upto booster fan inlet ±660 mm wg & +660 and -150 mmwc for booster fan outlet onward or maximum conceivable head of Booster fan, whichever is higher.	2	--	--	-	--	--	-	--	--	6	--	--
1	Design internal pressure at 67% yield strength (mm wc)	+660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher.																																				
2	--	--																																				
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2	--	--																																				
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6	--	--																																				
62.	VI	B	I-M1	37 of 49	16.01.03		Duct Design Pressure All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum	Duct Design Pressure The flue gas upto Booster fan inlet shall be designed for 660 mm w.g. at 67 % yield strength of																														

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
							conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material	material. The flue gas duct from Booster fan outlet shall be designed for +660 mm and -150 mm w.g. or maximum conceivable pressure of the Booster fan, at 67 % yield strength of material.
63.	VI	A	V	4 of 10	4.00.00		Predicted Performance data at FGD Inlet at various Loads Table- 1 Table-2 VWO - Valve wide open	Predicted Performance data at FGD Inlet at various Loads Refer Annexure-I
64.	VI	B	I-M1	28 of 49	8.09.00		The design of the shaft shall ensure that the operating speed is at least 20% above the critical speed of the shaft.	The design of the shaft shall ensure that the critical speed is at least 20% above the operating speed of the shaft.

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
65.	VI	B	I-M1	19 of 49	5.06.23		In case of Spray Tower System, Suction screens shall be installed inside the Absorber vessel to protect the Slurry recirculation pumps. In case Bubbling type, suction strainers shall be installed at the suction line side of Gas Cooling Pumps. For the agitators a flushing system for start ups shall be provided.	In case of Spray Tower System, Suction screens shall be installed inside the Absorber vessel to protect the Slurry recirculation pumps. In case Bubbling type, suction strainers shall be installed at the suction line side of Gas Cooling Pumps. The Suction screen shall be made of Alloy 59 / C276 or abrasion resistant FRP/Polypropylene (in case Contractor/Collabrator has proven experience). For the agitators a flushing system for start ups shall be provided.
66.	VI	B	I-M1	19 of 49	5.06.22		The bottom for this. The bottom of the absorber sump shall be designed in such a way that complete drainage of the absorption liquid/slurry is possible and is accessible without damage of lining/ rubber .	The bottom for this. The bottom of the absorber sump shall be designed in such a way that complete drainage of the absorption liquid/slurry is possible and is accessible without damage of lining.
67.	VI	B	I-M1	23 of 49	6.07.03		The limestone load operation. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of	The limestone load operation. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 6 mm

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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	REFERENCE						EXISTING	READ AS																		
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line																				
							minimum 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.																		
68.	VI	B	I-M1	28 of 49	8.07.00		For absorber recirculation service a Silicon carbide impeller and SiC lining for casing can also be accepted if the manufacturer has supplied a similar pump for a previous installation for similar service.	For absorber recirculation service a Silicon carbide/ hi-chrome impeller and SiC lining for casing can also be accepted if the manufacturer has supplied a similar pump for a previous installation for similar service.																		
69.	VI	A	VII	4 of 38	1.03.00		<table><tr><td>Absorber</td><td></td></tr><tr><td>1. Liner Material</td><td>15% coverage of each material and thickness for one Unit/absorber</td></tr><tr><td>2. Absorber Spray/Oxidation nozzles</td><td>20% of each type</td></tr><tr><td>3. Absorber Mist Eliminator Washing Nozzles</td><td>20% of each type</td></tr><tr><td>4. Absorber Mist Eliminator</td><td>15% of each type</td></tr></table>	Absorber		1. Liner Material	15% coverage of each material and thickness for one Unit/absorber	2. Absorber Spray/Oxidation nozzles	20% of each type	3. Absorber Mist Eliminator Washing Nozzles	20% of each type	4. Absorber Mist Eliminator	15% of each type	<table><tr><td>Absorber</td><td></td></tr><tr><td>1. Absorber Spray/Oxidation nozzles</td><td>20% of each type</td></tr><tr><td>2. Absorber Mist Eliminator Washing Nozzles</td><td>20% of each type</td></tr><tr><td>3. Absorber Mist Eliminator</td><td>15% of each type</td></tr></table>	Absorber		1. Absorber Spray/Oxidation nozzles	20% of each type	2. Absorber Mist Eliminator Washing Nozzles	20% of each type	3. Absorber Mist Eliminator	15% of each type
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3. Absorber Mist Eliminator	15% of each type																									
70.	VI	A	VI	8 of 24	4.02.00		The parameters/capabilities following:- (i) Wet ball Mill capacity at rated fineness	The parameters/capabilities following:- (i) Wet ball Mill capacity at rated fineness																		

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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	REFERENCE						EXISTING		READ AS	
SI No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line				
							Contractor shall demonstrate the above capacity with the originally installed grinding elements in nearly worn-out condition as mutually agreed for the purpose of ascertaining wear life of any of the wear parts.		Contractor shall demonstrate the above capacity with the originally installed grinding liners in nearly worn-out condition with recommended ball top up charge.	
71.	VI	B	I-M1	10 of 49	4.04.00		<table><tr><td>DESCRIPTION</td><td>Booster Fans</td></tr></table> <		DESCRIPTION	Booster Fans
DESCRIPTION	Booster Fans									

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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REFERENCE							EXISTING		READ AS	
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line				
							Type of fan blades		Type of fan blades	
										
							Fan casing material thickness	Abrasion and wear resistant, high BHN steel having minimum 8.0mm thickness or 12mm mild steel with liner of thickness 10mm (min.)	Fan casing material thickness	Abrasion and wear resistant, high BHN steel having minimum 8.0mm thickness or 12mm mild steel with liner of thickness 10mm (min.) Alternatively, 22 mm thickness casing of mild steel is also acceptable.
										
72.	VI	A	VII	4 of 38	1.02.00		Gates in Flue Gas System		Gates in Flue Gas System	
							1. Seals	3 sets of each type (Set means complete replacement for one gate)	1. Seals	3 sets of each type (Set means complete replacement for one gate)
							2. Actuator	1 no. of each type	2. Expansion Joint	1 no. of each type & size
73.	VI	B	I-M1	18 of 49	5.06.11		The absorber vessel shall be made of minimum 7 mm thick carbon steel.		The complete absorber vessel (absorber oxidation tank, absorber tower & absorber outlet duct) shall	

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
							The absorber oxidation tank, absorber tower & absorber outlet duct shall be provided with 2 mm (minimum) thickness lining / cladding / wall paper of Alloy C276 / Alloy 59 or better material.	be made of clad sheet of C276 / Alloy 59 (minimum 2 mm thickness) having minimum 7 mm thick carbon steel as base material.
74.	VI	B	I-M1	20 of 49	6.02.03		Each Silo shall be provided with sufficient no. of level transmitters.	Each Silo shall be provided with minimum 02 no. of level transmitters per silo.
75.	VI	C	GTR	42 of 92	30.00.00		NOISE LEVEL The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA . However for Ball Mills the noise levels as per following shall also be acceptable: a) Ball Mill < 90 dBA	NOISE LEVEL The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA . However for Ball Mills and limestone crusher the noise levels as per following shall also be acceptable: a) Ball Mill < 90 dBA b) Limestone crusher < 90

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	REFERENCE						EXISTING	READ AS				
SI No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line						
								dBA				
76.	VI	B	I-M1	19 OF 49	5.06.24		It should be possible to discharge the absorber sump into the emergency drain tank within 2 hours.	It should be possible to discharge the absorber sump into the Auxiliary Absorbent tank within 2 hours.				
77.	VI	B	I-M1	27 OF 49	7.08.01		The Contractor shall provide an auxiliary absorbent tank, for the unit , sized to contain the complete slurry It should be possible to discharge the each absorber into the emergency drain tank within 2 hours.	The Contractor shall provide a common auxiliary absorbent tank, common for all the three units, shall be sized to contain the complete slurry It should be possible to discharge the each absorber into the Auxiliary Absorbent tank within 2 hours.				
78.	VI	B	I-M1	28 OF 49	8.05.00		The pump casing should be radially split to allow easy removal of impeller.	In case of pump with rubber lined casing, the casing should be radially split to allow easy removal of impeller.				
79.	VI	A	III-A1	6 OF 8	7.01.02		The contractor system. The Interior surface of the Sumps shall be lined with replaceable chlorobuty/ bromobutyl rubber lining of minimum 5 mm thickness.	The contractor system. The Interior surface of the Sumps shall be lined with replaceable chlorobuty/ bromobutyl rubber lining of minimum 5 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness.				
80.	VI	A	VII	4 of 38	1.03.00		<table><tr><td>Absorber</td><td></td></tr></table>	Absorber		<table><tr><td>Absorber</td><td></td></tr></table>	Absorber	
Absorber												
Absorber												

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REFERENCE							EXISTING		READ AS	
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line				
							1. Liner Material	15% coverage of each material and thickness for one Unit/absorber	1. Absorber Spray/Oxidation nozzles	20% of each type
							2. Absorber Spray/Oxidation nozzles	20% of each type	2. Absorber Nozzles Mist Eliminator Washing Nozzles	20% of each type
							3. Absorber Nozzles Mist Eliminator Washing Nozzles	20% of each type	3. Absorber Mist Eliminator	15% of each type
							4. Absorber Mist Eliminator	15% of each type		
81.	VI	B	I-M1	23 OF 49	7.03.01		Each set of primary dewatering hydro-cyclone shall be sized to dewater the gypsum slurry produced by the unit operating at Design point with an additional 10% margin. The outlet water content in the gypsum shall be as per the requirement of the vacuum belt filters.		Each set of primary dewatering hydro-cyclone shall be sized to dewater the gypsum slurry produced by all the unit operating at Design point with an additional 10% margin. The outlet water content in the gypsum shall be as per the requirement of the vacuum belt filters	
82.	VI	A	III-A1	4 OF 8	4.01.04		2x100% Centrifugal/ positive displacement type oxidation blowers / compressors.		2x100% electric driven, single-stage, integrally geared, single or dual vane centrifugal type oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber	

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	REFERENCE						EXISTING	READ AS																																																
SI No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line																																																		
								reaction tank.																																																
83.	VI	B	I-M1	10 OF 49	4.04.00		Booster Fan: Fan rotational speed: 600 rpm (max.)	Booster Fan: Fan rotational speed: 745 rpm (max.)																																																
84.	VI	A	V	6 of 10	6.00.00		LIMESTONE CHARACATERSTICS Table-3 <table><tr><th colspan="4">Chemical Analysis(% by mass)</th></tr><tr><td>1.</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><td>2.</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><th colspan="4">Physical properties</th></tr><tr><td>1</td><td>Bond Index</td><td>kWh/t</td><td>13</td></tr><tr><td>2</td><td>.....</td><td>.....</td><td>.....</td></tr></table>	Chemical Analysis(% by mass)				1.				2.				Physical properties				1	Bond Index	kWh/t	13	2				LIMESTONE CHARACATERSTICS Table-3 <table><tr><th colspan="4">Chemical Analysis(% by mass)</th></tr><tr><td>1.</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><td>2.</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><th colspan="4">Physical properties</th></tr><tr><td>1</td><td>Bond Index</td><td>kWh/sh. t</td><td>13</td></tr><tr><td>2</td><td>.....</td><td>.....</td><td>.....</td></tr></table>	Chemical Analysis(% by mass)				1.				2.				Physical properties				1	Bond Index	kWh/sh. t	13	2			
Chemical Analysis(% by mass)																																																								
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1	Bond Index	kWh/sh. t	13																																																					
2																																																								
85.	VI	B	I-M1	21 OF 49	6.05.03		The mill hydro-cyclone set shall have sufficient The liners shall have a minimum wear life of not less than 7000 hrs.	The mill hydro-cyclone set shall have sufficient The liners shall have a minimum wear life of not less than 8000 hrs.																																																
86.	VI	A	I	12 of 18	4.01.08		In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements	In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements																																																

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(e) above for the Slurry Recirculation Pumps. However, in this case Million only).	stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(b) above for the Slurry Recirculation Pumps. However, in this case Million only).
87.	VI	A	I	9 of 18	4.01.02 Table Sl. No. (c)		Application : Wet Limestone based FGD application in Coal fired power plant	Application : Wet Limestone based FGD application in Coal fired power plant or any other process application.
88.	VI	A	I	9 of 18	Para below the clause No. 4.01.02 table		Bidder shall offer reference plant equipment.	Bidder shall offer reference plant equipment. The provenness criteria for equipment (Slurry Recirculation Pump) stipulated at Sl. No. 4.01.02(b) above shall also be considered acceptable

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								provided the rating parameters (i.e., flow, head) is covered within the operating regime of the respective Slurry Recirculation Pump performance curve of the reference plant equipment.
89.	VI	A	I	9 of 18	4.01.06		In case the Bidder only).	(i)In case the Bidder only). OR (ii)In case, the bidder or proposed sub vendor is not a manufacturer of proven Wet Limestone Grinding Mills as per clause no. 1.2 (d) above, but have designed, manufactured and Supplied dry Grinding Ball Tube mills for at least 500 MW pulverized coal fired power plant, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding Mills provided it has a licensing agreement with a Wet limestone Grinding mills manufacturer who meet the

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
								requirements stipulated at clause 1.2 (d) above for the Wet limestone Grinding mills and provides extended warranty of three (3) years for Wet Limestone Grinding Mills. In such a case Bidder shall provide an additional on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).
90.	VI	B	I-M1	4 OF 49	1.06.01		The Contractor shall offer the best design to accommodate the Flue Gas Desulphurization (FGD) System and Lime stone & Gypsum handling & storage system within the confines of the space available. The location of FGD System and associated facilities have been indicated in the tender drawings No. 9578-999-POM-F-001 & General Layout Plan.	The Contractor shall offer the best design to accommodate the Flue Gas Desulphurization (FGD) System and Lime stone & Gypsum handling & storage system within the confines of the space available. The location of FGD System and associated facilities have been indicated in the tender drawings No. 4410-999-POC-F-001 & 4410-999-POM-A-001.
91.	VI	A	I	5 OF 18	3.00.00 (B)		SCHEMES	SCHEMES

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REFERENCE							EXISTING					READ AS				
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line										
							SI · No	Drawings Title	Drawing s No.	R e v · No ·	No. of She ets	SI · No	Drawings Title	Drawing s No.	R e v · No ·	No. of She ets
							1)	Scheme of Absorber system	4410-109-POM-A-005	A	1	1)	Scheme of Absorber system	4410-109-POM-A-005	A	1
							2)	Scheme of Limestone Milling system	4410-109-POM-A-006	A	1	2)	Scheme of Limestone Milling system	4410-109-POM-A-006	B	1
							3)	Scheme of Gypsum De-watering system	4410-109-POM-A-007	A	1	3)	Scheme of Gypsum De-watering system	4410-109-POM-A-007	B	1
92.	VI	E	I	1 OF 2 12 of 14 13 of 14	1.00.00 (B)		SCHEMES					SCHEMES				
							SI · No	Drawings Title	Drawing s No.	R e v · No ·	No. of She ets	SI · No	Drawings Title	Drawing s No.	R e v · No ·	No. of She ets
							1)	.....	.....	.	....	1)	.....	.....	.	....
							...			.	...	...			.	...
							5)	Scheme of Limestone Milling system	4410-109-POM-A-006	A	1	5)	Scheme of Limestone Milling system	4410-109-POM-A-006	B	1
							6)	Scheme of Gypsum De-watering system	4410-109-POM-A-007	A	1	6)	Scheme of Gypsum De-watering system	4410-109-POM-A-007	B	1
												Revised Drawing attached at Annexure III & IV				

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
93.	VI	A	VI	11 OF 14	5.00.00		AUXILIARY POWER CONSUMPTION (PA) The unit auxiliary power consumption shall be calculated.....	Refer Annexure VII
94.	SECTION – VI, PART-A		SUB-SECTION-III-B ELECTRICAL SYSTEM/EQUIPMENT	1 of 6	1.02.00		HT/ LT SWITCH GEAR HT and 415V Switchgear / Motor control centers (as shown in Electrical Single Line Diagram Drg No. 4410-109-POE-J-001) Busduct / Cable (as applicable), distribution boards, AC/DC fuse boards, LDB, local emergency push button stations for all drives energized from MCC's under contractor scope and local motor starters (for ventilation fans) as required for plant and equipment in contractor's scope.	HT/ LT SWITCH GEAR HT and 415V Switchgear / Motor control centers (as shown in Electrical Single Line Diagram Drg No. 4410-109-POE-J-001) Busduct / Cable (as applicable), distribution boards, AC/DC fuse boards, LDB, local emergency push button stations for all drives and local motor starters (for ventilation fans) as required for plant and equipment in contractor's scope. HT Switchgear- All HT switchboards shall be provided with one spare motor feeder and one transformer feeder on each section as spares. LT Switchgear- All LT Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped switch fuse modules of each rating as spares, uniformly distributed over different vertical sections. In addition, all LT Switchgears, MCCs and AC distribution boards shall have

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REFERENCE							EXISTING	READ AS
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								as spares at least twenty per cent (20%) of starter modules/MCCB modules or at least one module (whichever is higher) of each rating range of the selection tables (Clause no.43.00.00) of Tech. Specification Part-B, Sub-Section E-10, equipped for the rating of the largest auxiliary fed from that range.
95.	SECTION – VI, PART-A		SUB-SECTION-III-B ELECTRICAL SYSTEM/EQUIPMENT	1 of 6	1.02.00		DC SYSTEM Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for plant and equipment in the scope of the contractor, as per system requirement. The DC system (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the chapter B-0 Part-B of Technical specifications	DC SYSTEM Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for plant and equipment in the scope of the contractor, as per system requirement. The DC system (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the Sub-section-II- E1 Part-B of Technical specifications
96.	SECTION – VI, PART-B		SUB-SECTION-II-E1 GENERAL ELECTRICAL SPECIFICATION	3 of 7	2.01.01		Adequate number of auxiliary transformers shall be provided to meet the demand on 11kV, 3.3KV and 415V systems under most onerous conditions, with the criteria that each 11kV / 3.3KV / 415 V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, 3x100% transformers / feeders, and these shall be rated to carry the maximum load expected to be imposed.	Adequate number of auxiliary transformers shall be provided to meet the demand on 11kV, 3.3KV and 415V systems under most onerous conditions, with the criteria that each 11kV / 3.3KV / 415 V switchgear / MCC / DB shall be fed by 2x100% or 3 X 50 %, transformers / feeders, and these shall be rated to carry the maximum load expected to be imposed.

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97.	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E1 GEN RAL ELEC TRIC ALSP ECIFI CATI ON	3 of 7	2.02.00		MV Switchgears Sizing of HT Switchgears (11kV/3.3kV) shall be in accordance with Clause No. 1.00.00 of Sub-section E9 and its sub-clauses covering sizing criteria, performance / reliability criteria, layout criteria, spare capacity requirements, standardization, etc.	MV Switchgears Sizing of HT Switchgears (11kV/3.3kV) shall be in accordance with Clause No. 1.00.00 of Sub-section E9 and its sub-clauses covering sizing criteria, performance / reliability criteria, layout criteria, spare capacity requirements, standardization, etc.
98.	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E1 GEN RAL ELEC TRIC ALSP ECIFI CATI ON	3 of 7	2.03.00		LV Switchgears Sizing of LT Switchgears shall be in accordance with Clause No. 1.00.00 of Sub-section-II-E10 and its sub-clauses covering design considerations, performance / reliability criteria, spare capacity requirements, standardization, etc.	LV Switchgears Sizing of LT Switchgears shall be in accordance with Clause No. 1.00.00 of Sub-section-II-E10 and its sub-clauses covering design considerations, performance / reliability criteria etc.
99.	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E1 GEN RAL ELEC TRIC ALSP ECIFI CATI ON	4 of 7	2.03.00		LV Switchgears For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer rating is 1000KVA or above	LV Switchgears For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer rating is 1000KVA or above. However, for transformers of 1000kVA rating, cable connection may also be acceptable in case of layout constraints.

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100	SECTION – VI, PART-B		SUB-SECTION-II-E1 GENERAL ELECTRICAL SPECIFICATION	4 of 7	2.04.00		Integration with Employer's Switchgear SCADA All MV & LV circuit breakers shall be provided with Communicable Numerical Relays complying with IEC-61850 as specified in Sub-section II-E-09. These relays shall be integrated with Employer's Switchgear SCADA through Ethernet switches (to be supplied by Employer) mounted on each switchgear. The circuit breaker will normally be controlled from remote control panels (DDCMIS) through closing and shunt trip coils. The control of the breakers shall also be possible from the Employer's Switchgear SCADA system.	THIS CLAUSE DELETED.
101	SECTION – VI, PART-B		SUB-SECTION-II-E1 GENERAL ELECTRICAL SPECIFICATION	4 of 7	2.05.00		Control Philosophy The Control Philosophy shall be as follows: (a) All the 11 KV/ 3.3 KV & LT Incomers, Ties , Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and also from DDCMIS. (b)The motor feeders shall be controlled from the DDCMIS only	Control Philosophy The Control Philosophy shall be as follows: a) All switchgears and MCCs shall be controlled from PLC/DCS.
102	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHG	1 of 39	1.00.00		 Sizing For fault Conditions Fault Level shall be the basic selection Criteria for MV switchgears. Typical Fault ratings	 Sizing For fault Conditions Fault Level shall be the basic selection Criteria for MV switchgears. Typical Fault ratings are as detailed under

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			EAR				are as detailed under Technical parameters (B-0).	Technical parameters (sub-section-II-E1).
103	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	2 of 39	1.00.00		Spare capacity and Future Requirements all MV Switchboards is provided with one spare motor feeder and one transformer feeder on each section for future requirements.	 Deleted
104	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	6 of 39	3.00.00		h) SURGE ARRESTERS (FOR MOTOR FEEDERS) 3. Rated Voltage of Surge arrestor 12 KV for 11 KV And 4.5 KV for 3.3 KV	h) SURGE ARRESTERS (FOR MOTOR FEEDERS) 3. Rated Voltage of Surge arrestor 12 KV(Phase to Phase) for 11 KV And 4.5 KV (Phase to Phase) for 3.3 KV
105	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	9 of 39	4.2.00(b)		Outgoing breakers shall be suitable for switching transformers and motors at any load. They shall be capable of being used for frequent direct-on-line starting of squirrel cage induction motors of following ratings : 1)3.3KV Above 160 kW up to 1500 kW (The contractor may adopt415V/3.3KV for drives rated in the range of 160-210 kW) 2) 6.6 kV Above 200 kW 3) 11 kV Above 1500 kW Surge arrestor shall be provided for each motor feeder.	Outgoing breakers shall be suitable for switching transformers and motors at any load. They shall be capable of being used for frequent direct-on-line starting of squirrel cage induction motors of following ratings : 1)3.3KV : Above 160 kW up to 1500 kW (The contractor may adopt415V/3.3KV for drives rated in the range of 160-210 kW) 2) 11 kV :Above 1500 kW Surge arrestor shall be provided for each motor feeder

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106	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	11 of 39	4.5.1		The circuit breaker / contactor will normally be controlled from remote control panels (DDCMIS) as well as from Switchgear SCADA System (via Numerical Relays) through closing and shunt trip coils.	The circuit breaker / contactor will normally be controlled from remote control panels (PLC/DCS) (via Numerical Relays) through closing and shunt trip coils.
107	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	15 of 39	4.10.00		(a) All switchboards shall be provided with separate LV panels at both the extreme ends which shall house the control & space heater supply distribution system, Ethernet switches (provided by employer) and other LV equipment common for the board. (e) Power Supply to Numerical Relay and Ethernet switch shall be an independent circuit with switch and fuse tapped from the panel DC supply.....	(a) Bus PT Panel shall house the control & space heater supply distribution system and other LV equipment common for the board. e) Power Supply to Numerical Relay shall be an independent circuit with switch and fuse tapped from the panel DC supply.....
108	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	19 of 39	5.1.4		(d) Board IED (Switchgear Control Unit)-32BI + 32 BO	DELETED
109	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	19 of 39	5.1.7		All the numerical relays shall have communications on three ports, local front port communication to laptop and dual ports on IEC 61850 to communicate with the employer's data concentrator through LAN. The dual IEC 61850 ports shall be connected to two	All the numerical relays shall have communications on two ports, local front port for communication to laptop and one RJ45 port on IEC 61850.

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							separate Ethernet switches (provided by employer) to form part of the Switchgear SCADA.	
110	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	22 of 39	5.3.1		Control of breakers / vacuum contactors shall be carried out from the HMI station of Switchgear SCADA system through the LAN and the numerical relays as well as from DDCMIS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.	Control of breakers / vacuum contactors shall be carried out from PLC/DCS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.
111	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	23 of 39	5.3.8		The alarm / status of each individual protection function and trip operation shall be communicated to the Switchgear SCADA system.	DELETED
112	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	23 of 39	5.4.00 5.4.1		NETWORKING Adequate space in the LV panel shall be identified for mounting of at least 2 Nos of employer's Ethernet Switches (19" rack mounting) in all switchgears. Further, mounting of Ethernet switch in the above compartment and inter-panel wiring of Ethernet cable for connection of all numerical relays on the	DELETED

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							switchgear to the Ethernet switches shall be in the contractor's scope. Arrangement to provide required control supply to Ethernet switch shall be made in the switchgear.	
113	SEC TION – VI, PART-B		SUB- SECTION- II-E9 HT SWIT CHG EAR	25 of 39	6.1.00		 For all important components like Surge Arrestors and Numerical relays, Ethernet switches, Data concentrators & Fibre Optic cables, the contractor shall submit the reports of all the type tests as per applicable standards and carried out not earlier than ten years prior to the date of bid opening. 	... For all important components like Surge Arrestors and Numerical relays, the contractor shall submit the reports of all the type tests as per applicable standards and carried out not earlier than ten years prior to the date of bid opening.
114	SEC TION – VI, PART-B		SUB- SECTION- II-E9 HT SWIT CHG EAR	27 of 39	7.0.00		Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of MV Switchgears. The scope shall include Two No's of MV Switchgear workshops and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two(2) days in each workshop at Project site. One day shall be for class-room training & One day shall be for hands-on training on MV Switchgears. One such Workshop shall be organized before the commissioning of First MV Switchboard and the Second workshop shall be conducted before	Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of MV Switchgears. The scope shall include one number of MV Switchgear workshop and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two (2) days at Project site. One day shall be for class-room training & One day shall be for hands-on training on MV Switchgears. The workshop shall be organized before the commissioning of First MV Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.

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							Unit Commissioning. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.	
115	SECTION – VI, PART-B		SUB-SECTION-II-E9 HT SWITCHGEAR	28 of 39	8.0.00		Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of Numerical Relays and trouble shooting. The scope shall include Two No's of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days in each of workshop at project site. One day shall be for class-room training & One day shall be for hands-on training on Numerical Relays. One such Workshop shall be organized before the commissioning of First MV Switchboard and the Second workshop shall be conducted before Unit Commissioning. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems	Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of Numerical Relays and trouble shooting. The scope shall include one number of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days at project site. One day shall be for class-room training & One day shall be for hands-on training on Numerical Relays. The workshop shall be organized before the commissioning of First MV Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.
116	SECTION – VI, PART-B		SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCTS	1 of 58	1.01.01		Lighting load of 50 kVA (Minimum) shall be considered on each section of main switchgears with incomer from transformer as indicated in the tender SLD.	Lighting load of 50 kVA (Minimum) shall be considered on each section of main switchgears with incomer from transformer.

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117	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCHGEARS & LT BUSDU CTS	2 of 58	1.03.00		Spare capacity and Future Requirements All LV Switchboard shall be provided with spare feeders / modules as specified in relevant clause of Part-A of Technical Specification.	DELETED
118	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCHGEARS & LT BUSDU CTS	2 of 58	1.04.00		It shall be preferred to have all LV Switchboards for the entire plant from a single manufacturer from maintainability and spares management point of view.	DELETED
119	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCHGEARS & LT BUSDU CTS	2 of 58	1.05.00		(f)Separate control cables shall be laid for EPB (Emergency/Local Push Button) status from EPB to Switchgear for the Switchgear and DCS.	(f)Separate control cables shall be laid for EPB (Emergency/Local Push Button) status from EPB to Switchgear for the Switchgear and PLC/DCS.
120	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCH	12 of 58	4.25.00		Adequate space in a separate compartment shall be identified for mounting of Ethernet Switch (19" rack mounting), in all switchgears having numerical relays. Further, mounting of Ethernet switch in the	DELETED

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			HGEA RS & LT BUSD UCTS				above compartment at site and provision of inter-panel wiring (Cat5e Ethernet / Fibre Optic) for connection of numerical relays to Ethernet switch shall be in the contractor's scope. Arrangement to provide required control supply (110 V / 220 V DC) to Ethernet switch shall be made in the switchgear.	
121	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	18 of 58	11.00.00		TELESCOPIC TROLLEY The quantity of telescopic trolleys to be supplied shall be 2 Nos. per switchgear room.	TELESCOPIC TROLLEY The quantity of telescopic trolleys to be supplied shall be 1 No. per switchgear room.
122	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	20 of 58	18.00.00		Numerical relays & networking	Numerical relays
123	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS &	20 of 58	18.01.00		 These relays shall be connected to the Switchgear SCADA System, through Ethernet switches.....	 DELETED

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			LT BUSD UCTS					
124	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	21 of 58	18.02.00		Control of circuit breakers shall be carried out from DDCMIS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from DDCMIS and no separate coupling relays shall be provided.....	Control of circuit breakers shall be carried out from PLC/DCS through hardwired control commands in the form of 24V DC signal. Preferably, binary input of all relays shall be configurable to accept 24V DC signals directly from PLC/DCS and no separate coupling relays shall be provided.
125	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	21 of 58	18.03.00		Each numerical relay shall be connected to the Ethernet switch(in Employers's scope) provided in the Switchgear through Cat5e Ethernet /FO cable. Ethernet Switches shall be connected through Fibre Optic cable to form a ring network.	DELETED
126	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	21 of 58	18.04.00		The numerical relay shall be capable of measuring and storing values of a wide range of quantities, events, faults and disturbance recordings. The alarm / status of each of protection function and trip operation shall be communicated to Switchgear SCADA / DDCMIS. The numerical relays shall have built in feature / hardware interface to provide such inputs to Switchgear SCADA / DDCMIS for analog / digital values.	The numerical relay shall be capable of measuring and storing values of a wide range of quantities, events, faults and disturbance.

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127	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	21 of 58	18.05.00		The required .ICD / .CID files of the Numerical relays under the scope of this package for the integration with the SCADA shall be provided by the Numerical relay vendor along with necessary engineering support.	DELETED
128	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	22 of 58	18.11.00		All the numerical relays shall have communications on three ports, local front port for communication with laptop and dual ports on IEC 61850 to communicate with the Switchgear SCADA System.	All the numerical relays shall have communications on two ports, local front port for communication with laptop and one RJ45 port on IEC 61850.
129	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	23 of 58	18.26.00		Numerical relays shall have feature for Time synchronization through the Switchgear SCADA System. The resolution of time synchronization shall be +/- 1.0 millisecond or better throughout the entire system.	Numerical relays shall have feature for Time synchronization. The resolution of time synchronization shall be +/- 1.0 millisecond or better throughout the entire system.
130	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC	23 of 58	18.27.00		Relays & Ethernet switches shall be suitable to accept both AC & DC supplies with range 110V or 220V with tolerance of 70 % to 120 % of rated voltage & shall be finalized during detailed engineering.	Relays shall be suitable to accept both AC & DC supplies with range 110V or 220V with tolerance of 70 % to 120 % of rated voltage & shall be finalized during detailed engineering.

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			HGEA RS & LT BUSD UCTS					
131	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	23 of 58	18.27.00		Bus no volt condition shall be configured to an output contact of the relay of incomers for suitably interfacing with DDCMIS wherever required.	Bus no volt condition shall be configured to an output contact of the relay of incomers for suitably interfacing with PLC/DCS wherever required.
132	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	24 of 58	19.08.00		The alarm/status of each individual protection function and trip operation shall be communicated to Switchgear SCADA / DDCMIS.	DELETED
133	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E10 LT SWITC HGEA RS & LT BUSD UCTS	24 of 58	19.12.00		Required No. of extra binary inputs shall be provided in the numerical relay for digital inputs from critical outgoing MCCB feeders on that switchgear section	DELETED

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134	SECTION – VI, PART-B		SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCKS	24 of 58	19.13.00		Circuit-breaker status, protection status, etc. required for control logics shall be hardwired to DDCMIS.....	Circuit-breaker status, protection status, etc. required for control logics shall be hardwired to PLC/DCS.....
135	SECTION – VI, PART-B		SUB-SECTION-II-E10 LT SWITCHGEARS & LT BUSDUCKS	24 of 58	19.14.01		The contractor shall arrange for training on design, engineering, Commissioning and operation & maintenance of LV Switchgear, Numerical relays and Switchgear networking system for a duration of one (1) man-months.	Training workshop at site for Switchgear Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M of LT Switchgears. The scope shall include one number of LT Switchgear workshop and Training for a batch of 20 Engineers and a separate batch of 20 supervisors/technicians for two (2) days at Project site. One day shall be for class-room training & One day shall be for hands-on training on LT Switchgears. The workshop shall be organized before the commissioning of First LT Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.
136	SECTION – VI, PART-B		SUB-SECTION-II-E10 LT SWITCH	24 of 58	19.14.02		The scope shall include training for a batch of engineers and a separate batch of Supervisors/Technicians at Project Site. One such Workshop shall be organized before the commissioning of First LV	Training workshop at site for Numerical Relay Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O & M

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			HGEA RS & LT BUSD UCTS				Switchboard and the second workshop shall be conducted before final system Commissioning. Owner shall provide the required Infrastructure such as Training Conference room, Projection systems etc.	of Numerical Relays and trouble shooting. The scope shall include one number of Numerical Relay workshops and Training for a batch of 20 Engineers at Project Site for 2 days at project site. One day shall be for class-room training & One day shall be for hands-on training on Numerical Relays. The workshop shall be organized before the commissioning of First LT Switchboard. Employer shall provide the required Infrastructure such as Training Conference room, Projection systems etc
137	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCH HGEA RS & LT BUSD UCTS	31 & 32 of 58	31.00.00 31.01.00 31.02.00 31.03.00 31.04.00 31.05.00 31.06.00 31.07.00 31.08.00 31.09.00 31.10.00 31.11.00		BUS TRUNKING SYSTEM (SANDWICH TYPE BUSDUCT)	DELETED
138	SEC TION – VI, PART-B		SUB- SECTION- II-E10 LT SWITCH HGEA RS & LT BUSD UCTS	34 of 58	38.04.00		Type test reports for the following tests on the model of the Numerical relays, Ethernet switches shall be submitted for Employer's review.	Type test reports for the following tests on the model of the Numerical relays shall be submitted for Employer's review.

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139	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	3 OF 19	5.03.00		Owner shall provide two (2) number..... . The alternator outgoing supply of DG set shall be fed into employers breaker panel.	Bidder shall provide two (2) number..... The alternator outgoing supply of DG set shall be fed into bidder's breaker panel.
140	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	4 of 19	6.01.00		All DG.....It shall also have auto initiation through command from remote from owner's panel.....included in the offer	All DG....It shall also have auto initiation through command from remote from bidder's panel.....included in the offer
141	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	7 OF 19	7.10.03		(I) Earth fault (alarm) input from owners switchgear	(i) Earth fault (alarm) input from bidder's switchgear
142	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	8 of 19	7.11.00		Suitable 4-20mA transducers with dual output shall be provided in the control panel for voltmeter & frequency meter for owners use at remote	Suitable 4-20mA transducers with dual output shall be provided in the control panel for voltmeter & frequency meter for bidder's use at remote
143	SEC TION –		SUB- SECT ION-	8 of 19	7.12.00		The bidder is required to provide coupling relays (with diodes) having 24V DC energising coil in	The bidder is required to provide coupling relays (with diodes) having 24V DC energising coil in

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	REFERENCE						EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
	VI, PAR T-B		II-E11 DIES EL GEN ERAT ORS				the control panel for the followings for owner's use	the control panel for the followings for bidder's use
144	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	8 of 19	7.14.00		Provision for following status/signal for Employers information shall be provided in the DG control panel for both main & standby DG Sets:	Provision for following status/signal for Bidder's information shall be provided in the DG control panel for both main & standby DG Sets:
145	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	2 of 19	3.00.00		Technical Requirements:- i) Fuel service tank:-8 hours running	Technical Requirements:- i) Fuel service tank:- 990 litres
146	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E11 DIES EL GEN ERAT ORS	5 of 19	7.04.00		A tinned copper/ aluminium bar of adequate dimension shall be provided for earth connection complete with nuts and bolts as required for external connection to Employers earth grid	A tinned copper/ aluminium bar of adequate dimension shall be provided for earth connection complete with nuts and bolts as required for external connection to Bidder's earth grid
147	SEC TION – VI, PAR T-B		SUB- SECT ION- II-E15 STAT ION	5 of 17	4.00.00		5) While finalizing the detailed layout of lighting fixtures, the position/location and layout of equipments should be taken into account to have adequate illumination at desired locations	5) Different Lighting Systems envisaged for various plant areas are indicated in Annexure-B: While finalizing the detailed layout of lighting fixtures, the position/location and layout of

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
			LIGH TING					equipments should be taken into account to have adequate illumination at desired locations
148	SEC TION – VI, PAR T-B		SUB-SECT ION-II-E15 STAT ION LIGH TING				NA	Annexure -B attached
149	SEC TION – VI, PAR T-B		SUB-SECT ION-II-E6 CABL ING, EART HING & LIGH TNIN G PRO TECT ION	23 OF 69	9.00.00		e) NA	e) The cable entry and exit from switchgear room shall be from 1.5 mtr (minimum) above FGL
150	SEC TION – VI, PAR T-B		SUB-SECT ION-II-E6 CABL ING, EART HING & LIGH TNIN G PRO	7 of 69	3.10.01		Receptacles boxes shall be fabricated out of MS The welding receptacle shall be provided with inbuilt ELCB rated for suitable mA sensitivity ranging from 30-300mA	Receptacles boxes shall be fabricated out of MS The welding receptacle shall be provided with RCCB/RCD of 30 mA sensitivity having facility for manual testing/checking of operation of RCCB/RCD.

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
			TECT ION					
151	SEC TIO N – VI, PAR T-B	SU B-SE CTI ON-II-E12 Outdoor Tran sfor mer			7.00.00		NEW CLAUSE ADDITION	Specification for Dry type (indoor transformers) Attached as Annexure-A
152	SEC TIO N – VI, PAR T-B		SUB-SECT ION-III-C5 PLC BAS ED CON TRO L SYST EM	19 of 27	9.05.00		Bidder shall clearly bring out in the proposal the redundancy feature along with configuration diagram, single line diagram and datasheets etc. & this shall be finalized subject to employer's approval during detail engineering. Configuration B : UPS system shall consist of 1 x 100% charger and inverter, 1 x 100% Ni Cd Battery Bank for 1 hour, Bypass Line Transformers and Voltage Stabilizer, static switch, manual bypass switch, 2 x 100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories. Scheme of UPS system	Bidder shall clearly bring out in the proposal the configuration diagram, single line diagram and datasheets etc. & this shall be finalized subject to employer's approval during detail engineering. Configuration B : UPS system shall consist of 1 x 100% charger and inverter with input isolation transformer, 1 x 100% Ni Cd Battery Bank for 1 hour, Bypass Line Transformers and Voltage Stabilizer, static switch, manual bypass switch, 2 x 100% ACDB, 1x100% Microprocessor controlled Battery Health Monitoring System (BHMS) and other necessary protective devices and accessories. UPS Configuration-B drawing 0000-999-POI-A-019C updated. (Annexure-

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
			C&I				Configuration-B Drg. no. 0000-999-POI-A-019C	IX)
153	SEC TION – VI, PAR T-A		SUB- SECT ION- IIIC C&I	6 of 9	6.01.00		Contractor shall ensure that RIO cabinets are provided in air conditioning environment.	Contractor shall ensure that RIO cabinets are provided in air conditioning environment. The construction & civil works of air conditioning room shall be in the scope of bidder. RIO panel with panel air conditioning shall also be acceptable if such RIO panels are placed inside a ventilated building. The construction & civil works of building (inside which RIO panel with panel air conditioning shall be placed) and its ventilation, shall be in the scope of bidder.
154	SEC TION – VI, PAR T-E		Tend er drawi ng C&I				Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013 (Rev no. A).	Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013 (Rev no. B). Annexure- X
155	SEC TION – VI, PAR T-A		SUB- SECT ION- IIIC C&I	5 of 9	New clause 2.07.00		-	2.07.00 Contractor shall provide one no. of Hand held HART calibrator per generating unit.
156	SEC TION – VI, PAR		SUB- SECT ION- IIIC C&I	7 of 9	New clause 6.08.00		-	6.08.00 Binary and modulating controls of complete Flue gas desulphurization system, associated material handling systems etc. and other systems being provided under the

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
	T-A							contract shall be implemented in PLC. The PLC based Control System shall have separate process blocks for unitised system and one process block for common system including material handling system. For example in North Karanpura (3x660MW), the PLC based control system shall have following process blocks: (i) Unit-1 FGD and associated system (ii) Unit-2 FGD and associated system (iii) Unit-3 FGD and associated system (iv) Common system including material handling systems.
157	SECTION – VI, PART-B		SUB-SECTION-III-C2, MEASURING INSTRUMENTS	15 of 30	8.00.00		Viscosity range of Fluid 0-500cst for HFO.	DELETED
158	SECTION – VI, PART-A		SUB-SECTION-III C&I	6 of 9	6.01.00		6.01.00 on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of	6.01.00 on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							programming station of PLC and Human Machine Interface system (EWS cum OWS). The PLC configuration drawing.....	PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)- 4 (Four) b) OWS cum EWS (placed in FGD control room)- 1 (ONE) c) OWS (placed in central control room of each generating unit)- 2 (TWO). The PLC configuration drawing.....
159	SECTION – VI, PART-A		SUB-SECTION-III-C&I	7 of 9	New clause 6.09.00			6.09.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of three year after Warranty period.
	SECTION – VI, PART-B		SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	27 of 27	16.01.00		16.01.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of one year after Warranty period and thereafter AMC for only hardware support for next two years.	16.01.00 The Bidder shall provide maintenance services of complete control System under a comprehensive Annual Maintenance Contract (AMC) for period of three year after Warranty period.

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
160	SEC TION – VI, PAR T-E		Tend er drawi ng C&I				Instrumentation/control/power supply cabling diagram Drg No. 0000-101/102-POI-A-021 Sheet 1 of 3 and sheet 2 of 3	Instrumentation/control/power supply cabling diagram Drg No. 0000-101/102-POI-A-021 Sheet 1 of 3 and sheet 2 of 3 updated. Annexure-XI
161	SEC TION – VI, PAR T-A		SUB- SECT ION- IIIC C&I	7 of 9	New clause 6.10.00		-	6.10.00 Contractor shall provide control desk placed in FGD control room, meeting specification requirements stipulated in clause 10.04.00, PART-B, Sub Section III-C5 of technical specification. Contractor shall also provide a control desk for each generating unit, of length 2 meter aesthetically matching with the existing control desk of main plant Central Control Room (CCR) for placing FGD OWS in main plant CCR.
162	SEC TION – VI, PAR T-A		SUB- SECT ION- IIIC C&I	3 of 9	2.03.02		CEMS, instruments shall be provided with provision for implementation of above connectivity. For CEMS - In addition to above requirement, 4-20 mA connectivity to DDCMIS shall be provided by the Contractor.	CEMS, instruments shall be provided with provision for implementation of above connectivity. For CEMS - In addition to above requirement, 4-20 mA connectivity to employer's BOP-DDCMIS shall be provided by the Contractor.
163	Part B (1)– Secti on VI		Sub Secti on-I- M1	20 of 49	6.02.03		a) Each silo shall be provided with sufficient no. of level transmitters.	Each Silo shall be provided with minimum 02 no. of Level transmitters per silo.

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
164	SECTION – VI, PART-B		SUB-SECTION-III-C2, MEASURING INSTRUMENTS	29 of 30	11.07.00 Note 1		NOTES:- 01. Hot extractive sampling type/ Dilution extractive type systems shall be provided with dual sample probes along with all required accessories such as redundant heavy duty pumps with continuous rated motors, moisture detection facility, pre-fabricated heated (for sampling type only) sample lines from probes to analyser panel, solenoid valves, filters, coolers along with level switch in gas coolers for auto draining purpose and flow meter etc as applicable.	NOTES:- 01. Hot extractive sampling type/ Dilution extractive type systems shall be provided with dual sample probes along with all required accessories such as redundant heavy duty pumps with continuous rated motors, moisture detection facility, pre-fabricated heated (for sampling type only) sample lines from probes to analyser panel, solenoid valves, filters, coolers along with level switch in gas coolers for auto draining purpose and flow meter etc as applicable. Alternatively, permeation type dryer (located near the tapping point) may also be provided in place of sample cooler.
165	SECTION – VI, PART-A		SUB-SECTION-VII, Mandatory Spare s	23 of 38	5.00.00		5.00.00 CONTROL AND INSTRUMENTATION	5.00.00 CONTROL AND INSTRUMENTATION (EXCLUDING AIR CONDITIONING AND VENTILATION SYSTEM, FIRE DETECTION AND PROTECTION SYSTEM. For mandatory spare of these systems, refer mandatory spare clauses specified under respective systems)
166	SECTION – VI, PART-A		SUB-SECTION-III C&I	7 of 9	6.07.00		UPS of suitable capacity for the intended application meeting the requirements of Technical Specifications as per Cl. No. 9.05.00, Part B, III-C5. Contractor to note that UPS of configuration C is acceptable only upto 5 KVA. In	UPS of suitable capacity for the intended application meeting the requirements of Technical Specifications as per Cl. No. 9.05.00, Part B, III-C5. Contractor shall provide Mini UPS for 01 (one) no. of OWS cum EWS. Contractor to note that UPS of

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	REFERENCE						EXISTING			READ AS								
SI No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line												
							case the consolidated load requirements.....			configuration C is acceptable only upto 5 KVA. In case the consolidated load requirements.....								
167	SECTION – VI, PART-A		SUB-SECTION-III C&I	7 of 9	New clause 6.11.00		-			Output redundancy is applicable for 10% of drives distributed in various functional groups (Exact application shall be finalized during detailed engineering).								
168	SECTION – VI, PART-B		SUB-SECTION-III-C2 MEASURING INSTRUMENTS	3 of 30	2.01.00 (16)		<table><tr><td>16.</td><td>Adjustment/calibration/maintenance</td><td>From hand held HART calibrator/centralized PC based system (as applicable).</td></tr></table>			16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).	<table><tr><td>16.</td><td>Adjustment/calibration/maintenance</td><td>From hand held HART calibrator.</td></tr></table>			16.	Adjustment/calibration/maintenance	From hand held HART calibrator.
16.	Adjustment/calibration/maintenance	From hand held HART calibrator/centralized PC based system (as applicable).																
16.	Adjustment/calibration/maintenance	From hand held HART calibrator.																
169	VI	E		1 OF 2 6 of 14	1.00.00 (A)		(A) LAYOUT & CIVIL DRAWINGS (1) Layout Plan of FGD System : (2) Layout of FGD Area : Drg No. : 4410-999-POM-A-001			(A) LAYOUT & CIVIL DRAWINGS (1) Layout Plan of FGD System : (2) Layout of FGD Area : Drg No. : 4410-999-POM-A-001 Rev-B Revised Drawing attached at Annexure VI								

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
170	VI	B	I-M1	13 OF 49	5.01.00 (B)		(i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 2x 100% Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping for cooling pump discharge shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. The Cooling Pumps shall be installed inside a building. The sparger and a minimum life of 5 years. Minimum 10% redundancy, ... Sparger Tubes.	(i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 2x 100% Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping which are in contact with hot flue gas shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. Cooling Pump discharge piping and valves outside the flue gas path shall be in line with the requirements specified for slurry recirculation pumps. The Cooling Pumps shall be installed inside a building. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.
171	VI	B	I-M1	2 OF 49	1.03.02		The FGD system shall Steam Generator is in operation. However, provision has be made by the Employer for	The FGD system shall Steam Generator is in operation. However, provision shall be made by the contractor for

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							facilitating operation of unit with FGD bypass. This unit in operation. For this purpose. Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber and (ii) in the bypass duct. Further, Quick opening Bi-plane motorized/pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct. The same shall also be taken into account while designing the control & logics for the FGD System.	facilitating operation of unit with emergency FGD bypass. This unit in operation. For this purpose. Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber, (ii) hot gas inlet to booster fan and (iii) outlet of booster fan. Further, Quick opening Bi-plane motorized / pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct. The same shall also be taken into account while designing the control & logics for the FGD System.
172	VI	B	I-M1	9 of 49	4.01.02 (iv)		Margin over pressure requirement: 44% over the calculated value	Margin over pressure requirement: Bidder shall consider the margin over pressure requirement as 44% over the calculated head value excluding the static head. Margin on Static head shall be taken as 10%.For bubbling type Absorber, Bidder shall consider choking/blockage of 10% sparger tubes while calculating the head

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Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/ Line		
								requirements of fan.
173	VI	B	I-M1	30 of 51	8.04.00		All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized valves shall be provided for each pump for automatic flushing of the pump after each shut down. The flushing water for the pumps shall be taken from the process water supply.	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized pneumatic valves shall be provided for each pump for automatic flushing of the pump after each shut down. The flushing water for the pumps shall be taken from the process water supply.
174	PAR T-B		IV-D Civil Works	8 OF 114	3.07.00		Gypsum Storage Shed The Gypsum storage shed shall be RCC framed structure with structural steel work shed with permanently colour coated profiled steel sheet roof and side cladding, grade slab and RCC foundations etc. Roof shall be	Gypsum Storage Shed The Gypsum storage shed shall be RCC framed structure with RCC/ Brick infill wall (upto Tripper floor) and structural steel shed with permanently colour coated profiled steel sheet roof and side cladding (above tripper floor). Roof

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							provided with troughed profile permanently colour coated sheet with slope for quick drainage of rain water.	shall be provided with troughed profile permanently colour coated sheet with slope of 1 in 5 for quick drainage of rain water. At grade level Heavy duty paving as detailed elsewhere in the specification shall be provided inside the shed.
175	VI/B		IV-D Civil Works	3.14.01, Para 1	10 of 114		Single-flue or multi-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level.	Single-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.
176	VI/B		IV-D Civil Works	3.14.08	14 of 114		Thermal insulation The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. pins and speed	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner) The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							washer.	used. pins and speed washer.
177	VI/B		IV-D Civil Works	3.14.09,	15 of 114		(iv) The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab, external surface of mini-shell above roof etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.	(iv) The inside surface of chimney shell above roof, horizontal surface of shell at top, underside of concrete roof slab etc shall be painted with epoxy phenolic coating system having total 220 microns DFT.
178	VI/B		Sub- section on IVD Civil Works	1.02.00	01 of 114		The specifications are intended for the general description of the work.....in writing with the Employer in respect of interpretation of any portions of this document.	The specifications are intended for the general description of the work, quality and workmanship. The specifications are not, however, intended to cover minutest details and the work shall be executed according to the relevant latest Indian Standard Codes / I. R. S. / I. R. C. specifications. Where provisions are not covered in Indian Standards, reference shall be made to ACI, AISC, ASCE, EN, CICIND and other international standards or to the best prevailing local Public Works Department practices or to the instructions of

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								the Engineer. Some of the relevant I. S. Codes to be followed are mentioned in the Technical Specifications. The Contractor is expected to get clarified on any doubts about the specifications, etc. before bidding, in writing with the Employer in respect of interpretation of any portions of this document.
179	Section VI / Part B		Sub-Section-IV-D Civil Works	2.00.00	1 of 114		“Sub QR for civil works:”	“ Clause Deleted”
180	VI/B		IV-D Civil works	Annexure-A	Para-5, 71 of 114		For regular buildings less than 12m in height..... with appropriate multiplying factor given in Appendix-I.	“Deleted”
181	VI/B		IV-D Civil works	Annexure-A	72 of 114		<u>Appendix-I</u> “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT”	“SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT” given in “Annexure-VIII” to this amendment shall replace the “SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND

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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								EQUIPMENT” at Appendix-I, Annexure-A, Sub-section- IV-D Civil works, Part-B, Sec-VI, of Tech. Specification.
182	Section VI / Part A		Sub-section IID Civil Works	2.00.00	3 of 4		8. Approach road to project site.....Bidder shall provide permanent access to all facilities/structures from the nearby existing roads of the Owner. Roads shall be in concrete (M 35) as per IRC standards, with minimum thickness of pavement (PQC) as 250mm. Width of all such roads shall be 7.5 M concrete pavement.	8. Approach road to project site.....Bidder shall provide permanent access to all facilities/structures from the nearby existing roads of the Owner. Roads shall be in concrete (M 35) as per IRC standards, with minimum thickness of pavement (PQC) as 250mm. Width of all roads shall be 6 M / 12 M concrete pavement.
183	Section VI / Part B		Sub-section IVD	15.00.00	32 of 114		 Sewage pump house shall be provided as per IS:4111.	 Sewage pumping stations shall be provided as per IS:4111.
184	Section VI / Part B		Sub-section IVD	14.00.00	31 of 114		These values shall be based on rainfall intensity of 90mm/hr	These values shall be based on rainfall intensity of 75mm/hr
185	Section		Sub-Section	17.01.00	34 of 114		Design of steel structures shall be done by working stress method. Design shall be as per	Design of steel structures shall be done as per provisions of IS:800: 2007 (Limit state design) and

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	REFERENCE						EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
	VI / Part B		on- IV-D Civil Work s				provisions of IS:800:1984.	other relevant IS standards.
186	Sect ion VI / Part B		Sub- Secti on- IV-D Civil Work s	17.26.0 0	38 of 114		-	For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015 for Earthquake loads.
187	Sect ion VI / Part B		Sub- Secti on- IV-D Civil Work s	17.27.0 0	38 of 114		-	Design drawings of steel structures shall include the connection, joint & fastener details for Main columns, Beams & Bracings.
188	Sect ion VI / Part B		Sub- Secti on- IV-D Civil Work s	4.02.00	18 to 19 of 114		The scope for potable water supply includes all distribution conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided. For sewerage below ground stoneware pipes conforming to IS: 651 with concrete bedding and haunch.	The scope for potable water supply includes all distribution conforming to IS: 458 and at rail crossing R.C.C. box culvert to be provided.

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
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REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
189	Section VI / Part B		Sub-Section-IV-D Civil Works	7.00.00, Para-2	24 of 114		In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification.	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.6mm as permanent shuttering. The detailed material property requirement of metal deck sheet is specified elsewhere in the specification. These profiled metal deck sheets shall be fixed to the structural steel beams/ purlins using headed shear anchor studs specified elsewhere in the specification.
190	Section VI / Part B		Sub-Section-IV-D Civil Works	3.03.00, Para-1	6 of 114		The over ground portion of the transfer house shall be framed structure..... ...Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Contractor shall	The over ground portion of the transfer house shall be framed structure..... Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Vertical bracings shall be provided only on four sides

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses.	along the periphery. Grade slab with 0.9m height one brick thick wall plastered on both side at periphery shall be provided for all transfer houses.
191	Section VI / Part B		Sub-Section-IV-D Civil Works	3.04.00, Para-1	7 of 114		The crusher house shall be framed structure..... Adequate steel doors and windows for natural lighting and ventilation shall be provided. Contractor shall have option to use tubular steel sections for roof truss only. Vertical bracings shall be provided only on four sides along the periphery.	The crusher house shall be framed structure..... Adequate steel doors and windows for natural lighting and ventilation shall be provided. Vertical bracings shall be provided only on four sides along the periphery.
192	Section VI / Part B		Sub-Section-IV-D Civil Works	3.09.00, Para-1	8 of 114		All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. For steel staircases, Stringers shall be of rolled steel channel (minimum ISMC 250) and tread shall be of steel gratings. Out side stairs to	All floors of transfer points/crusher houses and other facility buildings shall be accessible through staircase. For steel staircases, Stringers shall be of rolled steel channel (minimum ISMC 250) and tread shall be of steel gratings. Out side stairs to transfer points/crusher house

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
							transfer points/crusher house shall be open type. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's.	shall be open type. However sheeting shall be provided at the top. Minimum 50 x 50 x 6 mm size angles with lugs shall be provided as edge protection for treads of stairs in underground TP's.
193	Section VI / Part B		Sub-Section-IV-D Civil Works	3.01.00, Para-11	3 of 114		Plinth protection along with drains shall be provided along the Hopper complex. However, 5m wide paving shall also be provided around machinery hatches.	Plinth protection along with drains shall be provided along the Hopper complex. However, minimum 5m wide paving shall also be provided around machinery hatches and Truck hopper.
194	Section VI / Part B		Sub-Section-IV-D Civil Works	24.00.00,	42 of 114		CONCRETE c) M35- For spring supported RCC deck	CONCRETE c) M35- For spring supported RCC deck and rail load bearing structure (if applicable).
195	Section VI / Part B		Sub-Section-IV-D Civil Works	39.03.00,	66 of 114		Fly ash based Portland pozzolona cement conforming to IS: 1489 Part - I shall preferably be used. However, the contractor may use other types of cements conforming to IS: 269, IS:	Cement Fly ash based portland pozzolona cement conforming to IS:1489 (Part-1) shall be used for all areas other than for the critical structures identified below. Other properties shall be

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
							8112, IS: 12269, & IS: 455.	as per IS code. Ordinary Portland Cement (OPC) shall necessarily be used for the following structures. a) Spring supported decks of limestone crusher b) RCC for Chimney shell. The grade of cement shall be Grade 43 for OPC conforming to IS:8112. In place of fly ash based portland pozzolana cement, OPC mixed with Fly Ash can be used. Batching plant shall have facility for mixing fly ash. Fly ash shall conform to IS:3812(Part I & Part II). Percentage of fly ash to be mixed in concrete shall be based on trial mix. Mix design shall be done with varying percentage of fly ash mix with cement.
196	Section VI / Part		Sub-Section-IV-D	39.05.00,	67 of 114		-	Aggregates a) Coarse Aggregate Coarse aggregate for concrete

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
	B		Civil Works					shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383. b) Fine Aggregate Fine aggregate shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or pellets. Fine aggregate in concrete shall conform to IS : 383. For plaster, it shall conform to IS : 1542 and for masonry work to IS : 2116. c) Petrographic examination of aggregate shall be carried out by the contractor at National Council for Cement and Building Materials (NCB), Ballabgarh, or any other approved laboratory to ascertain the structure and rock type including presence of strained quartz and other reactive minerals. In case, the coarse aggregate sample is of composite nature, the proportions (by weight) of different rock types in the composite sample and

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
								petrographic evaluation of each rock should also be ascertained. While determining the rock type, special emphasis should be given on identification of known reactive rocks like chalcedony, opal etc. The procedure laid down in IS 2430 for sampling of aggregates may be followed. The laboratory shall determine potential reactivity of the aggregate, which may lead to reaction of silica in aggregate with the alkalis of cement and / or potential of some aggregates like limestone to cause residual expansion due to repeated temperature cycle. If the same is established, the contractor shall further carry out alkali aggregates reactivity test as per IS 2386 (Pt.VII) and / or repeated temperature cycle test to establish the suitability of the aggregates for the concrete work. The test results, with the final recommendations of the laboratory, as to a suitability of the aggregate, for use in the concrete work for various structures and suggested measures, in case of results

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
								are not satisfactory, shall be submitted to the Engineer for his review, in a report form. In case in the report, it is established, that the aggregates contain reactive silica, which would react with alkalis of the cement, the contractor shall change the source of supply of the aggregate or use low alkali cement as per recommendation or take measures as recommended in the report as instructed by Engineer. In case aggregates indicate residual expansion, under repeated temperature cycle test (from 10° Celsius to 65° Celsius and for 60 temperature cycles) the material shall not be used for concreting of Lime stone crusher decks, Mills, Fans and other equipment foundations which are likely to be subjected to repeated temperature cycle. The contractor shall use aggregates free from residual expansion under repeated temperatures cycle test.

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
197	Section VI / Part B		Sub-Section-IV-D Civil Works	8.00.00, Para-3	26 of 114		Bricks to be used in brickwork shall be of minimum Class designation 50.	Only fly ash bricks shall be used in all construction. Bricks shall be table moulded/ machine made of uniform size, shape and sharp edges and shall have minimum compressive strength of 75kg/cm ² . Burnt clay fly ash bricks and fly ash lime bricks shall conform to IS 13757 and IS 12894 respectively. Minimum fly ash content in fly ash based bricks shall be 25%.

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
198	SEC TION – VI, PAR T-A		SUB- SECT ION- IIIC C&I	5 of 9	New clause 2.07.00		-	2.07.00 Microprocessor based vibration monitoring system shall be provided for booster fans, limestone crushers, wet limestone mills and all other equipment operating on 11kV/ 6.6kV/ 3.3kv. The number of bearing locations to be monitored on each equipment shall be as per requirements finalized during detailed engineering but not less than 2 bearing locations (except for vertical pumps for which one bearing location may be sufficient).
199	SEC TION – VI, PAR T-B		SUB- SECT ION- III- C2 MEA SURI NG INST RUM ENT S	30 of 30	New clause 12.00.00		-	12.00.00 Vibration Monitoring System (VMS) i)The vibration monitoring system shall be furnished on a system basis including vibration transducers with low noise flexible cables in flexible conduit, terminated in local terminal boxes, necessary pre-amplifier/electronics mounted in local weather proof boxes, vibration monitors, mounting racks and cabinets. The vibration monitoring system shall include all power supplies, interconnecting cabling, calibration equipment, indicators, integrating units, signal

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Part	Sub Sec	Page No	Clause	Para/Line		
								conditioning devices and all other accessories required for monitoring of vibration at each point. ii)Eddy current type proximity transducers shall be used. However, the finally selected sensor type shall also depend on recommendation of the equipment manufacturer & suitable for application requirement. Transducers shall be furnished in weatherproof housing suitable for field conditions. iii)Vibration monitoring system shall give buffered output of 4-20 mA DC for each point monitored. The signal shall be suitable for use as an input to PLC as well as for analog recording & analysis, linear in proportion to vibration velocity as well as displacement. Monitor shall provide vibration indication calibrated in velocity units along with provisions of changing to displacement unit (field-programmable) for each measurement point in both horizontal & vertical planes. For each vibration monitor, two independent potential free contacts shall be made available for alarm & trip purposes.

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								iv)The vibration monitor racks with power supplies shall be mounted in a separate self standing cabinet to be located in control room. The number of racks and power supplies shall be such that on failure of a single power supply/module, not more than four monitors shall be affected. The vibration monitoring cabinet shall be fed from redundant UPS feeders with auto changeover scheme. v)The functional requirement for vibration monitoring system shall include but not be limited to the following: a)Vibration monitor front face status indications shall be available for indications of healthy conditions of pick up circuit, monitor circuit and power supply. Also set point indication with set point adjustment facility for setting alarm & trip levels shall be provided. b)The facility shall be available from front of mounting rack for functional checking of monitors with inhibition of alarm and trip contact outputs during test. Alarm inhibition shall also be provided during start-up.

**AMENDMENT NO. 1 TO TECHNICAL SPECIFICATION (SECTION-VI) FOR NORTH KARANPURA (3X660MW)
FGD PACKAGE**

REFERENCE							EXISTING	READ AS
Sl No.	Sec	Par t	Sub Sec	Page No	Clause	Para/ Line		
								vi)All vibration monitoring equipment shall be functionally tested for circuit continuity and output response. All the components & interconnection cables shall be tested to ensure compliance with the specification requirements and all other applicable codes & standards. In case it is the proven standard practice of a Bidder to provide vibration monitoring TFTs instead of dedicated monitors with the signal conditioning equipment in control equipment room, the same shall also be acceptable. However, all relevant functional requirements detailed above shall be met and the system shall be subject to purchaser's approval. vii)All vibration monitoring equipment shall be functionally tested for circuit continuity and Vibration monitoring system shall comply the complete requirements as per API 670 – 5th edition or latest edition at the time of supply.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
1	Section-VI Part-A Sub-Sec-I / Intent of Specification			1.01.00	1 of 18	Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required;	Since, the proposed FGD package is a brown field project, seeking statutory clearances (if any) related to existing facilities will be NTPC's responsibility.	Specification requirement is clear in this regard. Bidders to comply.
2	Section-VI Part-A Sub-Sec-I / Intent of Specification			1.03.01	3 of 18	Wet limestone based Flue gas desulphurization(FGD) for 2X 800 MW unit, capable of reducing to the specified limits the emissions of Sulphur Dioxide in flue gas produced by specified coal being fired in boiler....	Since the plant consists of 3X660 MW units, "2X800 MW" mentioned in this clause is presumed to be a typo. NTPC to confirm.	Refer Amendment to technical specification in this regard.
3	Section-VI Part-A Sub-Sec-I / Intent of Specification			3.00.00	4 of 18	The scope and terminal points of the equipment to be furnished under this steam generator package shall be as identified in these drawings and read in conjunction with text of the specification.	The term "Steam Generator Package" mentioned in this clause is considered to be a typo and the same is presumed to be referring to "FGD System Package". NTPC to confirm.	Refer Amendment to technical specification in this regard.
4	Section- VI, Part-A Sub Section-I Intent of Specification			4.01.02 (c)	9 of 18	Oxidation Blowers Application : Wet Limestone based FGD application in Coal fired power plant	Since, there are many constraints in obtaining the performance certificates of oxidation air blowers from some of the global power plant owners in overseas countries as these blowers were mostly in FGD supplier scope and not directly purchased by the power plant owner, NTPC is requested to qualify the Oxidation Blower supplier who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the blower with 80% of the flow & 100% of the head of the offered Oxidation Blower for any process application (instead of only FGD application). Also, performance certificates of oxidation air blower will be arranged for other process applications from blower suppliers.	Refer Amendment to technical specification in this regard.
5	Section-VI Part-A Sub-Sec-II / Project Information			Annexure-III	6 of 10	CLARIFIED WATER ANALYSIS	NTPC is requested to provide the detailed composition including chlorides for clarified water.	Shall be provided during detailed engineering
6	Section VI Part-A Sub-section-III-B Electrical System & Equipment			1.03.00	1 of 6	Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for plant and equipment in the scope of the contractor, as per system requirement.	Bidder has considered Nickel cadmium type of batteries. NTPC to confirm.	Specification requirements are clear. Bidder to comply the requirement of technical specifications.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
7	Section VI Part-A Sub-section-III-B Electrical System & Equipment				1.04.00	1 of 6	Transformers as per Electrical Single Line Diagram Drg No. 4410-109-POE-J-001 and system requirement, however bidder to provide complete sizing & selection criteria of Transformer's feeding Contractor's own systems.	Bidder has considered LT transformers of 2x100% or 3x50% configuration and HT transformers of 2x100% configuration. 3x100% configuration for any of the transformer is not considered. NTPC to confirm.	Refer Amendment to technical specification in this regard.
8	Section VI Part-A Sub-section-III-B Electrical System & Equipment				1.07.00	2 of 6	DG SET (IF APPLICABLE)	One no. emergency DG set shall be provided common for all three FGD units. NTPC to confirm.	Min 1 (one) number of DG set common for entire FGD plant shall be provided by bidder for meeting emergency process loads envisaged for FGD plants. Refer tender SLD
9	Section VI Part-A Sub-section-III-B Electrical System & Equipment				1.09.00	3 of 7	Complete lighting system for internal and external areas for the plant, buildings, chimney and equipment in the bidder's scope.	Lighting shall be provided only for those systems which are in bidder scope. For other areas including roads, lighting will be in customer's scope. NTPC to confirm.	Lighting system shall be provided for all the internal and external area including roads which is under bidder's scope
10	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.07.00	2 of 3	Waste Water: FGD waste water pipes shall be terminated at 5M away from the nearest Mixing tank of Employer in HCSD Silo area. Pressure at terminal point shall be 3kg/cm2(g) at 300mm above FFL. pH shall be 7.0 (approx.) and temperature shall be <50°C.	The temperature of waste water will normally be in the range of 50 to 60°C, however, no separate cooling system is considered for waste water. NTPC to confirm.	Bidder to note down that the tempreature of waste water at terminal point shall be < 50°C. In case it is greater then 50°C, bidder to make necessary cooling arrangement to get it below 50°C.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
11	Section-VI Part-A Sub-Sec-V / Salient Design Data			3.00.00 Sl. No. 7	2 of 10	Flue Gas Composition at FGD system inlet (Guarantee Point): (i) O ₂ (% v/v wet): 6.18 (ii) CO ₂ (% v/v wet): 9.1 (iii) H ₂ O (% v/v wet): 14.63 (iv) SO ₂ (% v/v wet): 0.088 (v) N ₂ (% v/v wet): 70.1 (vi) Inlet SO ₂ (mg/Nm ³ -wet): 2437 Flue Gas Composition at FGD system inlet (Design Point): (i) O ₂ (% v/v wet): 5.8 (ii) CO ₂ (% v/v wet): 8.92 (iii) H ₂ O (% v/v wet): 17.29 (iv) SO ₂ (% v/v wet): 0.087 (v) N ₂ (% v/v wet): 68.00 (vi) Inlet SO ₂ (mg/Nm ³ -wet): 2407	Summation of flue gas constituents furnished is not equal to 100 (100.098 for Guarantee Point & 100.097 for Design Point). NTPC is requested to provide the flue gas analysis having sum of its constituents as 100. Also, the values of SO ₂ (% v/v wet) and Inlet SO ₂ (mg/Nm ³ -wet) furnished in the design data are not consistent with each other. NTPC is requested to clarify.	Refer Amendment to technical specification in this regard.
12	Section-VI Part-A Sub-Sec-V / Salient Design Data			3.00.00 Sl. No. 7	2 of 10	(iv) SO ₃ (ppm) (at 6% O ₂ wet)	Sl. No. for SO ₃ constituent is presumed to be a typo and the same is read as follows: (ix) SO ₃ (ppm) (at 6% O ₂ wet)	Refer Amendment to technical specification in this regard.
13	Section-VI Part-A Sub-Sec-V / Salient Design Data & Sizing			3.00.00 Sl. No. 5	2 of 10	Gas flow at the FGD inlet when firing respective coal	Since, FGD inlet flue gas flow (in m ³ /s) calculated by applying the pressure & temperature correction on the flue gas flow furnished at normal conditions is not matching with the actual flue gas value provided in salient design data, NTPC to clarify the flue gas pressure (<i>including site altitude correction</i>) and temperature corresponding to the FGD inlet flue gas flow (in m ³ /s).	Refer Amendment to technical specification in this regard.
14	Section-VI Part-A Sub-Sec-I / Intent of Specification			4.01.08	12 of 18	In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(e) above	Bidder understand that the bidder or proposed sub-vendor who does not meet the requirements of 4.01.02 (e) can also manufacture slurry pumps provided it has collaboration or valid license agreement with manufacturer who meet the requirements of 4.01.02 (e). NTPC to confirm	Refer Amendment in this regard.
15	Section-VI Part-A Sub-Sec-I / Intent of Specification			4.02.04	13 of 18	In case Bidder or its agency do not meet the requirements at 2.1	Bidder could not locate the Clause 2.1. NTPC to clarify.	Refer Amendment to technical specification in this regard.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
16	Section- VI, Part-A Sub Section-III-A1 FGD				2.02.00	1 of 8	Bidder shall make opening in the existing duct at ID Fan outlet duct at the terminal point and connect to the booster fan inlet ducting.	Incase, opening is already available in the existing ID fan duct at ID fan outlet, NTPC to clarify whether the tapping for booster fan inlet duct is to be taken from the same opening or it can also be taken from any other suitable location in ID fan outlet duct. If the same is acceptable, the new opening in the ID fan outlet duct will be in bidder's scope. Bidders to comply the specification requirement.
	Section- VI, Part-A Sub Section-IV Terminal Points and Exclusions				1.02.00	1 of 3	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: Outlet flange (matching flanges/ expansion joint included in the Contractor's scope) in the tapping from the common Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. In case no opening or flange connection is available in the ducts from where tapping will be taken, the cutting in the duct as well as flange connection shall be in the scope of the contractor.	
17	Section-VI Part-A				Drg. No. 0-00-020-76722, Rev. 02		Gen. Arrgt. - Back end Elevation (Layout of ID system - Elevation)	Since, the dimensions mentioned on this drawing provided along with Section-VI, Part-A are not readable, NTPC is requested to provide these drawings in CAD format.
18	Section-VI Part-A				Drg. No. 0-00-020-76723, Rev. 02		Gen. Arrgt. - Back end Plan (Layout of ID system - Plan)	

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
19	Section-VI Part-A Sub-Sec-III-A1 / FGD				3.01.03	3 of 8	Two (2) limestone slurry tanks, each tank sized to meet 12 hrs total limestone slurry storage requirement for two units at Design point, complete with all accessories and Agitator(s).	Since, the proposed FGD system is for 3x660 MW plant, it is presumed that each limestone slurry tank is to be sized for meeting 12 hrs storage requirement of three units and not two units. NTPC to confirm.	Refer Amendment to technical specification in this regard.
20	Section-VI Part-A Sub-Sec-III-A1 / FGD				5.01.00	4 of 8	The employer envisages a common gypsum dewatering system for the two (2) units.	Since, the proposed FGD system is for 3x660 MW plant, it is presumed that the gypsum dewatering system is common for three units and not two units. NTPC to confirm.	Refer Amendment to technical specification in this regard.
21	Section- VI, Part-A Sub Section-III-A1 FGD				5.02.00	5 of 8	Each set (suitable for handling /dewatering of one unit) of dewatering equipment (01 working set + 01 standby set) shall comprise of the following items as a minimum requirement:	When two or more units are combined into a common dewatering facility, providing a holding tank (with dedicated primary hydrocyclone feed pump) in between bleed pumps and primary hydrocyclone is critical for achieving the desired performance from the hydrocyclones. NTPC to advise. Also, since dewatering system is common for all the units, the statement "Each set (suitable for handling /dewatering of one unit) of dewatering equipment" mentioned in this clause is ignored. NTPC to confirm.	Specification requirement stipulated are minimum requirement. However, for proper functioning of system, bidders may also provide additional facilities as per the system requirement. For the query as per second para refer Amendment to the technical specifications.
22	Section-VI Part-A Sub-Sec-V / Salient Design Data				4.00.00	4 of 10	Predicted Performance data at FGD Inlet at various Loads	NTPC is requested to also provide the volumetric gas flow & flue gas composition to be considered for all the specified load cases.	Refer Amendment to technical specification in this regard.
23	Section-VI Part-A Sub-Sec-VI / FGD				4.02.00 (i)	8 of 14	Wet ball mill capacity Contractor shall demonstrate the above capacity with the originally installed grinding elements in nearly worn-out condition	Since grinding elements of limestone mills are balls which need to be replaced at regular intervals, the worn-out condition is not applicable for these kind of mills and hence not considered. NTPC to confirm.	Refer Amendment to technical specification in this regard.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
24	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.07.00	2 of 3	Waste Water: FGD waste water pipes shall be terminated at 5M away from the nearest Mixing tank of Employer in HCSD Silo area. Pressure at terminal point shall be 3kg/cm2(g) at 300mm above FFL. pH shall be 7.0 (approx.) and temperature shall be <50°C.	The temperature of waste water will normally be in the range of 50 to 60°C, however, no separate cooling system is considered for waste water. NTPC to confirm.	Bidder to note down that the tempreture of waste water at terminal point shall be < 50°C. In case it is greater then 50°C, bidder to make necessary cooling arrangment to get it below 50°C.
25	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.11.01	2 of 3	Electrical Terminal points of Contractor's electrical scope, applicable for all systems/ subsystems described in relevant clauses for SCOPE is given below: (i) Terminals of Employers HT switchgear.	NTPC is requested to provide the location of Employer's 11 KV switch gear.	HT Switchgear is located in main plant AB bay.
26	Section-VI Part-A Sub Sec-III-A1- (FGD)				18.00.05	8 of 8	<u>Wet Stack Condensate Collection system</u> A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration.	Bidder proposes to transfer the condensate collected in wet stack back to the absorber, which will not require neutralization of condensate. NTPC to advise if the same is acceptable.	Specification requirement is clear in this regard. Bidders to comply.
27	Section-VI Part-A Sub Sec-III-A1- (FGD)				17.00.00	8 of 8	In case higher pressure/flow requirements are envisaged for instrument & service air Contractor shall make its own arrangement.	NTPC to inform the pressure of instrument & service air available at plant to decide the requirement of new arrangement.	At terminal point 5-7 kg/cm2 pressure available.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
28	Section-VI Part-A Sub-Sec-VI / Functional Guarantees & Liquidated Damages			4.02.00 (vi)	8 of 14	Waste Water: The Contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be 10m ³ /hr averaged over a 24 hour period from each unit.	It is presumed that waste water purge flow rate limit of 10 m ³ /hr (averaged over a 24 hour period) is applicable for each FGD unit of the plant (i.e. total 30 m ³ /hr for the complete plant). NTPC to confirm.	Specification requirement is clear in this regard. Bidders to comply.
27	Section-VI Part-A Sub-Sec-V / Salient Design Data			6.00.00	6 of 10	Limestone Characteristics: Bond Index : 13 kWh/t	Bond Work Index of limestone is considered as 13 kWh/t, which is presumed to be same as 13 kWh/MT. NTPC to confirm bidder's understanding.	
	Section-VI Part-B Sub-Sec-I-M1 (FGD)			6.05.01 (vi)	21 of 49	Limestone Bond Index : 13 kWh/Sh.T (Min.)		Refer Amendment to technical specification in this regard.
28	Section-VI Part-B Sub-Sec-I-M1 (FGD)			6.06.02	22 of 49	The agitators shall be designed to meet the requirements stipulated in Cl. No. 12.00.00 of this Sub-Section.	Since, Clause No.17.00.00 of this Sub-Section refers to Slurry lines and Valves. bidder believes that the correct reference clause is 11.00.00 -Agitators. NTPC to confirm.	Refer Amendment to technical specification in this regard.
29	Section-VI Part-B Sub-Sec-I-M1 (FGD)			3.03.09	7 of 49	Provision shall be made for giving signal automatic bypass controls of the absorber in case of failure of the absorber spray system or the GGH.	Since GGH is not applicable for the proposed FGD project, the requirements specified in tender related to the same have been ignored. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub-Sec-I-M1 (FGD)			3.03.01	7 of 49	A Pneumatic operated multi louver damper with seal air arrangement shall also be provided by the Contractor in the clean gas duct after GGH.		Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub-Sec-I-M7			MDL		Documents & Drawings related to GGH.		Since GGH is not applicable, hence, documents & drawings mentioning GGH requirement may be ignored.
30	Section-VI Part-B Sub-Sec-I-M1 (FGD)			1.03.02	2 of 49	However, provision has be made by the Employer for facilitating operation of unit with FGD bypass.	Please clarify whether only quick opening bi-plane damper or both guillotine gate and bi-plane damper of bypass duct are in NTPC's scope.	
	Section-VI Part-B Sub-Sec-I-M1 (FGD)			1.03.02	2 of 49	Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber and (ii) in the bypass duct. Further, Quick opening Bi-plane motorized/pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct.		All the mentioned dampers / gates are in Bidders scope.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
	Section-VI Part-B Sub-Sec-I-M1 (FGD)			3.03.07	7 of 49	A damper in the bypass duct is being provided by the Employer for quick opening to allow bypass to come into operation in case of emergency.	Scope:	Refer Amendment to technical specification in this regard.
	Section-VI Part-E			Drg. No.: 4410-109-POM-A-005		Scheme of FGD-Absorber System showing guillotine gate in bypass duct to be in FGD scope.		
31	Section-VI Part-A Sub-Sec-III-A1 FGD			6.02.00	6 of 8	Auxiliary Absorbent Tank: The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.).	Since, the requirement for no. of pumps specified in both of these clauses is contradictory, 1x100% slurry pump per station has currently been considered to pump back the slurry from absorber tank to the absorber. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub-Sec-I-M1 (FGD)			7.08.02	27 of 49	The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours.		
32	Section-VI Part-B Sub-Sec-I-M1 (FGD)			5.06.24 7.08.01	19 of 49 27 of 49	It should be possible to discharge the absorber sump into the emergency drain tank within 2 hours.	It is presumed that emergency drain tank mentioned in this clause refers to auxiliary absorbent tank. NTPC to confirm.	Bidders understanding is correct. Refer Amendment to technical specification in this regard.
33	Section-VI Part-B Sub-Sec-I-M1 (FGD)			1.09.00	4 of 49	Noise Level: The equivalent weighted average of sound level measured at a distance of 1.5 m above floor level in each elevation and one meter horizontally from the base of any equipments furnished and installed under these specifications, expressed in decibel to a reference of 0.0002 microbar, shall not exceed 85 dB(A).	Noise level for limestone crusher will be ≤ 105 dB(A). Also, noise level for Limestone ball mill will be ≤ 90 dB(A) outside sound barrier. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-C General Technical Requirements			30.00.00	42 of 82	Noise Level: The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA . However for Ball Mills the noise levels as per following shall also be acceptable: a) Ball Mill < 90 dBA		

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.		
34	Section-VI Part-B Sub Sec-I-M1 (FGD)				7.06.02	26 of 49	2x100% horizontal centrifugal pumps shall be provided for wash water requirements of belt filter.	Wash water for the belt filter should be clean water and not filtrate. The source of wash water should be the clarified water as stated in Section-VI, Sub-Section IV, Clause No- 1.05.00, Page No- 1 of 3. Therefore, 2x100% pumps for wash water (filtrate) are not envisaged. NTPC to confirm.
	Section-VI Part-A Sub Sec-III-A1 FGD				5.04.00	5 of 8	The filtrate water from belt filter dewatering and wash water from washing system and the under flow from the secondary hydro-cyclone shall be taken to a common filtrate water tank. 2x100% pump shall be provided to supply wash water (for cake washing as well as belt cloth washing) to the belt filters.	
	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.05.00	1 of 3	Gypsum Wash Water (Clarified Water): For Gypsum washing, Contractor shall take a tap off suitably from the existing HVAC header (HVAC make up pump discharge) available along C-row at CD bay rack for meeting the water requirement of Gypsum washing. The pressure available at TP will be 4Ksc (gauge) wrt FGL (approx.).	
35	Section-VI Part-B Sub Sec-I-M1 (FGD)				1.03.08	3 of 49	In case of a power failure all items of equipment (e.g. minimum one agitator in absorber and limestone slurry tank, flue gas damper upstream & downstream of FGD, Process water pump & lube oil system of Booster Fan & Ball Mill) which may cause irreversible damage to the FGD System shall be connected to the emergency power supply system to be provided by the Contractor.	Since, a new wet chimney is to be provided for the proposed FGD project, flue gas damper downstream of FGD is not required and hence not envisaged. NTPC to confirm.
36	Section-VI Part-B Sub Sec-I-M1 (FGD)				3.01.00 (1)	5 of 49	The entire flue gas system, flue gas ducts, absorber etc. shall be designed to meet the following conditions: Design internal pressure at 67% yield strength (mmwc): +660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher	The duct design pressure is considered inline with Clause No. 3.01.00 (1), Section-VI Part-B, Sub Sec-I-M1 (FGD) i.e. +660 & -

Refer Amendment to technical specification in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
	Section-VI Part-B Sub Sec-I-M1 (FGD)			16.01.03	37 of 49	Duct Design Pressure: All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material	150 mmWC. NTPC to confirm.	
37	Section-VI Part-B Sub Sec-I-M1 (FGD)			3.01.00 (5)	5 of 49	Maximum flue gas velocity through the Absorber (M/sec) : Not more than 4 m/s at Design Point Conditions	It is presumed that the specified flue gas velocity limit refers to "Superficial gas velocity". NTPC to confirm.	Bidders understanding is correct.
38	Section-VI Part-B Sub Sec-I-M1 (FGD)			3.02.01	5 of 49	The flue gas ducts shall be sized and designed to meet all the criteria as specified in Cl. No 17.00.00 this subsection.	Since, clause No.17.00.00 of this Sub-Section is related to Dampers, bidder believes that the correct reference clause is 16.00.00-Duct Work & Dampers. NTPC to confirm.	Refer Amendment to technical specification in this regard.
39	Section-VI Part-B Sub Sec-I-M1 (FGD)			4.01.00	8 of 49	Additionally a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-Nox system.	Since, additional pressure loss of 100 mmWc is to be considered on account of De-NOx system for booster fan sizing, NTPC is requested to re-confirm the specified flue gas pressure at booster fan inlet. Also, it may be noted that there will not be enough pressure available to overcome draft loss of DeNOx system during FGD bypass condition.	Pressure specified at Booster Fan suction is without DeNox system in service. Suction pressure correction in view of DeNOx system in service has to be considered. Refer Amendment of the Technical specifications.
	Section-VI Part-B Sub Sec-I-M1 (FGD)			4.01.01 (3 -iii)	8 of 49	Pressure at Booster Fan suction : 0 mmWc	In addition, NTPC to inform the draft loss of SCR to be considered for guarantee point.	
	Section-VI Part-B Sub Sec-I-M1 (FGD)			4.01.02 (vi)	9 of 49	Pressure at Booster Fan suction : 0 mmWc		
40	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.01.00 (iii)	13 of 49	The slurry recirculation pumps shall have a minimum margin of 10% of flow and head, over the actual requirement for meeting the guarantee and design point conditions. All slurry recirculation pumps including motors shall be of the same size and type.	The 10% margin on head is considered to be on its frictional component only.	Refer Amendment to technical specification in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
41	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.04.00	15 of 49	Gypsum Bleed Pump: The pumps shall be designed to meet the stipulations of Clause No.9.00.00 of this Sub-Section.	Since, clause No.9.00.00 of this Sub-Section is related to Vertical Sump Pumps, bidder believes that the correct reference clause is 8.00.00-Slurry Pumps. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.07.02	23 of 49	The limestone slurry pumps shall be designed to meet the requirements stipulated in Cl. No.9.00.00. of this Sub-Section.		Refer Amendment to technical specification in this regard.
42	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.10	17 of 49	The raw gas inlet duct of the absorber shall be equipped with a flushing device of the side walls and the ground, which shall operate continuously as well as intermittently.	The proposed design of absorber is having a sloped inlet flue gas duct along with an inlet eyebrow design which negates the need for any duct wash as per the experience of QFGDM. So, duct wash & normal quench system is not required and hence not envisaged.	Bidder to comply the specification requirements for flushing system.
	Section-VI Part-E			Scheme of FGD Absorber system	Drawing No: 4410-109-POM-A-005 - Rev.No: A	Normal Quench System with Quench Nozzles and Control valves		Normal quench system with quench nozzles and control valves may be provided if it is the standard practice of bidder / its collaborator.
43	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.13	18 of 49	All internal members shall be lined with minimum 2 mm Alloy 59/ C276 .	NTPC to elaborate the definition of internal members i.e. whether these includes only structural members or all the components (Suction Screens, baffles, Agitators, etc.) located inside the absorber. Also, NTPC to advise whether Polypropylene can be considered as the alternate MOC for Recycle pump suction screens.	All the internal members of Absorber shall be lined with minimum 2 mm Alloy 59/C276 unless material is specifically specified for any component.
	Section-VI Part-B Sub Sec-I-M1 (FGD)			11.05.00	30 of 49	The material for the shaft (which is continuously in contact with slurry) and agitator blades of the Absorber Agitators shall be made with Alloy 926 or better material.		Regarding suction screen refer necessary amendment.
				5.06.23	19 of 49	In case of Spray Tower System, Suction screens shall be installed inside the Absorber vessel to protect the Slurry recirculation pumps.		
44	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.22	19 of 49	The bottom of the absorber sump shall be designed in such a way that complete drainage of the absorption liquid/slurry is possible and is accessible without damage of lining/rubber.	It is presumed that rubber lining is not acceptable for absorber sump (oxidation tank). NTPC to confirm.	Refer Amendment to technical specification in this regard.
45	Section-VI Part-B Sub Sec-I-M1 (FGD)			10.01.00	29 of 49	Slurry & Process Water Tanks: Coarse screen(s) at suction-side of these pumps shall be provided.	Coarse screens are generally considered at the suction side for slurry recirculation pumps only. All other slurry pumps are handling fine slurry only. Hence coarse screens are not envisaged for other slurry pumps and also process water pumps. NTPC to confirm.	Bidders to comply the specification requirement for flushing system..
46	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.03.05	20 of 49	In addition, a hand wheel with proper access shall also be provided for manual operation of the gate. The force at the rim of the hand wheel shall not exceed 35 kg with bunker full of coal.	It is presumed that "coal" mentioned in this statement is a typo and the same shall be replaced with "limestone". NTPC to confirm.	Refer Amendment to technical specification in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
47	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.05.01 (ii)	21 of 49	Flow: 110% of limestone requirement of two absorbers at Design point	It is presumed that flow is to be considered as "110% of limestone requirement of all three absorbers in operation at Design point". NTPC to confirm.	Refer Amendment to technical specification in this regard.
48	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.06.01	22 of 49	For tank volume calculation, solid concentration (by weight) in the slurry shall be assumed, not more than 20% or actual required whichever is lower.	Since 30% solid concentration is considered for limestone feed slurry, NTPC to advise whether solid concentration (by weight) of 30% can be considered for tank volume calculation also.	Bidders to comply the specification requirement.
49	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.06.01	22 of 49	Each tank shall be sized to meet 12 hours continuous limestone requirement of the two units operating at Design point.	Since plant capacity is 3x660 MW, it is presumed that the storage tank is to be sized for 12 hours storage of limestone slurry requirement of three units and not two units. NTPC to confirm.	Refer Amendment to technical specification in this regard.
50	Section-VI Part-B Sub Sec-I-M1 (FGD)			6.07.03	23 of 49	The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	Rubber lining thickness of 3 to 6 mm is sufficient for slurry piping. NTPC to confirm whether the same can be considered.	Refer Amendment to technical specification in this regard.
51	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.04.01 (c)	24 of 49	Gypsum Purity: 90% (minimum)	The gypsum purity of 90% will be maintained at guarantee point condition using limestone having available (reactive) CaCO ₃ of 89%.	Bidders to comply the specification requirement.
	Section-VI Part-A Sub Sec-VI Functional Guarantees & Liquidated Damages			4.02.00 (v)	8 of 14	The contractor shall demonstrate that the purity of the gypsum produced shall not be less than 90%, chloride content shall not be more than 100ppm and the moisture content shall not be more than 10% for the range of specified coal(s) and limestone.		
52	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.04.03	24 of 49	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material or shall be provided with corrosion resistant liners of proven design.	Parts in contact with Gypsum (like Gypsum discharge chute) will be of Carbon steel with rubber lining. However, since the complete frame of filter is not exposed to Gypsum, the unexposed part of the filter frame will be made of Mild steel with Epoxy paint (MSEP) as per Industry practice . NTPC to confirm.	Specification requirement is clear in this regard.Bidders to comply the specification requirement.
53	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.04.09	25 of 49	Gypsum cake from each belt filter shall be discharged through a hopper onto belt conveyor being provided by the Employer.	Please clarify whether gypsum conveying system is in bidder's scope or NTPC's scope.	Gypsum handling/ conveying is in the bidders scope. Please refer of the Amendment in this regard.
	Section-VI Part-A Sub Sec-III-A2			1.02.00	2 of 7	GYPSUM HANDLING PLANT		

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
54	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.05.05	25 of 49	The vacuum receiver and pump internals shall be suitably lined to protect against the corrosive environment. The material selected for vacuum pumps & vacuum receivers shall be proven for similar application.	The vacuum pump proposed is of liquid ring type which doesn't require any lining and hence the same is not considered. NTPC to confirm.	The material selected for vacuum pumps & vacuum receivers shall be proven for similar application and shall be subjected to approval of the employer.
55	Section-VI Part-B Sub Sec-I-M1 (FGD)			10.01.00	29 of 49	All the slurry tanks (Slurry Tanks, Filtrate Tank, Secondary hydro cyclone feed tank, vacuum receiver tank, Waste water Tank, Lime Neutralization tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition.	IS 803 code will be considered for slurry tank design. However, the hazard related requirements specified in this code which are applicable for oil storage will not be considered. NTPC to confirm.	Noted
56	Section VI Part B Sub-Section-II-E1 General Electrical Specifications			2.05.00	4 of 7	(a) All the 11 KV/ 3.3 KV & LT Incomers, Ties , Bus couplers, Transformer feeders shall be controlled from Switchgear SCADA and also from DDCMIS.	Bidder understand that all the 11 KV/ 3.3 KV & LT Incomers, Ties , Bus couplers, Transformer feeders shall be controlled from purchaser SCADA system. New SCADA system is not required. NTPC to confirm.	Refer Amendment to technical specification in this regard.
57	Section VI Part B Sub-Section-II-E1 General Electrical Specifications			2.08.00	5 of 7	Complete DC system, comprising of batteries, battery charges, relays, contactors, timers etc shall be suitable for continuous operation at the maximum continuous float voltage including suitable temperature correction factors.	One no. 110V DC system shall be considered common for all the units of FGD package. Battery shall be of Ni-Cd type. NTPC to confirm.	Bidder to comply the requirement of technical specifications.
58	Section VI Part B Sub-Section-II-E6 General Electrical Specifications			3.02.01	4 of 69	Cable tray support system shall be pre-fabricated	Welded type channel / angle support shall be provided for all cable trays. Kindly confirm.	Bidder to comply the requirement of technical specifications.
59	Section-VI Part-C General Technical Requirements				74 of 82	Public Address System	It is presumed that public address system is not in bidder's scope of supply. NTPC to confirm.	Bidders understanding is correct.
60	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions			1.11.01	2 of 3	Electrical Terminal points of Contractor's electrical scope, applicable for all systems/ subsystems described in	NTPC is requested to provide the location of Employer's 11 KV switch gear.	HT Switchgear is located in main plant AB bay.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
61	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.07.07	26 of 49	All piping, valves & instrumentation upto the employer's terminal point shall be in the contractor's scope. Contractor shall provide the complete lime dosing system to correct the pH of the waste water by lime (83% purity) dosing shall be provided and after mixing of the effluent (using re-circulation system of the pumping system), the effluent shall be discharged once the waste water has been neutralized to desired pH.	NTPC to furnish the size of Lime powder and inform whether the lime will be supplied in the form of bags or transported loose through truck.	Specification requirement is clear in this regard. Bidders to comply the specification requirement.
62	Section-VI Part-B Sub Sec-I-M1 (FGD)			7.07.02	26 of 49	The secondary hydrocyclone feed tank shall be sized to provide a minimum storage of 1 hr of primary hydrocyclone overflow with all the units operating at Design Point and no outflow from the tank.	The partial flow from primary hydrocyclone would be sent to filtrate tank and controlled flow as per purging requirement would be sent to secondary hydrocyclone. Hence, secondary hydrocyclone feed tank will be sized for 1 hour storage of the flow entering to the tank. NTPC to confirm.	Bidders to comply the specification requirement.
63	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.01.00 A (v)	13 of 49	Minimum 10% spare nozzles shall be provided at each level.	Since a complete spray level for recirculation has been kept as stand-by, no separate margin on nozzle quantity is required for individual spray level. Hence, it is presumed that 10% spare nozzles would be required only if spare spray level is not provided. NTPC to confirm.	Specification requirement is clear in this regard, please ready the specification in totality. Bidders to comply the specification requirement.
64	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.06	16 of 49	The mist eliminator spray headers shall be made of FRP or rubber lined Carbon Steel, corrosions and erosion resistant in the inner and outer side (Silicon Carbide coating on metal/FRP surface exposed to slurry).	Since ME wash water is process water and not exposed to slurry, silicon carbide coating for ME spray headers is not required. In addition, the Mist Eliminator Wash spray nozzles will be of polypropylene material. NTPC to confirm.	Bidders to comply the specification requirement.
65	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.03.02	14 of 49	Absorber oxidation systems Margin on Head 10% under above conditions.	Margin of 10% will be considered only on frictional component of head. NTPC to confirm.	Bidders to comply the specification requirement.
66	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.03	16 of 49	Inaccessible gaps or hollow beams shall be avoided.	Incase beams are made of 100% C-276 / A-59 material, whether hollow beams (or pipes for trusses) can be used for supporting members located inside the absorber.	Bidders to comply the specification requirement.
67	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.18 (iv)	18 of 49	A flushing device of the spray levels with water shall be installed. Flushing shall take place if spray levels are out of operation.	Since, the design of spray headers proposed allows its self drainage, separate flushing system for spray headers is not required and hence not considered. NTPC to confirm.	Bidders to comply the specification requirement.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
68	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.15	18 of 49	The other bridges(supports) shall be lined with minimum 2 Alloy 59/C276	NTPC to advise whether Flake glass can be considered as the alternative lining material for support trusses of Spray headers and Mist eliminators.	Bidders to comply the specification requirement.
69	Section-VI Part-B Sub Sec-I-M1 (FGD)			5.06.17	18 of 49	The spray headers (if provided) and air supply headers shall be made of FRP or Carbon Steel with rubber lining (minimum 10 mm natural rubber lining), corrosions and erosion resistant in the inner and outer side (Silicon Carbide coating on metal/FRP surface exposed to slurry).	Since, bidder has offered the lance type oxidation air system, NTPC to advise whether alloy material can also be considered as an alternate MOC for lances.	Bidders to comply the specification requirement.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.		
70	Section-VI Part-B Sub Section-I-M1 (FGD)				5.06.11	18 of 49	The absorber vessel shall be made of minimum 7 mm thick carbon steel. The absorber oxidation tank, absorber tower & absorber outlet duct shall be provided with 2 mm (minimum) thickness lining / cladding / wall paper of Alloy C276 / Alloy 59 or better material. NTPC is requested to consider the following option for Absorber MOC. " Cementitious Grouted Liner Plate over a Trowel-on Membrane ("Tile linings") over mild steel or a Liner Plate with RCC Absorber. A Wet Flue Gas Desulfurization ("WFGD") absorber requires an appropriate long-lasting lining to resist abrasion and corrosion resulting from the operating conditions within the WFGD absorber and the tile lining are widely accepted for over 25 years in USA and total WFGD units installed with Tile Linings are around 50,000 MW. The Tile Lining materials will be selected and designed by the Manufacturer to meet the criteria of WFGD and also these linings should have operational history in WFGD." NTPC to confirm the acceptability of the above.	Refer Amendment to technical specification in this regard.
71	Section-VI Part-B Sub Sec-I-M1 (FGD)				5.06.20	19 of 49	In case the contractor offers a multiple spray level design, minimum distance of 1.5 m shall be maintained between individual spray levels. The specified minimum distance of 1.5 m will be kept between the center lines of spray levels.	Specification requirement is clear in this regard. Bidders to comply the specification.
72	Section-VI Part-B Sub Sec-I-M1 (FGD)				7.03.05	24 of 49	The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining. The feed chamber shall be provided with a minimum lining thickness of 25mm. In line with Clause no. 7.07.04 (related to Secondary Hydro Cyclone), the primary Hydrocyclone shall also be made up of polyurethane or urethane materials. Also, based on feed back received from sub-vendors, 12 mm rubber lining is sufficient for feed chamber. NTPC to confirm.	Bidders to comply the specification requirement.
73	Section-VI Part-B Sub Sec-I-M1 (FGD)				7.04.02	24 of 49	The vacuum belt filter shall be proven design in operation for similar capacities. The filter cloth shall be polyester or polypropylene as per the proven design of the supplier and shall be guaranteed for a minimum life of not less than 7000 hrs. NTPC to advise whether PET (Polyethylene Terephthalate) can also be considered as the alternate MOC for filter cloth which ensures the specified minimum life of 7000 hours.	Bidders to comply the specification requirement.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
74	Section-VI Part-B Sub Sec-I-M1 (FGD)				13.03.00	32 of 49	2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (total 4 nos. of pumps for 3x660 MW) along with all necessary piping, valves, control & instrumentation shall be provided by the Contractor.	It is presumed that total 6 nos. of mist eliminator pump are to be provided for 3x660 MW plant. NTPC to confirm.	Refer Amendment to technical specification in this regard.
75	Section-VI Part-B Sub Sec-I-M1 (FGD)				10.01.00	29 of 49	Slurry & Process Water tanks Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor.	Since, contradictory requirements related to corrosion allowance in process water tanks is specified in these clauses, corrosion allowance of 1.5 mm will be considered for process water tanks. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub Sec-I-M1 (FGD)				13.01.00	31 of 49	Process Water Storage tanks Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness		
	Section-VI Part-B Sub Sec-I-M1 (FGD)				13.03.07	32 of 49	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor.		

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
76	Section-VI Part-B Sub Sec-I-M1 (FGD)				13.01.00	31 of 49	Process Water Storage Tanks: All the process water storage tanks shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the bidder.	Since, corrosion allowance specified in both of these requirements is contradictory, additional corrosion allowance of 1.50 mm will be considered for all the Process water tanks over and above the minimum tank shell thickness as calculated per IS:803. NTPC to confirm.	Refer Amendment to technical specification in this regard.
	Section-VI Part-B Sub Sec-I-M1 (FGD)				13.03.07	32 of 49	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor.		
77	Section-VI Part-B Sub Sec-I-M1 (FGD)				14.17.00	34 of 49	Approach and Handling Facilities: Inter-connecting pipes/cables between various facilities of FGD plant shall be routed on the steel trestles to be provided by the contractor.	NTPC to advise whether existing pipe rack (wherever possible) can be used instead of separate pipe rack for routing of long distance piping.	Specification requirement is clear in this regard. Bidders to comply the specification.
78	Section-VI Part-B Sub Sec-I-M1 (FGD)				16.01.04	37 of 49	All ducts shall have a sufficient slope with respect to horizontal so that any chance of accumulation of ash particles or water in the duct can be avoided under all normal/abnormal operating conditions.The inlet duct shall be sloped towards the absorber.	Only absorber inlet wet dry interface will be sloped towards absorber, remaining inlet duct will not have any slope.	Specification requirement is clear in this regard. Bidders to comply the specification.
79	Section-VI Part-B Sub Sec-I-M1 (FGD)				16.01.05	37 of 49	The duct shall be of rectangular cross-section	NTPC to advise whether circular cross-section can be used for flue gas ducts from absorber outlet to wet stack.	Bidders to comply the specification requirement.
80	Section-VI Part-B Sub Sec-I-M1 (FGD)				16.01.05 a)	37 of 49	Duct stiffening shall be by means of rolled sections of duct material.	If size (depth) of duct stiffener member exceeds 600 mm, plate fabricated sections will be used. NTPC to confirm.	Bidders to comply the specification requirement.
81	Section-VI Part-B Sub Sec-I-M1 (FGD)				16.01.08 b) (ii)	38 of 49	Such internal stiffeners for the flue gas duty between boiler and ESP shall be provided with erosion protection shields.	Duct between boiler & ESP is not in bidder scope. NTPC to confirm.	Refer Amendment to technical specification in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
82	Section-VI Part-E				Drg. No. 4410-000-POM-A-001 , Rev. A	Layout of FGD area	As per the flue gas flow scheme shown in this layout drawing, the flue gas duct from FGD absorber is connecting to the individual flue gas duct entering the existing chimney. Since, new wet stack is considered for the proposed FGD project, this flow scheme is presumed to be not valid now. NTPC to confirm.	Query is not clear. Bidder to read the specifications in totality.	
83	Section-VI Part-B SUB-SECTION-IV-D CIVIL WORKS				3.14.01	10 of 114	Single-flue or multi-flue chimney(s) shall be provided.	NTPC to advise whether common chimney for all the three units (i.e. chimney with three flues) is acceptable.	Specification requirement is clear in this regard. Bidders to comply the specification.
84	Section-VI Part-B SUB-SECTION-IV-D CIVIL WORKS				6.08.00	24 of 114	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, Ball mill building shall be through RCC staircase, and roof access to all other buildings all shall be through cage ladder as per requirement.	Bidder understands that Gypsum Dewatering Building, FGD Control room, MCC building, Ball mill building, Slurry Recirculation pump & Oxidation blower house are RCC framed building with Brick walls. In addition, no wall / cladding shall be provided for areas where Blower, Slurry Recirculation Pumps, Dewatering equipment, Limestone Ball mill will be located since these areas need maintenance access for the above equipment. However, Electrical Control room, MCC room will be of enclosed type with Brick walls. NTPC to confirm.	Type of building structure (Steel/RCC) and cladding system,if not specified in the technical Specification, shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any).
85	Section-VI Part-E				Drg. No. 4410-999-POC-F-001, Rev. 0	Layout plan of FGD system	NTPC is requested to provide the layout drawings in CAD format.	CAD format Drawing cannot be provided.	
					Drg. No. 4410-999-POM-A-001, Rev. A	Layout of FGD area			

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
86	Section-VI Part-E					Drg. No. 4410-109-POM-A-007, Rev. A	Scheme of Gypsum Dewatering System The source of process water is specified as CW blowdown.	Source of process water specified in both of these clauses is contradictory. NTPC to clarify.
	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.04.00	1 of 3		
87	Section-VI Part-E					Drg. No. 4410-109-POM-A-007, Rev. A	Scheme of Gypsum Dewatering System The source of water for cake wash is specified as process water.	NTPC to clarify the source of water to be considered for gypsum washing i.e. whether it is clarified water or process water (raw water)
	Section-VI Part-A Sub Sec-IV Terminal Points & Exclusions				1.05.00	1 of 3		
88	Section-VI Part-E					Drg. No. 4410-000-POM-A-00, Rev. 0	Terminal Point for Normal Make-up of E.C.W overhead tank for FGD	There appears to be an error in the said terminal point shown in drawing. NTPC to clarify.
89	Section - VI, Part - A			Sub Section - I	3 of 18	1.03.01	Wet limestone based Flue gas desulphurization (FGD) for 2X 800 MW unit, capable of reducing	We understand that the proposed enquiry is for 3x660 MW North Karanpura, the plant capacity indicated is a typographical error.
90	Section - VI, Part - A			Sub Section - III-A1	1 of 8	1.03.00	The FGD system shall have an independent absorber for each unit and two (2) nos of Booster fans each unit shall be provided in downstream of ID fans capable of handling the pressure drop in the FGD system, ducting, Selective Catalytic Reactor (SCR) (in Employer's Scope) and maintain required chimney inlet pressure.	Please furnish the pressure across SCR system (In Employer's scope) so that the the same pressure drop will be considered while designing the Booster Fan supplied by FGD supplier.
91	Section - VI, Part - A			Sub Section - III-A1	3 of 8	3.01.03	Two (2) limestone slurry tanks, each tank sized to meet 12 hrs total limestone slurry storage requirement for two units at Design point , complete with all accessories and Agitator(s).	We understand that bidder to furnish two (2) limestone slurry tanks, each tank is sized to meet the total limestone slurry requirement of three (3) units at design point instead of two (2) units as specified. Kindly confirm.

Refer Amendment to technical specification in this regard.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
92	Section - VI, Part - A			Sub Section - III-A1	3 of 8	3.01.04	2x100% limestone slurry pumps for each absorber connected to each of the limestone slurry tank (total 6 nos. of pumps for 3x660 MW).	Please note that in the flow scheme (Dwg No. 4410-109-POM-A-006) 3x100% limestone slurry pumps are indicated for each absorber/limestone slurry tank but in the specification 2x100% pumps are specified. Please clarify the discrepancy.	Specifiacion requirement is clear in this regard.
93	Section - VI, Part - A			Sub Section - III-A1	4 of 8	4.01.05	1 No. Emergency water tank for spraying water at inlet of Absorber for upset condition.	Kindly clarify the storage time or capacity to be considered by bidder.	Already indicated. Please read the specification in totality.
94	Section - VI, Part - A			Sub Section - III-A1	4 of 8	5.01.00	The employer envisages a common gypsum dewatering system for the two (2) units.	Please note that in the the technical specification Section VI, Sub Section III-A2 Cl. No. 3.01.00 it is specified that complete gypsum dewatering system including Gypsum conveying from Vacuum belt filter outlet to Gypsum storage shed are included in Bidder's scope but as per reference clause common gypsum dewatering system is excluded from bidder's scope. Please clarify the discrepancy.	Refer Amendment to technical specification in this regard.
95	Section - VI, Part - A			Sub Section - III-A1	5 of 8	5.02.00	Each set (suitable for handling/dewatering of one unit) of dewatering equipment (01 working set + 01 standby set) shall comprise of the following items as a minimum requirement:	As per technical specification for all three (3) units a common Gypsum dewatering system shall be provided and the equipments related to gypsum dewatering system shall be sized to handle maximum gypsum produced by Three (3) units, but in the reference clause it is stated that each set should be suitable for handling/dewatering of one unit. Please clarify the discrepancy.	Refer Amendment to technical specification in this regard.
96	Section - VI, Part - A			Sub Section - III-A1	8 of 8	17.00.00	Contractor shall provide separate air receivers of adequate capacity for meeting the instrument and service air requirements.	Please furnish the Instrument air, Service air Quantity and Pressure provided by M/s NTPC at bidder's terminal point.	It is in the Bidders scope. However preesure at terminal point will be 5-7 Kg/cm2.
97	Section - VI, Part - A			Sub Section - III-A1	8 of 8	18.00.05	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided.	Please confirm that bidder to furnish one (1) common Nickel based alloy material storage/Neutralizing tank twelve (12) hrs storage of Three (3) units stack condensate instead of two (2) units.	Refer Amendment to technical specification in this regard.
98	Section - VI, Part - A			Sub Section - III-A2	3 of 7	2.01.01 (a)	Clear access shall be provided for movement of pay loaders/ bulldozers on the paved area and on the hopper grating in order to remove the oversized limestone.	Please conrim that pay loaders/bulldozers required for remove the oversized limestone on truck hoppers are in owner's scope.	CONFIRMED

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
99	Section - VI, Part - A			Sub Section - III-A2	5 of 7	2.01.22	One (1) number of passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and electrical to serve various floors of limestone crusher house.	Please clarify capacity of Passenger cum Goods Elevator to be considered by bidder in Limestone crusher house.	Refer amendment in this regard
100	Section - VI, Part - A			Sub Section - III-A2	7 of 7	3.01.00 (b)	One number of covered storage shed for gypsum complete with all mechanical, electrical & civil works including floors for tripper and at ground level and truck bay.	Please clarify the storage period to be considered by bidder for Gypsum storage shed.	Refer Technical Specification Part-A ,Sub section III-A2 Cl. 1.02.00 (a)
101	Section - VI, Part - A			Sub Section - IV	1 of 3	1.03.01	Normal make up to ECW tank	Please furnish the water quantity available at Bidder's terminal point.	Refer tender drawing no. 4410-000-POM-A-01
102	Section - VI, Part - A			Sub Section - IV	1 of 3	1.03.02	Emergency make up to ECW tank	Please furnish the water quantity available at Bidder's terminal point.	Refer tender drawing no. 4410-000-POM-A-01
103	Section - VI, Part - A			Sub Section - IV	1 of 3	1.04.00	Process Water	Please furnish the water quantity available at Bidder's terminal point.	Refer tender drawing no. 4410-000-POM-A-01. Process water is raw water from the reservoir.
104	Section - VI, Part - A			Sub Section - IV	1 of 3	1.05.00	Gypsum Wash Water (Clarified Water)	Please furnish the water quantity available at Bidder's terminal point.	Bidder to design the system for optimal the water requirement for Gypsum washing and same shall be made available.
105	Section - VI, Part - A			Sub Section - IV	2 of 3	1.09.00	Hydrant and spray header each of size 150 NB available in near Chimney for tapping required for Hydrant and spray system for FGD facilities.	Please furnish the Co-ordination point of Hydrant spray water header for each size to enable us to design/consider the further routing to FGD system.	Co-ordinate point for hydrant & spray water header shall be furnished during detailed engg. However, one no. tapping each for hydrant & spray shall be provided around 50m vicinity.
106	Section - VI, Part - A			Sub Section - IV	2 of 3	1.12.00	b) Instrument air at one point (if required).	Please furnish the Co-ordination point of Instrument air to consider the same as bidder's terminal point. Also please furnish the Instrument air quantity and Pressure available at Bidder's terminal point.	Bidder to note that piping header is available at C row (running along CD bay rack). Exact location will be finalized during detail engineering. Pressure available is approx 5-7 kg/cm2.
107	Section - VI, Part - A			Sub Section - V	2 of 10	3.00.00	Sl. No. 7) Flue Gas Composition at FGD system inlet: (viii) Dust (mg/Nm ³) 50-200	Please note that the Maximum Dust content indicated at FGD system inlet in both Guarantee Point and Design Point seems very high. We request you to kindly once again check and confirm.	Bidders to comply the specification requirement.
108	Section - VI, Part - A			Sub Section - V	2 of 10	3.00.00	Sl. No. 7) Flue Gas Composition at FGD system inlet:	Please furnish the HCL and HF value in Flue gas for both Guarantee Point and Design Point with reference condition, the same is not mentioned in the specification.	Refer Amendment to technical specification in this regard.
109	Section - VI, Part - A			Sub Section - I-M1	2 OF 49	1.03.02	Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber and (ii) in the bypass duct. Further, Quick opening Bi-plane motorized/pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct.	Please note that in the Flow Diagram {Dwg No. 4410-109-POM-A-005} each Motorized Guillotine type gates are indicated with 2x100% seal air fans, but in the reference clause the seal air fan is specified only for Bi-plane type	Refer Amendment to technical specification in this regard.

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110	Section - VI, Part - A			Sub Section - I-M1	2 OF 49	3.03.07	The Guillotine gate type dampers mentioned at Clause No. 3.03.01 above shall have a guaranteed gas tightness efficiency without the use of seal air fans of the damper.	dampers. Please clarify whether bidder to consider the Seal air fans for Bi-plane type dampers only or for both Bi-plane type and Guillotine type dampers.
111	Section - VI, Part - A			Sub Section - I-M1	6 OF 49	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner.	We propose Borosilicate lining in the chimney in addition to the proposed titanium and C-276 as specified in the reference clause. We request you to kindly confirm the same.
112	Section - VI, Part - A			Sub Section - I-M1	6 OF 49	3.03.01	Guillotine gate type damper is being provided by the Employer before the suction of each Booster fan.	Please note that in the flow scheme (Dwg No. 4410-109-POM-A-005, Rev. A) Guillotine gate type dampers at Booster fan inlet is indicated in Bidder's scope, but in the reference clause it is specified in Employer's scope. Please clarify the discrepancy.
113	Section - VI, Part - A			Sub Section - I-M1	7 OF 49	3.03.01	A Pneumatic operated multi louver damper with seal air arrangement shall also be provided by the Contractor in the clean gas duct after GGH.	Please confirm the requirement of GGH. We understand that this is a typographical error and GGH is not envisaged for the proposed project.
114	Section - VI, Part - A			Sub Section - I-M1	7 OF 49	3.03.07	A damper in the bypass duct is being provided by the Employer for quick opening to allow bypass to come into operation in case of emergency.	Please note that in the flow scheme (Dwg No. 4410-109-POM-A-005, Rev. A) dampers in the bypass duct is indicated in Bidder's scope, but in the reference clause it is specified in Employer's scope. Please clarify the discrepancy.
115	Section - VI, Part - A			Sub Section - I-M1	7 OF 49	3.03.09	Provision shall be made for giving signal automatic bypass controls of the absorber in case of failure of the absorber spray system or the GGH.	Please confirm the requirement of GGH. We understand that this is a typographical error and GGH is not envisaged for the proposed project.
116	Section - VI, Part - A			Sub Section - I-M1	13 OF 49	5.01.00	iii) The slurry recirculation pumps shall have a minimum margin of 10% of flow and head, over the actual requirement for meeting the guarantee and design point conditions.	Kindly note that our technology partner do not recommend any margin on the flow and head as this will affect mass balance. Please check requirement.
117	Section - VI, Part - A			Sub Section - I-M1	13 OF 49	5.01.00	V) Minimum 10% spare nozzles shall be provided at each level.	It may please note that 10% of spare nozzles for each spray level is not applicable for our design. Hence please confirm that the same shall be as per Bidder's design standard.

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118	SECTION-VI, PART-B			SUB-SECTION-I-M1	15 OF 49	5.03.03	Oxidation nozzles / spargers shall have a minimum redundancy of 10% or as per the contractor's proven practice whichever is maximum.	Please note that we are supplying lance type oxidation air system (one (1) lance for each agitator) 10% margin on oxidation air nozzle is not applicable for our design. Hence please confirm that the margin for oxidation nozzles/spargers will be applicable as per bidder design standard.	Specification requirements is clear. Bidders to comply the specification requirement.
119	SECTION-VI, PART-B			SUB-SECTION-I-M1	15 OF 49	5.04.00	Margins Flow -- 15% Head – 20%	Please note that for since the Gypsum bleed pumps are continuous operation hence Margin on flow are not required. Kindly check the requirement.	Bidders to comply the specification requirement.
120	SECTION-VI, PART-B			SUB-SECTION-I-M1	16 OF 49	5.06.06	Three stage chevron type Mist Eliminators (ME) made of polysulfone or stainless steel shall be provided at the exit of the absorber.	We porpose to accept polypropylene (PP) Mist Eliminator elements/lamellas and frames as per manufacturers standards.	Bidders to comply the specification requirement.
121	SECTION-VI, PART-B			SUB-SECTION-I-M1	18 OF 49	5.06.14	The absorber wet-dry interface shall be made of solid Alloy 59 or C276 of minimum 6 mm thickness.	As per technology partner experience 2 mm thick Alloy 59 or C-276 cladding over MS plate is adequate to protect wet Dry interfaces from corrosion. Kindly confirm.	Bidders to comply the specification requirement.
122	SECTION-VI, PART-B			SUB-SECTION-I-M1	18 OF 49	5.06.17	The spray headers (if provided) and air supply headers shall be made of FRP or Carbon Steel with rubber lining (minimum 10 mm natural rubber lining), corrosions and erosion resistant in the inner and outer side (Silicon Carbide coating on metal/FRP surface exposed to slurry).	Please note that FRP spray headers and alloy steel air supply pipes in Absorber do not require any protective linings on inner/outer surfaces. Please confirm.	Specification requirements is clear. Bidders to comply the specification requirement.
123	SECTION-VI, PART-B			SUB-SECTION-I-M1	20 OF 49	6.03.02	All parts of the gate in contact with limestone shall be of stainless steel construction.	Please furnish the the Material code for Stainless Steel to be considered by bidder or please confirm that the material code for SS will be as per Manufacturer/Vendor standard suitable for the limestone handling system.	Specifiacion requirement is clear in this regard. Bidder to comply.
124	SECTION-VI, PART-B			SUB-SECTION-I-M1	21 OF 49	6.03.06	For each bunker facilities shall be provided for unloading the bunker, through feeder, to a truck at ground level, along with all necessary chutes and diversion chutes.	Please furnish the details of truck unloading equipments below limestone silo to be considered by bidder for more clarity.	Specification requirement is clear in this regard. Bidders to comply the specification requirement.
125	SECTION-VI, PART-B			SUB-SECTION-I-M1	22 OF 49	6.05.03	The hydro-cyclone shall be of proven design and shall be provided with replaceable rubber lining.	Please confirm if polyurethane/polypropylene Hydro-cyclones are also acceptable as per manufacturer standard.	Bidders to comply the specification requirement.

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126	SECTION-VI, PART-B			SUB-SECTION-I-M1	22 OF 49	6.06.01	Each tank shall be sized to meet 12 hours continuous limestone requirement of the two units operating at Design point.	Please note that since the proposed project is having Three (3) units, hence we understand that bidder to design/size the limestone slurry tank to meet 12 hours continuous limestone requirement for three (3) units instead of two (2) units specified in the reference clause. Please confirm	Refer Amendment to technical specification in this regard.
127	SECTION-VI, PART-B			SUB-SECTION-I-M1	23 OF 49	6.07.01	2x100% centrifugal type limestone slurry pump shall be provided for each unit.	Please note that in the flow scheme (Dwg No. 4410-109-POM-A-006, Rev. A) three (3) nos 3x100% Limestone slurry pumps are specified. Please clarify the discreancy and confirm the actual number of Limestone slurry pumps to be considered by bidder.	2x100% centrifugal type limestone slurry pump shall be provided for each unit. Please read the specification in totality.
128	SECTION-VI, PART-B			SUB-SECTION-I-M1	23 OF 49	6.07.03	The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	Please note that FRP pipes and bends are suitable for lime slurry duty and do not require any wear resistant lining. Please check the requirement of rubber lining in FRP pipes.	Bidders to comply the specification requirement.
129	SECTION-VI, PART-B			SUB-SECTION-I-M1	24 OF 49	7.04.01	Each vacuum belt filter shall be sized to meet the following requirements, all occurring together, with an inlet solid concentration of not more than 45% or outlet of hydro-cyclones whichever is minimum:	Please note that the solid concentration from Primary Hydrocyclone underflow is based on the mass balance and may vary from supplier to supplier based on the proprietary design. Please confirm that the same will be as per bidder's design standard.	Bidders to comply the specification requirement.
130	SECTION-VI, PART-B			SUB-SECTION-I-M1	26 OF 49	7.07.02	The secondary hydrocyclone feed tank shall be sized to provide a minimum storage of 1 hr of primary hydrocyclone overflow with all the units operating at Design Point and no outflow from the tank.	Please note that in Cl. No. 7.07.02 the Secondary hydrocyclone feed tank storage is specified to design 1Hr storgae of Primary hydrocyclone overflow and in the same page under Cl. No. 7.07.03 it is specified that the	Refer Amendment to technical specification in this regard.
131	SECTION-VI, PART-B			SUB-SECTION-I-M1	26 OF 49	7.07.03	2x100% horizontal centrifugal pumps shall be provided to feed the secondary hydrocyclones. Each pump shall be sized to empty the full storag capacity of the tank in 6 hrs.	Secondary hydrocyclone feed pump is designed to empty the Secondary hydrocyclone feed tank with in 6 Hrs . Please check and clarify the discrepancy	

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132	SECTION-VI, PART-B			SUB-SECTION-I-M1	26 OF 49	7.05.05	The vacuum receiver and pump internals shall be suitably lined to protect against the corrosive environment.	Please check the requirement. Since there is no lining inside the liquid ring type vacuum pump.	The material selected for vacuum pumps & vacuum receivers shall be proven for similar application and shall be subjected to approval of the employer.
133	SECTION-VI, PART-B			SUB-SECTION-I-M1	27 OF 49	7.08.02	The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours.	Please note that in Section-III A-1, P No. 6 of 8 Clause No .6.02.00, the same is specified as 1x100% slurry pumps for pumping the slurry back to any of the absorber of the units . Please clarify the discrepancy and confirm actual number of slurry pumps to be considered by bidder.	Refer Amendment to technical specification in this regard.
134	SECTION-VI, PART-B			SUB-SECTION-I-M1	28 OF 49	8.09.00	The design of the shaft shall ensure that the operating speed is at least 20% above the critical speed of the shaft.	We understand that the slurry pump shaft should be designed to operate at critical speed which is 20% higher than the operating speed. Kindly confirm.	Refer Amendment to technical specification in this regard.
135	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				16 of 49	5.06.06	The mist eliminator wash piping shall be constructed of rubber lined carbon steel or glass fiber reinforced plastics.	Carbon steel pipe shall be selected for outside pipe up to the nozzles at Mist Eliminator casing. Inside the mist eliminator casing piping header shall be of FRP/CSRL as per tender specification.	specification requirement is clear in this regard. Bidder to comply the specification.
136	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				28 of 49	8.04.00	The flushing water for the pumps shall be taken from the process water supply	Bidder envisages to use reclaim water for the flushing of slurry pumps (3-5% slurry concentration) according to our collaborator proven practice.	Bidder to comply the specification requirement.
137	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				5 of 49	3.01.00.5	Maximum flue gas velocity through the Absorber (M/sec) Not more than 4 m/s at Design Point	Bidder understands that this clause is applicable for spray tower systems. Since the gas flow path is different in offered jet bubbling technology, this clause is not applicable to our offered Process. Kindly confirm.	Bidder to comply the specification requirement.
138	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				30 of 49	11.09.00	Static and dynamic balancing shall of all agitators shall be carried out after assembly	Since all the agitators are vertically mounted & rotating at low rpm, the static & dynamic balancing after assembly are not envisaged.	Bidder to comply the specification requirement.
139	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				24 of 49	7.04.04	In case, the contractor offers a design with an underlying belt for carrying the filter cloth, the same shall be endless, factory vulcanized rubber belts.	The size of Vacuum belt filter will decide the extent of modularization and hence the final assembly requirement at site. This will in turn govern the requirement of site joint (vulcanized) for rubber belts.	specification requirement is clear in this regard. Bidder to comply the specification.
140	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				17 of 49	5.06.10	The raw gas inlet duct of the absorber shall be equipped with a flushing device of the side walls and the ground, which shall operate continuously as well as intermittently.	Bidder understands the gas cooling mechanism which is continuously operated and is provided in the raw gas inlet duct of absorber meets the requirement. Kindly confirm.	specification requirement is clear in this regard. Bidder to comply the specification.

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141	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				20 of 49	6.02.06	For each silo facilities shall be provided for unloading the bunker, through feeder, to a truck at ground level, along with all necessary chutes and diversion chutes.	Kindly let us know the purpose of limestone unloading into a truck at the ground level. Also furnish the type of feeder to be considered, in case above is required. In general, Rotary air lock valve with the telescopic chute is required to load material on to trucks. Please clarify the requirement.	specification requirement is clear in this regard. Bidder to comply the specification.
142	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				27 of 49	7.08.01	The Contractor shall provide an auxiliary absorbent tank, for the unit, sized to contain the complete slurry of one absorber tank at its maximum level equipped with all necessary pumps, valves, piping and controls to transfer the tank's contents back to the absorber to refill the absorber sump	The two clauses are contradictory. Bidder understands that only one common auxillary absorbant tank is required. Kindly clarify.	Refer Amendment to technical specification in this regard.
143	SECTION- VI, PART-A/ SUB SECTION-111-A1 FGD				6 of 8	6.01.00	The employer shall provide a common auxiliary absorbent tank, common for the three (03) units, of sufficient capacity for storage of absorber slurry of one unit.		
144	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				27 of 49	7.08.01	The Contractor shall provide an auxiliary absorbent tank, for the unit, sized to contain the complete slurry of one absorber tank at its maximum level equipped with all necessary pumps, valves, piping and controls to transfer the tank's contents back to the absorber to refill the absorber sump It should be possible to discharge the each absorber into the emergency drain tank within 2 hours.	Draining of absorber using a pumping system is possible between normal slurry level and minimum slurry level. The balance slurry will be drained to the drain sump by gravity. Kindly confirm.	Bidder to comply the specification requirement.

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145	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			31 of 49	12.02.00	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 3" made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same.	Bidder proposes FRP as alternative material for all sizes of slurry pipes, please confirm.	specification requirement is clear in this regard. Bidder to comply the specification.
146	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			4 of 49	1.09.00	Noise level	Bidder understand that for ball mill noise level limit shall be <90 dB(A). Please confirm.	specification requirement is clear in this regard. Also Refer Amendment to technical specification in this regard.
147	SECTION – VI, PART-C / General technical requirements			42 of 82	30.00.00	Noise level <90 dB(A)		
148	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			5 of 49	3.01.00	Recirculation Slurry pH Not less than 5.5 under all operating conditions	This clause is not applicable to Jet Bubbling technology offered by the bidder. Please confirm.	specification requirement is clear in this regard. Bidder to comply the specification.
149	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			21 of 49	6.05.01	Limestone bond index(kWh/sh. T) 13 (min)	Bidder considers Limestone bond index as 13 kWh/metric ton. Please confirm.	Refer Amendment to technical specification in this regard.
150	SECTION-VI, PART-A/SUB-SECTION-V SALAIENT DESIGN DATA			6 of 10	6.00.00	Bond Index 13 kWh/t		
151	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			34 of 49	15.01.00	One (1) no. Passenger cum goods elevator per Absorber & for Mill Building	Bidder understands that passenger cum goods elevator of minimum capacity of 1000 kgs for each absorber shall be required only if height of absorber is higher than 20M.	Bidders understanding is correct.
152	SECTION – VI, PART-A / SUBSECTION-III-A1 (FGD)			6 of 8	8.01.00	One (1) number passenger cum goods elevator of minimum capacity of 1000 kgs for each Absorber (to be provided in case height of absorber is higher than 20m)....		
153	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			2 of 49	1.03.02	Motorized Guillotine type gates has to be provided at.....(iii) in the bypass duct (common Flue Gas Duct going towards the existing Chimney).	Already a Bi-plane motorized/pneumatic is asked in the bypass duct in 3.03.01. Purpose of this Motorized Guillotine type gates damper to be clarified.	Refer Amendment to technical specification in this regard. Bidder to comply the specification requirement.
154	SECTION- VI, PART-A/SUB SECTION-111-A1 FGD			6 of 8	6.02.00	The contractor shall provide 1 x 100% slurry pumps	The two clauses are contradictory. Kindly clarify.	Refer Amendment to technical specification in this regard.
155	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			27 of 49	7.08.02	The contractor shall provide 2 x 100% pump		
156	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			32 of 49	13.03.07	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell thickness	The two clauses are contradictory. Bidder shall consider 1.5mm corrosion allowance. Please confirm.	Refer Amendment to technical specification in this regard.

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157	SECTION – VI, PART-B SUB-SECTION-I-M1				31 of 49	13.01.00	Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the bidder.	
158	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				5 of 49	3.01.00 (3)	The entire flue gas system, flue gas ducts, absorber etc. shall be designed to meet the following conditions: Short temp excursion temperature of inlet gas (for approx. fifteen (15) minutes at a time) (deg. C) 300	In case of offered technology, since the absorber is preceded by the gas cooling system (including emergency cooling water system), we don't envisage 300 Deg c excursion temperature at absorber. Hence this clause is not applicable for offered absorber.
159	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				9 of 49	4.03.00	Fan component shall also be designed to withstand the excursions in flue gas temperature up to 300 degree Celsius, which may persist for about 30 minute duration.....	
160	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				24 of 49	7.04.03	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material or shall be provided with corrosion resistant liners of proven design.	Bidder proposes CS body with epoxy paint for the complete frame which is also followed as standard by vendors. However, if different material is required the same need to be specifically mentioned.
161	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)				2 of 49	1.03.06	The FGD and the ancillary facilities shall be suitable for unlimited operation with all transients and at any load point between the minimum and maximum load point of the Steam Generator. Further, the FGD plant shall be suitable for an unlimited operation at any pollutant concentrations between minimum and maximum without exceeding the emission values of SO ₂ emission of less than 100 mg/Nm ³ (6% O ₂ dry).	Bidder shall design considering Guarantee point is 100% TMCR & worst coal and corresponding SO ₂ removal efficiency is 96.997% and design point is VWO & worst coal and corresponding SO ₂ removal efficiency is 96.997%. In view of non availability of data between minimum and maximum load point of steam generator, bidder shall design FGD system and ancillaries and commit SO ₂ emissions less than 100 mg/Nm ³ with 6% O ₂ dry for the two points given above. Please confirm.
162	SECTION-VI, PART-A/ SUB-SECTION-V SALIENT DESIGN DATA				3 of 10	3.00.00	Guarantee point is 100% TMCR & worst coal and corresponding SO ₂ removal efficiency is 96.997% and design point is VWO & worst coal and corresponding SO ₂ removal efficiency is 96.997%	Bidder to comply the specification requirement. Refer Amendment to technical specification in this regard.
163	SECTION – VI, PART-E / TENDER DRAWING LIST					4410-109-POM-A-006	Limestone grinding area sump	Bidder considers only Limestone grinding area sump shown in "4410-109-POM-A-006". Please confirm.
						4410-109-POM-A-007	Limestone grinding area sump	

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164	TECHNICAL SPECIFICATION SECTION – VI, PART-A SUB-SECTION-V (SALAIENT DESIGN DATA)				2 OF 10		Flue Gas Composition at FGD system inlet: Please provide HCl & HF content in flue gas.	Refer Amendment to technical specification in this regard.
165	TECHNICAL SPECIFICATION SECTION-VI, PART-A SUB-SECTION-V SALAIENT DESIGN DATA				6 of 10	6.00.00 note-1	Guaranteed parameters (guarantee on limestone consumption, auxiliary power consumption & gypsum purity) shall be based on available (reactive) CaCO ₃ content of 89%. The design of Flue Gas Desulphurisation (FGD) system & auxiliaries shall be based on available (reactive) CaCO ₃ content of 79%. Bidder will design the FGD system considering CaO as 51% for guarantee point and CaO as 47% for design point. Please confirm.	Specification requirement is clear in regard. Bidders to comply the specification requirement.
166	TECHNICAL SPECIFICATION SECTION-VI, PART-A SUB-SECTION-V SALAIENT DESIGN DATA & SIZING				5 of 10	6.00.00		
						LIMESTONE CHARACTERISTICS: CaO: 47-51%		

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167	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			21 of 49	6.05.01	iv) output fineness: 90% or higher (as per the requirement of the absorber) through 200 mesh (for bubbling process)	Bidder understands that for Jet Bubbling process absorber, guarantee of 90% or higher (as per the requirement of the absorber) through 200 mesh (for bubbling process) shall be applicable in line with Technical Specifications. Kindly confirm.	Specification requirement is clear in this regard. Comply the specification.
168	TECHNICAL SPECIFICATION SECTION.YI, PART-A/ SUB-SECTION-VI - FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES			7 of 14	4.02.00	90% or higher (as per the requirement of the absorber) through 325 mesh.		
169	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			5 of 49	3.01.00	The entire flue gas system, flue gas ducts, absorber etc. shall be designed to meet the following conditions: Design internal pressure at 67% +660 and -150 mmwc or maximum yield strength (mm wc): +660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher	Bidder shall consider the duct design pressure +660 and -150 mmwc. Please confirm.	Refer Amendment to technical specification in this regard.
				37 of 49	16.01.03	Duct Design Pressure: All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material		
170	TECHNICAL SPECIFICATION SECTION – VI, PART-A SUB-SECTION-V - SALIENT DESIGN DATA			2 OF 10		Flue Gas Composition at FGD system inlet: (iv) SO ₂ (% v/v wet) 0.088/ 0.087 correspondingly at Guarantee Point /Design Point	These two data are not conforming. Please confirm which one is to be considered for FGD sizing.	Refer Amendment to technical specification in this regard.
171				2 OF 10		Flue Gas Composition at FGD system inlet: (vi) Inlet SO ₂ (mg/Nm ³ -wet) 2437/ 2407 correspondingly at Guarantee Point /Design Point		
172	TECHNICAL SPECIFICATION SECTION-VI, PART-A, SUB-SECTION-IV - TERMINAL POINTS & EXCLUSIONS					TERMINAL POINTS	Please provide the terminal points for Service/ Instrument air.	Bidder to note that piping header is available at C row (running along CD bay rack). Exact location will be finalized during detail engineering.
173	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			27 of 49	7.07.10	Bucket conveyors shall be provided by the contractor to feed lime to each of the lime storage silos from ground level. The Bucket conveyors shall be sized to completely feed each lime silo within 2hrs.	Bidder understands that the bucket conveyor quantity shall be (1Working+1Standby). Please confirm.	Refer Amendment to technical specification in this regard.

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174	SECTION – VI, PART-B / SUB-SECTION-I-M1 (FGD)			21 of 49	6.05.01	Each mill shall be sized to meet 110% of the maximum limestone requirement	Bidder understands each mill shall be sized to meet 110% of the maximum limestone requirement of all the three units in the project.	Refer Amendment to technical specification in this regard.
				21 of 49	6.05.01-ii	Flow: 110% of limestone requirement of two absorbers at Design point		
175	Section-VI PART-A, Sub-Section-III-C (C&I)			2 of 8	2.01.00	Primary instruments like... vibration transmitter..	Bidder understands that as specified in Section-VIA Sub-Section-IIIC (C&I), Vibration transmitters shall be considered for vibration monitoring of all critical HT drives in Bidder's scope & same shall be hardwired to FGD PLC system. Accordingly no dedicated Vibration Monitoring System is envisaged for the same. Kindly confirm.	Bidder's understanding is generally correct that Vibration transmitters shall be considered for vibration monitoring of all critical HT drives in Bidder's scope & same shall be hardwired to FGD PLC system. However, bidder to refer Clause 1.02.07, sub section I-M2, PART B and Clause 2.01.11, sub section III-A2, PART-A of technical specification wherein Vibration Monitoring System is envisaged for each mill and crusher. Bidder to comply with the specification requirement.
176	Section-VI PART-A, Sub-Section-III-A2, Limestone & Gypsum Handling Plants			4 of 7	2.01.11	Two (2) numbers of hammer mills of 150TPH rated capacity each for crushing limestone complete with drives, ..., vibration monitoring system etc.		
177	Section-VI PART-B, Sub-Section-I-M2, (Limestone & Gypsum Handling System)			60 of 112	1.02.07	Crusher shall be provided with vibration monitoring (VMS) system . Specification of VMS shall be as specified elsewhere.		
178	Section-VI PART-A, Sub-Section-III-C (C&I)			6 of 9	6.01.00	Contractor shall ensure that RIO cabinets are provided in air conditioning environment.	Bidder understands that RIO cabinets may be considered in air conditioned room or with Panel Air conditioning. Kindly confirm / clarify.	As per clause 6.01.00, PART-A, Sub Sec IIIC, it is envisaged that RIO panel shall be placed in air conditioning room. The construction & civil works of air conditioning room shall be in the scope of bidder. However, RIO panel with panel air conditioning shall also be acceptable if such RIO panels are placed inside a ventilated building. The construction & civil works of building (inside which RIO panel with panel air conditioning shall be placed) and its ventilation, shall be in the scope of bidder. Refer amendment in this regard.
179	Section-VI PART-A, Sub-Section-III-C (C&I)			8 of 9	9.01.00	Hardwired Signal exchange:... Contractor shall provide Remote Input Output (RIO) for PLC per unit , placed in Central Equipment Room (CER) for the same.	Since common PLC system is considered for FGD of all Units & its associated systems, Bidder understands that PLC RIO panel common for all Units , shall be considered at CER. Kindly confirm.	Bidder's understanding is not correct. Remote Input Output (RIO) panel, located in respective unit (s) CER, for hardwired signal exchange between FGD PLC and BOP DDCMIS of respective unit (s) shall be provided on per unit basis.
180	Section-VI PART-A, Sub-Section-III-C (C&I)			8 of 8	9.02.00 (2)	Contractor shall provide necessary hardware and software for dual fibre optic connectivity & interconnection with station wide LAN for transfer of signals...	Bidder understands that only supervisory monitoring of FGD system is envisaged through Station LAN connectivity, and type of connectivity/no. of signals to be transferred, shall be considered accordingly. Owner to kindly confirm.	Bidder's understanding is correct that supervisory monitoring of FGD system is envisaged through Station LAN connectivity. However, bidder to further refer clause 9.02.00, PART-A Sub Section-IIIC, wherein it is mentioned that it is also envisaged to control, operate and monitor FGD and associated system remotely from main plant Central Control Room (CCR). Bidder to comply with the specification requirement.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
181	Section-VI PART-B, Sub-Section-III-C4, Instrumentation Cables			10 of 13	8.05.00	The cables emanating from redundant equipment/devices shall be routed through different paths.	Considering the space constraint for FGD system, different path for cables from redundant equipments is not feasible. Owner to kindly consider.	Specification requirements are clear. Bidder to comply with the specification requirement.
182	Section-VI PART-A, Sub-Section-III-C (C&I)			6 of 9	6.01.00	Dual processor based PLC system with PC based Operator Work Station (OWS), programmable station and A4 size color Laser printer etc. on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system located in FGD control room	Bidder understands that as specified in Section-VI PART-B, Sub-Section-III-C5, Cl.No.2.05.01, 1 no. PC based OWS is to be provided for FGD PLC, in FGD Control room. Additional EWS cum OWS or PC based Programming station is required to be provided only if the FGD OWS cannot be used as programming station. Kindly confirm / clarify.	Bidder's understanding is not correct. Bidder to refer clause 6.01.00, PART-A, Sub Section-IIIC, where in it is mentioned that Operator Work Station (OWS) shall be supplied on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)-FOUR (4 Nos) b) OWS cum EWS (placed in FGD control room)-ONE (1 No) c) OWS (placed in central control room of each generating unit)-TWO (2 no.). Bidder to refer amendment in this regard. It is further clarified that, in case, FGD OWS can be used as programming station, One (1) no. of FGD OWS shall be provided in place of EWS cum OWS, which shall be used as a programming station.
183	Section-VI PART-E, Tender drawing no. 0000-151-POI-A-013			-	-	1 no. OWS & 1 no. EWS CUM OWS in FGD Control Room		
184	Section-VI PART-B, Sub-Section-III-C5, PLC Based Control System			4 of 27	2.05.01	In case the PC based OWS can not be used as programming station of the PLC and the Human Machine Interface System, then separate PC based programming station shall be provided.		
185	Section-VI PART-B, Sub-Section-III-C5, PLC Based Control System			8 of 27	3.01.01	Input used for interlock/protection shall be dual redundant.	Bidder understands that indicated redundancy refers to redundancy of field instruments, and not the signal (input channel) redundancy. Kindly confirm.	Bidder's understanding is not correct. Bidder to refer clause 3.01.01, PART-B Sub Section-IIIC-5, wherein it is mentioned that each of the redundant binary & analog inputs shall be wired to separate input modules. These redundant modules shall be placed in different racks, which will have separately fused power supply distribution. Implementation of multiple measurement scheme of these inputs will be performed in the redundant hardware. Loss of one input module shall not affect the signal to other modules. Other channels of these modules can be used by other inputs of the same functional group.
186	Section-VI PART-B, Sub-Section-III-C5, PLC Based Control System			8 of 27	3.01.04	The on-off status of HT drives etc, however, be wired to two input modules in parallel.	Bidder understands that as per referred clause 'on' status of HT drives shall be wired in input module parallel with its 'off' status. Kindly confirm / clarify.	Bidder's understanding is not correct. It is clarified that ON status of HT drive shall be wired to two input modules in parallel. Similarly OFF status of HT drive shall be wired to two input modules in parallel.

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187	Section-VI PART-B, Sub-Section-III-C5, PLC Based Control System				13 of 27	5.03.07	For the drives, the command shall be provided through redundant O/P module to MCC/SWGR/Actuator as applicable...	Output signal redundancy is not specified in the Tender, hence Bidder understands that the same is not applicable. Kindly confirm / clarify.	Bidder's understanding is not correct. It is clarified that output redundancy is applicable for 10% of drives distributed in various functional groups (Exact application shall be finalized during detailed engg.) Refer amendment in this regard.
188	Section-VI PART-A, Sub-Section-III-C (C&I)				8 of 9	9.01.00	... Contractor shall provide Remote Input Output (RIO) for PLC per unit, placed in Central Equipment Room (CER) for the same...	Bidder understands that UPS and non-UPS power feeders as required for Bidder's FGD OWS to be mounted in Central Control room and FGD PLC Remote I/O Panels to be located in Central Equipment rooms, shall be provided by Purchaser. Kindly confirm.	It is clarified that NTPC shall provide 02 nos. of UPS power feeder per unit from employer's ACDB, for powering FGD OWS located in CCR. Cabling from ACDB to FGD OWS (located in CCR) shall be in bidder's scope of supply. Bidder to refer clause 9.01.00, PART-A Sub Section-III-C, wherein it is mentioned that NTPC shall provide 2 (Two) nos. of 24V DC power supply feeders per unit from employer's DCDB, for powering RIO panel located in CER. Cabling from DCDB to RIO panel (located in CER) shall be in bidder's scope of supply.
189	Section-VI PART-E, Tender drawing no. 0000-151-POI-A-013				-	-	FGD PLC OWS in Central Control Room		
190	Section-VI PART-A, Sub-Section-III-C (C&I)				8 of 9	9.01.00	... contractor to consider IOs ... for minimum number of hardwired signal exchange per unit as follows DI - 80, DO - 80, AI - 20 and AO- 20.	Bidder understands that necessary provision in FGD PLC, for hardwired interface between DCS and FGD PLC shall be in Bidder's scope. However, I/O channels, marshalling TBs etc. as required at Purchaser's DCS for the same shall be in Purchaser's scope. Kindly confirm.	Bidder's understanding is correct.
191	Section- VI, Sub section-II-E12				1 of 30	1.01.00	Outdoor transformers	Except control, lighting & welding transformer(dry types) all other transformers irrespective of its rating shall be oil filled outdoor types. Employer to confirm that the understanding is correct.	Bidder's understanding is correct. The Specification for Dry type Transformer is mentioned in Amendment of Technical Specification Section VI Part-B Sub section-II-E12 outdoor Transformers Clause 7.00.00.
192	Section- VI, Sub section-II-E11				4 of 19	6.02.00	Battery- The minimum voltage at the end of load cycle shall not be less than 1.75 volts per cell.	Bidder understands that battery for DG set shall be Lead acid plante type. Please confirm.	Bidders understanding is not correct. Please refer clause 6.02.01.
193	Section -IV, Part-A, SUB-SECTION-III-B ELECTRICAL SYSTEM/EQUIPMENT				4 of 6	1.10.00	EARTHING AND LIGHTNING PROTECTION Complete below ground earth mat and above ground equipment earthing system and lightning protection for the plant and equipment under contractors scope along with its interconnection to the nearest employers earth grid at two points.	1) We understand that for FGD area separate step & touch potential calculation is not required. Calculation shall be to check ground resistance within limits. 2) Employers to specify the ground resistance limits.(1 ohms or 5 ohms) 3) Bidder requests owner to provide soil resistivity report for FGD area.	Bidder shall comply with requirement of technical specifications clause no:- 5.01.00, E-6, part-B

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194	SUB SECTION-II -E6 CABLING, EARTHING & LIGHTNING PROTECTION				15 of 69	6.00.00	LIGHTNING PROTECTION SYSTEM Lightning protection system shall be in strict accordance with IEC : 62305 and latest IS standards.	Lighting protection calculation shall be as per IEC 62305. Accordingly, FGD system if found protected by near by stack or any other higher structures, air terminations and lightning conductors shall not be provided. Please confirm.	The same shall be decided during detailed engg
195	SECTION-VI, PART-B, SUB-SECTION 11-E-16				1 of 14	1.00.00	BATTERY AND DC HEALTH MONITORING SYSTEM:- Note: DC health monitoring system shall be offered integral with each battery set for Main Plant & Switchyard batteries.	We understand that health monitoring sytem shall not be applicable to FGD system battery. Please confirm	Bidders understanding is correct.
196	SECTION- VI, PART-B, SUB SECTION-II-E6 CABLING, EARTHING & LIGHTNING PROTECTION				11 of 69	4.04.13	Separation At least 300mm clearance shall be provided between: - HT power & LT power cables, - LT power & LT control/instrumentation cables,	We understand that this clause is applicable for horizational configuration of cable trays only. Bidder proposes to provide spacing of 100 mm between different tiers of trays for vertical configuration. Please confirm.	When vertical trays are arranged one above the other, 100 mm spacing shall be maintained between bottom of top and top of bottom tray. However 300 mm spacing shall be maintained when vertical trays are arranged side by side
197	SECTION - VI, PART-B SUB SECTION-II -E6 CABLING, EARTHING & LIGHTNING PROTECTION				3 of 69	2.01 .08	For feeder in bidder's scope for offsite areas, overhead cable tray arrangement shall be followed.	Bidder understands the purchaser's cable trestle structure between Power House & FGD Area has space and load capability for fixing the bidder's cable tray (if required) for bidder's supplied cables. Bidder will not consider separate cable trestle structure between Power House & FGD Area. Please confirm.	Bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. refer clause no:- 1.08.00.2. However bidder may visit the project in order o get itself acquainted with existing electrical of plant
198	SECTION - VI, PART-B SUB SECTION-11 -E6 CABLING, EARTHING & LIGHTNING PROTECTION				3 of 69	2.01.07	Two separate cable routes shall be provided for cable routing of working and standby drives or different set/group (say 50% capacity) of auxiliaries.	Bidder understands that referred clause (i.e. separate route) is applicable for Main incoming cable from Power House Building to FGD area. Within FGD internal area, separate route may not be feasible for redundant equipments.	Bidder to comply with technical specification requirements.
199	Part E, Section-VI, Tender Drawings, Dwg. no. 4410-109-POE-J-001						Electrical Single Line Diagram	Bidder requests employers to furnish co-ordinates/location of 11kV switchgears (customer switchgear) inorder to enable us to calculate the cable route length.	Bidder to refer Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A). Boards are located in main plant area (AB bay). Further details shall be furnished during Detailed engg.
200	SECTION- VI, PART-B, SUB SECTION-11-E9 HT SWITCHGEAR				2 of 39	1.00.00	Spare capacity and Future Requirements all MV Switchboards is provided with one spare motor feeder and one transformer feeder on each section for future requirements.	Please note that motor spare feeders may not be appcalbe in 11kV FGD switchgear, in case there is no motor feeder envisaged to be supplied from this board.	Please refer amendment-01 in this regard. "All HT switchboards shall be provided with one spare motor feeder and one transformer feeder on each section as spares."

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201	Part E, Section-VI, Tender Drawings, Dwg. no. 4410-109-POE-J-001				Note. 7	Bidder shall provide DC system of adequate capacity for meeting DC loads in FGD area	Bidder proposes to consider 1 set of Battery with charger system for all DC loads requirement for entire FGD area. Please confirm.	Bidder to refer clause 2.08.00 of Chapter E1 and Dwg. no. 4410-109-POE-J-001 regarding rating and number of battery system.
202	SECTION-VI, PART-A, SUB-SECTION-IV, TERMINAL POINTS & EXCLUSIONS			2 of 3	1.12.00 a), b), c) & d)	a) Employer's marshalling cabinets for hardwired signal exchange with Employer system. b) Instrument air at one point (if required). d) Employer's station wide LAN switch	Please provide the coordinates/ location of Employer's marshalling Cabinet, Instrument air terminal point & Station wide LAN switch	Employer's marshalling cabinet and station wide LAN shall be located in Central equipment room (CER) near B row. For coordinates of instrument air refer clarification no. 172.
203	SECTION- VI, PART-B, SUB SECTION-II-E6 CABLING, EARTHING & LIGHTNING PROTECTION			22 of 69	9.00.00 b)	Separate Switchgear Rooms shall be provided for each unit. For TG building, all HT boards shall be provided in HT switchgear room at only one floor and all L T boards shall be provided in L T switchgear room at only one floor	Bidder understands that this clause is not applicable for FGD Package. Please confirm.	Bidder understanding is correct.
204	Section -VI, Part-A, SUB-SECTION-III-B ELECTRICAL SYSTEM/EQUIPMENT			4 of 6	1.12.00	To meet the construction power requirement of the FGD and associated systems,the Employer shall provide Two Number 415V feeders in LT switchgears.	Bidder requests owner to mark the exact coordinates for Construction power supply in GLP.	To meet the construction power requirement of the FGD and associated systems,the Employer shall provide Two Number 415V feeders in LT switchgears near ESP area.
205	Section -VI, Part-B, SUB-SECTION-II-E1			5 of 7	2.08.00	An ageing factor of 1.25 shall be considered.	Bidder would like to clarify that for Plante batteries the applicable ageing factor shall be 1.0 as per IEEE 485. Owner may please confirm.	Bidder to comply technical specification
206	Section -VI, Part-B, SUB-SECTION-II-E2			2 of 9 5 of 9	3.01.00 (b) 8.00.00	Continuous duty LT motors up to 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor. (a) Below 110KW : 11.0 (b) From 110 KW & up to 200 KW : 9.0 (c) Above 200 KW & up to 1000KW : 10.0 (d) From 1001KW & up to 4000KW : 9.0 (e) Above 4000KW : 6 to 6.5	Bidder would like to clarify that the starting current for IE3 motors shall be followed as per IS 12615 only. Owner may please confirm.	Bidder to comply with Technical Specification requirement.

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207	Section -VI, Part-B, SUB-SECTION-II-E6				2 of 69	2.01.04	No sub zero level cable vault/trenches shall be provided below control building/switchgear rooms in main plant.	Bidder understands that cable trenches can be considered in Gypsum / Limestone Handling System MCC Room/ FGD switchgear room / Control Room. Owner may please confirm.	Bidder understanding is correct.
208	Part E, Section-VI, Tender Drawings, Dwg. no. 4410-109-POE-J-001				-	-	Note 3 - Standard LT Transformers ratings are as follows: 2500/2000/1600/1000/630 kVA	Bidder requests owner to accept LT transformers of rating 1250kVA & 750 kVA in addition to the range mentioned in the referred clause.	Bidder to comply technical specification
209	Part E, Section-VI, Tender Drawings, Dwg. no. 4410-109-POE-J-001				-	-	Electrical Single Line Diagram: 11KV Motor Feeders	Bidder understands that 11KV Motor feeders as required FGD package will be fed from purchaser's 11KV Unit Boards. Modication required (if any) in existing 11KV Unit Board will not be in Bidder's scope.	Bidder to refer Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A). Maximum one motor from each unit board shall be fed from owners 11kV Unit switchgear.
210	Part E, Section-VI, Tender Drawings, Dwg. no. 4410-109-POE-J-001				-	-	Electrical Single Line Diagram: 11KV Feeders from Station Board to FGD 11KV Switchgear	Bidder understands that modication required (if any) in existing 11KV Station Board will not be in Bidder's scope.	Bidders understanding is in order
211	Section -VI, Part-B, Sub-section-I-M1 (FGD)				36 of 49	16.01.02	All ducts to be designed for one tenth of duct full of ash.....	The absorber (JBR) proposed by Bidder shall have zero ash carried over at the outlet of the absorber. Hence, Bidder proposes to consider zero ash load for the design of duct after the absorber upto the Wet Stack terminal point. NTPC is requested to confirm.	Bidder to comply the specification requirement in this regard.
212	Section -VI, Part-B, Sub-section-I-M1 (FGD)				37 of 49	16.01.02	All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans.....	(-)660mmWC is not envisaged in the FGD duct system. Hence bidder requests to consider (-)150mmWC as minimum pressure for duct design. NTPC is requested to confirm.	Refer Amendment in this regard.
213	Section -VI, Part-B, Sub-section-IV-D (Civil Works)				10 of 114	3.14.01	Single-flue or multi-flue chimney(s) shall be provided.....	NTPC is requested to confirm the minimum center to center distance to be maintained between existing chimney and new 150m High stack.	The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres. Also refer Amendment issued separately in this regard.
214	SECTION – VI, PART-A			SUB-SECTION-V SALIENT DESIGN DATA	3.00.00	3 OF 10,	HCL (PPM-WET) and HF (ppm-wet):	Employer is requested to confirm the concentration of HCL & HF.	Refer Amendment to technical specification in this regard.
215	SECTION – VI, PART-A			SUB-SECTION-V SALIENT DESIGN DATA	3.00.00, (Sub Item 7)	3 OF 10,	Guarantee case: SO2 (% v/v) : 0.088 and Inlet SO2 (mg/Nm3-wet) : 2437 Design case: SO2 (% v/v) : 0.087 and Inlet SO2 (mg/Nm3-wet) : 2407	The data in % v/v and mg/Nm3-wet are not matching (not in consonance with each other). Employer to confirm which one should be considered for design.	Refer Amendment to technical specification in this regard.

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216	SECTION – VI, PART-A			SUB-SECTION-V SALIENT DESIGN DATA	3.00.00, (Sub Item 7)	3 OF 10,	Guarantee case: Dust (mg/Nm3): 50-200 Design case: Dust (mg/Nm3): 50-200 Bidder would like to clarify that 50 mg/Nm3 Dust concentration shall be considered for guarantee case and 200 mg/Nm3 Dust concentration shall be considered for design case. Employer is requested to confirm on bidder's clarification.	Bidder to comply the specification requirement.
217	SECTION – VI, PART-A			SUB-SECTION-IV TERMINAL POINTS AND EXCLUSION	1.07.00	2 OF 3	Waste water : pH shall be 7.0 (approx) and temperature shall be <50 deg C Employer to clarify whether waste water temperature of around 60 deg C at FGD Battery limit is acceptable.	Bidder to comply the specification requirement.
218	SECTION – VI, PART-A			SUB SECTION-II PROJECT INFORMATION	Annexure-III	Page 6 of 10	Raw Water and Clarified water Analysis Employer is requested to provide TDS of Raw Water (Process Water for FGD) and clarified water.	Bidder to refer raw water and clarified water analysis. Any additional information beyond that shall be discussed during detailed engineering

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219	SECTION – VI, PART-A			SUB SECTION-II PROJECT INFORMATION	Annexutre-III	Page 6 of 10	Raw Water and Clarified water Analysis	Employer is requested provide minimum & maximum temperature of Raw water (Process Water for FGD) and Clarified water	Bidder to refer weather data of project and estimate water temperature.Any additional information beyond that shall be discussed during detailed engineering
220	SECTION – VI, PART-A			SUB SECTION-II PROJECT INFORMATION	Annexutre-IV-4	Page 10 of 10	The sulphur content in the 'worst type' imported coal is 0.9 % which looks high..	Bidder request Employer to furnish the corresponding SO2 concentration in the flue gas corresponding to this type coal.	Refer Amendment in this regard.
221	SECTION – VI, PART-A			SUB-SECTION-III-A1 SCOPE OF SUPPLY & ABSORBER	4.01.03	4 of 8	Guillotine gates shall be provided at the inlet & outlet of the each Booster fan. One (1) no FGD by pass gate shall be provided in the existing duct connecting to existing chimney.	These Clauses are contracdictory to each others, so Bidder request Employer to clarify the dampers scope division between Employer and Bidder.	Refer Amendment to technical specification in this regard.
	SECTION – VI, PART-B			SUB-SECTION-I-M1 TECHNICAL REQUIREMENTS (FGD)	3.03.01	6 of 49	Guillotine gate type damper is being provided by the Employer before the suction of each Booster fan. A gas tight, motor operated Guillotine gate type damper shall be provided by the Contractor at the outlet of each booster fan. A Pneumatic operated multi louverdamper with seal air arrangement shall also be provided by the Contractor		Refer Amendment to technical specification in this regard.
	SECTION – VI, PART-B			SUB-SECTION-I-M1 TECHNICAL REQUIREMENTS (FGD)	1.03.02	2 of 49	Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber and (ii) in the bypass duct. Further, Quick opening Bi-plane motorized/pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct.		Refer Amendment to technical specification in this regard.
	PART E, TENDER DRAWINGS			P&ID	4410-109-POM-A-005	11 of 14	FGD bypass Multilouvre Control Dampler in bypass duct is shown in Employer Scope		FGD bypass multilouvre damper shall be in the scope of bidder. Read tender document in totality.
222	SECTION – VI, PART-A			SUB-SECTION-VI FUNCTIONAL GUARANTEED AND LIQUIDATED DAMAGES	4.02.06	8 of 14	VI) Waste Water: The Contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be 10m3/hr averaged over a 24 hour period from each unit.	Bidder understand that 10 m3/hr is for one boiler unit so the total 30 m3/hr for 3 x 660 MW units. Employer is requested to confirm on Bidder's understanding.	Specification requirement is clear in this regard. Bidders to Comply the specification requirement.

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223	SECTION – VI, PART-B			SUB-SECTION-I-M1 TECHNICAL REQUIREMENTS (FGD)	7.07.03	26 of 49	2x100% horizontal centrifugal pumps shall be provided to feed the secondary hydrocyclones. Each pump shall be sized to empty the full storage capacity of the tank in 6 hrs.	Bidder understand the 6hrs is a typo and it should be 1 hr, which is in consonant with thr residence time of 1 hr for secondary hydrocyclone feed tank. Employer is requested to confirm on Bidder's understanding.	Refer Amendment to technical specification in this regard.
224	SECTION – VI, PART-B			SUB-SECTION-I-M1 TECHNICAL REQUIREMENTS	13.03.00	32 of 49	2x100% Mist Eliminator Wash Water Pump for each unit connected to each of the Process water Storage tanks (total 4 nos. of pumps for 3x660 MW) along with all necessary piping, valves, control & instrumentation shall be provided by the Contractor.	Bidder wish to clarify that there should be 6 nos of Mist Eliminator wash pumps instead of 4 nos for 3 X660 MW. Employer is requested to confirm on Bidder's clarification.	Refer Amendment to technical specification in this regard.
225	PART E, TENDER DRAWINGS			LAYOUT OF FGD AREA	4410-109-POM-A-005	6 of 14	Flue gas duct from FGD outlet to existing Chimney.	Bidder wish to clarify that, in the layout drawing it is shown that the Flue gas from FGD is returning to the existing stack. However as per SUB-SECTION-III-A1SCOPE OF SUPPLY , clause 18.00.00 there is a requirement of new stack (Wet Stack Condensate Collection System). Employer is requested to clarify the same.	Absorber outlet Flue gas duct shall be led to new wet stack. Please read the specification in totality.
226	SECTION – VI, PART-A			SUB SECTION-III-A2 LIMESTONE & GYPSUM HANDLING SYSTEM	1.01.00	2 OF 7	vii) Conveyors 5A/B shall drop limestone in to Limestone Silos of FGD System through fixed Tripper on the first silo in the path.	Employer to confirm the capacity requirements of these limestone silos.	Specification requirement is clear in this regard. Please refer clause No. 3.01.01, Section-VI, Sub-Section III-A1
227	SECTION – VI, PART-A			SUB-SECTION-IV Terminal Point & Exclusions	1.02.00	1 of 3	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: Outlet flange (matching flanges/expansion joint included in the Contractor's scope) in the tapping from the common Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. In case no opening or flange connection is available in the ducts from where tapping will be taken, the cutting in the duct as well as flange connection shall be in the scope of the contractor.	Employer is requested to provide the details i.e. exact location, size and elevation of Terminal Points.	Details of existing duct is indicated in the drawing enclosed with chapter Project Information i.e. sub section-II, Part- A, Section - VI of technical specification.

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228	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	1.09.00	4 of 49	The equivalent weighted average of sound level..... shall not exceed 85 dB(A).	Bidder understands that 85 dB(A) is not applicable for Ball Mill, Crusher & Compressor and the exact noise level shall be informed in the Stage-1 Bid.	Specification requirement is clear in this regard. Bidders to Comply.
229	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	3.03.09	7 of 49	The dampers shall be pneumatically operated and controlled.....of failure of the absorber spray system or the GGH.	Bidder understands that GGH is not applicable for this project. Employer is requested to confirm on Bidder's understanding.	Refer Amendment to technical specification in this regard.
230	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	5.04.00	15 of 49	The pumps shall be designed to meet the stipulations of Clause No.9.00.00 of this Sub-Section.	Bidder understands that the Cl. No. 9.00.00 is a typographical error and the correct reference cl. No. is 8.00.00.	Refer Amendment to technical specification in this regard.
231	SECTION – VI, PART-A			SUB SECTION-III-A1	3.01.02	2 of 9	2x100% wet horizontal ball mills with each mill sized to meet 110% of the maximum total limestone requirement of three (03) units at Design point.	Bidder understands that the Ball Mill is common for all absorbers units instead of two absorber.	Refer Amendment to technical specification in this regard.
	SUB-SECTION-I-M1 (FGD)			6.05.01	22 of 51	There shall be 2X100% tube mills for grinding of limestone. Each mill shall be sized to meet 110% of the maximum limestone requirement of 3x660 MW units under the following conditions, all occurring together. (i) Load Design point flow (ii) Flow 110% of limestone requirement of two absorbers at Design point			

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232	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	7.07.07 & 7.07.10	26 of 49 & 27 of 49	Employer is requested to furnish the following: 1) A detailed scheme for automated waste water neutralization system along with automated lime feeding and dosing system since same has not been shown in the Tender Drawing no. 4410-109-POM-A-007, Rev-A, Scheme of Gypsum Dewatering System. 2) Please let us know the bulk density of Hydrated lime and weather this lime (supplied by Employer) will be in the form of bags or transported through trucks. 3) As Employer is arranging the Hydrated lime unto lime storage building (in Dewatering area), so this point needs to be incorporated in the Terminal Point Chapter (Section-VI, Part-A, Sub-section IV, Terminal Points & Exclusions).	Specification requirement is clear. Bidder shall comply with the specification requirements.
	PART-A			SUB-SECTION-III-A1 FGD	2.06.00	2 of 8		

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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233	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	13.01.00 & 13.03.07	31 of 49 & 32 of 49	- Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness - Additional Corrosion allowance of 3mm on the minimum tank shell thickness	Both clauses are contradictory to each other. Employer is requested to clarify which clause needs to be considered. Refer Amendment to technical specification in this regard.
234	SECTION – VI, PART-B			SUB-SECTION-I-M1 FGD	16.01.03	37 of 49	All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield strength of material	Bidder understands that, the FGD is designed for +660 and -150 mmwc or maximum conceivable head of Booster fan, whichever is higher, as per cl. No. 3.01.00 of same sub-section (pg. 5 of 51). Employer is requested to confirm on Bidder's understanding. Refer Amendment to technical specification in this regard.
235	SECTION – VI, PART-A SECTION – VI, PART-E			SUB-SECTION-III-A1 FGD Drawing No. : 4410-109-pom-A-007, Rev-A (Scheme of Gypsum Dewatering System)	5.04.00 -	5 of 8 -	2x100% pump shall be provided to supply wash water (for cake washing as well as belt cloth washing) to the belt filters. In addition, 2x100% Filtrate water pump (common for all units) shall be provided to recycle the filtrate to the absorber. 2x100% Belt & Cloth wash water pump (going to belt filter)	Bidder clarifies that Filtrate water (from Filtrate water tank) can not be used for belt & cloth washing as filtrate may contain solids. Process/Make-up water (from process water pump) shall be used for belt cloth washing. Hence Bidder do not envisage 2x100% belt & cloth wash water pumps as indicated in the specification & drawings. Employer is requested to confirm on Bidders above clarification.
236	SECTION – VI, PART-A Section VI part B			Sub-section-III A-1 Sub section-I-M1	6.02.00 7.08.02	5 of 9 27 of 49	- The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.). - The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours.	There is a contradictory in the specification, so Employer is requested to clarify the no. of pumps to be considered. Refer Amendment to technical specification in this regard.
237	SECTION – VI, PART-B			Sub section- I-M1	5.06.10	17 of 49	The raw gas inlet duct of the absorber shall be equipped with a flushing device which shall operate continuously as well as intermittently.	Bidder understands that this clause (flushing device) means emergency quenching. Employer to clarify on Bidders understanding.
238	SECTION – VI, PART-B			SUB-SECTION - I-M1 - FGD System	6.05.07	22 of 49	The ball mill shall be driven by a motor through a peripheral gear. An auxiliary motor shall also be provided for inching of mills after trip and during maintenance.	Bidder understands that Peripheral/central drive system with motor shall be provided as per clause no. 3.01.06 vi) of section -VI, Part - A & Sub section - III A - 1, page 3 of 8. Employer is requested to confirm on Bidders understanding.

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239	SECTION – VI, PART-A			SUB-SECTION-I INTENT OF SPECIFICATION	1.01.00-d	1 of 18	d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required	Bidder will furnish the necessary technical drawings/documents enabling Employer to take clearance from statutory authorities.	Bidder to comply the specification requirement.
240	SECTION – VI, PART-B			SUB-SECTION-I M1 (FGD)	6.05.01	21 of 49	There shall be 2x100% tube mill for grinding of limestone.	Bidder understands that the offered mill are "Ball Mill" not "Tube mill" as mentioned in this clause.	Bidders understanding is correct. Refer necessary Amendment in this regard.
241	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	6.07.03	23 of 49	The slurry pipes shall be lined with replaceable wear resistant natural rubber of min. 10 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends.	Bidder shall envisage 6 mm thick rubber lined Carbon steel pipes for slurry applications.	Bidder to comply the specification requirement.
242	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	8.07.00	28 of 49	For Absorber Recirculation service a Silicon Carbide impeller and SiC lining for casing can also be accepted if manufacturer has supplied a similar pump for a previous installation for similar service.	Bidder also proposes the Absorber recirculation pump impeller with Hi-chrome/ Duplex Stainless steel material and SiC lining for casing as per manufacturer's proven practice in similar applications.	Refer necessary amendment in this regard.
243	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	12.03.00	31 of 49	The isolation valves provided in all slurry lines shall be of knife gate/ butterfly type.	Bidder shall also propose diaphragm valves as per bidder's proven supply in similar service for valve sizes lower than 2".	Specification requirement is clear in this regard. Bidders to Comply.
244	SECTION-VI PART-B			SUB-SECTION-I M2 (AIR CONDITIONING AND VENTILATION SYSTEM)	3.01.00	1 of 26	Unitary Air Filtration Unit (UAF) of min. capacity 75,000 m3/hr. or capacity calculated considering 8 air changes per hour, whichever is higher, shall be provided for non-Air Conditioned areas of FGD and ZLD (as provided) control building (e.g. Switchgear rooms, cable galleries etc.).	Bidder shall envisage Mechanical ventilation (Supply air fan and back draft louvres) in Non-Air Conditioned area of FGD and ZLD control building (like MCC and switchgear rooms) as per specification clause no. 3.02.00. Employer is requested to confirm on Bidders understandings.	Bidder to refer relevant amendment in this regard.
					3.02.00	2 of 26	All non-air conditioned areas shall be ventilated by a combination of supply/ exhaust fans and fresh air in-take/ back draft louvres: ii) MCC and Switchgear rooms: Supply air fan and back draft dampers		
245	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	6.05.01	21 of 49	Limestone bond index: 13 kWh/ sh. Ton	Both clauses are contradictory to each other, so Employer is requested to clarify the same, which data shall be considered by Bidder.	Refer Amendment to technical specification in this regard.
	SECTION-VI PART-A			SUB-SECTION-V SALIENT DESIGN DATA AND SIZING	6.00.00	5 of 10	Bond index 13 kWh/t		
246	SECTION-VI PART-A			SUB-SECTION-VII MANDATORY SPARES	1.01.00	4 of 38	Booster fan impeller Liners: 3 sets Booster fan casing liners: 3 set	Same is not applicable, hence bidder shall not envisage any spares for these items.	Bidder to comply the specification requirement.

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247	SECTION-VI PART-A			SUB-SECTION-VII MANDATORY SPARES	1.07.00	7 of 61	Gear box: 1 no. of each type and size	Same may not be applicable for pumps which are V-belt driven, hence bidder shall not envisage any spares for these items for V-belt driven pumps.	Bidder to comply the specification requirement.
248	SECTION-VI PART-A			SUB-SECTION-VII MANDATORY SPARES	1.16.00	6 of 38	Casing Liners: 1 set of each type	Same shall not be applicable for water pumps since there is no wear resistant liners on casing, hence bidder shall not envisage any spares for these items for water pumps.	Bidder to comply the specification requirement.
249	SECTION-VI PART-B			SUB-SECTION-I-M8 (Low Pressure Piping)	1.13.00	2 of 16	Drains and vents: No option for Butterfly valve.	Butterfly valve shall also be envisaged for slurry drain application. Bidder shall envisage Knife Gate/ Diaphragm valves (Diaphragm valves for sizes lower than 2") as well for similar application.	Specification requirement is clear in this regard. Bidders to Comply.
250	SECTION-VI PART-B			SUB-SECTION-I-M2 (Limestone Handling Plant)	4.4.3	8 of 73	Provision for alternative manual operation shall also be made using declutchable hand wheel of 500 mm diameter.	Bidder understands that 500 mm hand wheel diameter is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select hand wheel size as per the recommendation of equipment manufacturer.	Specification requirement is clear in this regard. Bidders to Comply.
					2.4.4	37 of 73	Minimum Hand wheel diameter: 500 mm		
251	SECTION-VI PART-B			SUB-SECTION-I-M2 (Limestone Handling Plant)	4.4.3	8 of 73	All the actuators in the plant should be selected based on heaviest loading, but the rating should not be less than 2500 kg with a lever arm of 1.0 m in any case.	Bidder understands that 2500 kg is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select actuator size as per the recommendation of equipment manufacturer.	Specification requirement is clear in this regard. Bidders to Comply.
					2.3.3	37 of 73	Minimum Actuator rating: 2500 kg with 1.0 m lever arm		
252	SECTION-VI PART-B			SUB-SECTION-I-M6 (Limestone Handling Plant)	4.4.3	9 of 73	The diameter of the shaft shall not be less than 150 mm.	Bidder understands that 150 mm shaft diameter is a typical figure. Same might not be maintained for all Flap gates used in Limestone Handling plant. Bidder is free to select shaft diameter as per the recommendation of equipment manufacturer.	Specification requirement is clear in this regard. Bidders to Comply.
					2.4.5	37 of 73	Flap gate shaft diameter: minimum 150 mm		
253	SECTION-VI PART-B			SUB-SECTION-I-M6 (Limestone Handling Plant)	1.2.0	28 of 73	Maximum slope: 16 deg.	As per IS 8730: 1997 maximum allowed inclination angle for Belt Conveyor handling limestone shall be 18 deg. Hence bidder propose 18 deg. inclination angle for the Belt conveyor selection.	Specification requirement is clear in this regard. Bidders to Comply.

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254	SECTION-VI PART-A			SUB-SECTION-III A1 FGD	3.01.06	3 of 8	Each mill shall be complete with the following items: Complete lubricating system with appropriate lubricating medium storage facility (i.e. 1 no. lube oil tank for storage of lube oil and/or 1 no. grease storage drum as required).	Bidder shall envisage common lube oil system for two (2) mills as per bidder's proven practice.	Bidders to comply specification requirement.
255	SECTION-VI PART-A			SUB-SECTION-III A1 FGD	16.01.00	7 of 8	Each booster fan shall be provided with bearing lubrication and hydraulic blade pitch control unit(s).	Bidder shall envisage common lubrication system for two (2) booster fans as per bidder's proven practice.	Bidders to comply specification requirement.

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256	SECTION-VI PART-A			SUB-SECTION-VII MANDATORY SPARES	1.03.00	4 of 38	Absorber Liner material: 15% coverage of each material and thickness for one unit/Absorber	Absorber shall be provided with 2 mm thickness cladding/ wall paper of Alloy C276/ Alloy 59. Hence bidder shall not envisage any spares for Absorber liners which are supposed to be valid only for rubber lined absorber. Employer is requested to confirm on Bidders understanding	Refer necessary amendment in this regard.
257	SECTION-VI PART-C			GENERAL TECHNICAL REQUIREMENTS	30.00.00	42 of 82	The equivalent "A" weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/ machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA. However for Ball Mills the noise levels as per following shall also be acceptable: a) Ball Mill: < 90 dBA	As per clause no. 9.01.00 mentioned in Sub-section-V (Salient Design Data and Sizing) under Technical Specification Section VI Part A, Noise level shall not exceed 90 dBA to a reference level of 0.0002 microbar when measured at a distance of 1.5 meter above the floor for Air Compressor. Hence bidder shall follow the same noise level limit for Air Compressor as well and same will be applicable for Limestone Crushers as mentioned below: b) Air Compressor: < 90 dBA c) Crusher: < 102 dBA Employer is requested to confirm on Bidders understanding.	Refer Amendment to technical specification in this regard.
258	SECTION-VI PART-B			SUB-SECTION-I-M2 (Limestone Handling Plant)	2.00.00	1 of 112	a) The limestone delivered to the power station shall be of size 250 mm & below. However occasionally 1-2% limestone of 400 mm lump size may also be encountered.	Crusher shall be designed for feed size of (-) 250 maximum not for 400 mm limestone particle size. Employer is requested to provide the limestone particle size	Bidder to provide Crusher meeting specification requirement. Bidder may consider sieve analysis as per general industry practice for lime stone
259	SECTION-VI PART-A			SUB-SECTION-III-A2 (Limestone & Gypsum Handling Plant)	2.01.26	5 of 7	Complete dust suppression system for control of fugitive dust in gypsum storage shed, complete with pumps, water tanks, drives, hoisting arrangements, ducting, piping, valves etc. electrical, accessories, civil, structural and architectural works.	Bidder shall envisage Dust extraction system comprising of dust collection hoods, ducting, fans, bag filter and dust collection hopper with bag filters, similar to the system proposed for Limestone handling system.	Bidders to comply specification requirement.
260	SECTION-VI PART-B			SUB-SECTION-I-M1 (FGD)	7.08.06	28 of 49	Coarse-screen(s) of suitable material at suction-side of the pumps shall be provided.	Bidder shall not envisage any coarse-screen/ suction strainer at Slurry pump suctions. Suction strainer shall only be provided inside the Absorber vessel to protect the Slurry recirculation pumps as per clause no. 5.06.23 mentioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B. Employer is requested to confirm on Bidders consideration.	Bidders to comply specification requirement.

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261	SECTION-VI PART-B			SUB-SECTION-I-M1 (FGD)	10.01.00	29 of 49	Coarse-screen(s) at suction-side of these pumps shall be provided.		Bidders to comply specification requirement.
262	SECTION – VI, PART-B			SUB-SECTION-I-M1 (FGD)	4.04.00Note (b)	10 of 49	Although employer envisages to install highly efficient electrostatic precipitator to control particulate emission, however. Bidder shall select the Booster fan components such as blades, hubs, casing etc. to encounter the high dust burden of the order of 250 mg/Nm3 . The minimum wear life of Booster fan components shall not be less than 25000 hours of operation from the date of commissioning.	Bidder would like to clarify that Booster fan components shall not be exposed to high dust load in order of 250 mg/ Nm3 since the same is going to be installed at downstream of highly efficient electrostatic precipitator (ESP). Bidder shall envisage the selection of Booster fan components considering 200 mg/Nm3 dust load as per clause no. 3.01.00 mentioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B. Further if Employer still insists for high dust load, then please inform the maximum duration of such extreme dust load (250 mg/Nm3) condition.	Bidders to comply specification requirement.
263	SECTION – VI, PART-E			TENDER DRAWINGS	1.00.00	1 OF 2	List of applicable drawings /Details	Bidder request Employer to furnish the detail drawings of existing pipe /cable rack near ESP control room.	All the relevant drawings are enclosed with the tender.
264	SECTION-VI PART-B			SUB-SECTION-I-M1 (FGD)	6.07.03	23 OF 49	The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 10 mm thickness.	Bidder considered 6mm rubber lining thickness inside all ERW Carbon Steel pipe and bends/miter for DN80 size and above used for slurry handling. Employer is requested to confirm on above consideration.	Bidders to comply specification requirement.

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265	SECTION.VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.03.00	1 OF 3	Equipment Cooling Water Normal make up to ECW tank: Contractor shall take a tap off suitably from the existing DM normal make up header (DM normal make up pump discharge) available along C-row at CD bay rack for meeting the makeup water requirement of ECW system. The pressure available at TP will be 4Ksc (gauge) wrt FGL (approx.). Emergency make up to ECW tank: Contractor shall take a tap off suitably from the existing DM Emergency make up header (condensate transfer pump discharge) available along C-row at CD bay rack for meeting the emergency make up water requirement of ECW system. The pressure available at TP will be 4 Ksc (gauge) wrt FGL (approx.).	Bidder request Employer to furnish the following details: - Please furnish the Terminal Point coordinate of "DM normal makeup pump discharge" for connection of Normal make up ECW tank and markup this TP in the layout drawing. - Please furnish the Terminal Point coordinate of "condensate transfer pump discharge" for connection of Emergency makeup ECW and markup this TP in the layout drawing.	Bidder to note that piping header is available at C row (running along CD bay rack). Exact location will be finalized during detail engineering.
266	SECTION-VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.04.00 1.05.00 1.06.00	2 OF 3	Process Water : Employer shall provide Raw water tap off from 700NB header in raw water pump area near raw water reservoir for further connection by bidder. Gypsum Wash Water (Clarified Water): For Gypsum washing, Contractor shall take a tap off suitably from the existing HVAC header (HVAC make up pump discharge) available along C-row at CD bay rack for meeting the water requirement of Gypsum washing. The pressure available at TP will be 4Ksc (gauge) wrt FGL (approx.). Portable water: Contractor shall take a tap off suitably from the existing potable water supply header (potable water pump discharge) available along C-row at CD bay rack for meeting the potable water requirement . The pressure available at TP will be 3Ksc (gauge) wrt FGL (approx.).	Bidder request Employer to furnish the Terminal Point coordinate for connection of Process water and markup this TP in the layout drawing. - Bidder request Employer to furnish the Terminal Point coordinate of "existing HVAC makeup pump discharge" for connection of Gypsum wash water (clarified water) and markup this TP in the layout drawing. - Bidder request Employer to furnish the Terminal Point coordinate of "existing portable water pump discharge in CD bay rack" for connection of Portable water and markup this TP in the layout drawing.	Exact location will be finalized during detail engineering.

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267	SECTION-VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.07.00	2 OF 3	Waste Water FGD waste water pipes shall be terminated at 5M away from the nearest Mixing tank of Employer in HCSD Silo area. Pressure at terminal point shall be 3kg/cm2(g) at 300mm above FFL. pH shall be 7.0 (approx.) and temperature shall be <50°C.	Bidder request Employer to furnish the Terminal Point coordinate of "existing Mixing Tank in HCSD Silo Area" for terminating the waste water and markup this TP in the layout drawing.	Specification requirement is clear. Bidder shall comply with the specification requirements.
268	SECTION-VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.09.00	2 OF 3	FIRE DETECTION AND PROTIECTION SYSTEM (i) Mechanical: Separate Hydrant and spray Hader (within 100 metre) available in plant area for tapping required for Hydrant and spray system for FGD/ZLD facilities. Minimum pressure available for hydrant and spray system shall be 8 Kg/cm2.	Bidder request Employer to furnish the Terminal Point coordinate of "existing Hydrant and spray Hader" for connection of Hydrant and markup this TP in the layout drawing.	Bidder has wrongly mentioned that Separate Hydrant and spray Header (within 100 metre) available in plant area. Bidder to refer cl. No. 1.09.00 of technical specification , sub-section-IV "Terminal Point & Exclusion". Further, Co-ordinate point for hydrant & spray water header shall be furnished during detailed engg. However, one no. tapping each for hydrant & spray shall be provided around 50m vicinity.
269	SECTION-VI, PART-A			SUB-SECTION-VII MANDATORY SPARES	1.11.00	6 OF 38	Slurry Line Bends 3 no. of each type and size	Employer to confirm that this clause is applicable for bends used in Recycle Pump discharge & suction lines also.	Bidder's understanding is correct. Bidder shall comply with the specification requirements.
270	SECTION-VI, PART-A			SUB SECTION-III-A1 FGD	1.01.00	1 OF 8	The contractor shall also include all supporting and structural works, like pipe trestles, platforms, staircases in their scope of work.	Bidder understands that, the pipe connections from Terminal Points to FGD area, Dewatering area along with pipe connections between FGD area & Dewatering area, Bidder will use Employers Pipe Trestle/Rack, then further distribution within FGD area is in Bidders scope. Employer is requested to confirm on Bidders consideration.	Stipulations, as given under Clause 13.00.00 Sub Section- IIIA1 Section –VI, Part-A, shall be complied with w.r.t trestles.
271	SECTION-VI, PART-B			SUB-SECTION-I-M6 (LOW PRESSURE PIPING)	2.02.09	3 OF 16	Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.	Bidder has overground pipes in RC pump suction & discharge having size higher then 800 NB and there inspection holes are not being provided. So Bidder understands that this clause may be applicable for underground pipes only. Employer to confirm on Bidders understandsing.	This clause is applicable for yard Piping.

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272	SECTION-VI, PART-B			SUB-SECTION-I-M6 (LOW PRESSURE PIPING)	2.02.11	4 OF 16	For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided as dictated by the system requirement and operation philosophy & tripping conditions of pumping system. Sizing criteria for air release valves shall be generally on the basis of valve size to pipe diameter ratio of 1 :8. Requirement shall be decided as per relevant code.	Bidder understands that this clause is not applicable for Recycle Pump suction & discharge line. Employer to confirm on Bidders understandings.	Technical requirement are clear. Bidder to comply the same
273	SECTION-VI, PART-B			SUB-SECTION-I-M6 (LOW PRESSURE PIPING)	2.02.08	3 OF 16	For rubber lined ERW pipes, bead shall be removed.	Bidder understandss this clause is applicable for Pipe sizes DN80 and above. Employer is requested to confirm on Bidders understandings.	Bidder to comple the specification requirement.
274	SECTION-VI, PART-B			SUB-SECTION-I-M6 (LOW PRESSURE PIPING)	2.07.02	7 OF 16	For pipe size 350NB and above miter bends may be used for all pipes except rubber lined pipes.	Bidder clarifies to use miter bends with rubber lining for size above DN1200,as fittings for the same are not available in standard. Employer is requested to confirm on Bidder's understanding.	Bidders understanding is correct.

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275	SECTION – VI, PART-A			SUB-SECTION-III-A2 (Limestone & Gypsum Handling Plant)	1.01.00 (i)	1 of 3	Stacking Conveyor 3A/B will drop limestone to overground storage hopper provided within a shed via travelling trippers. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B. The storage Capacity of Limestone Storage hopper shall be sufficient to store Limestone for minimum 10 days consumption considering all units at full load.	Bidder is requested for flexibility in selecting storage silo instead of storage shed. Employer is requested to check & confirm whether we can consider 7 days storage for crushed limestone storage (similar to Gypsum) instead of 10 days.	Bidder to comply the stipulations of the technical specifications
276	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	3.03.08	7 of 49	The blades and frames of the dampers provided at the outlet of Booster fan in the untreated gas path shall be made of carbon steel. In the FGD outlet treated gas path the frame of the damper shall be made of STEN-1 or better material, the blades shall be made of SS317LMN or better material and the seals shall be made of Alloy C- 276 or better material.	Bidder clarifies that FGD outlet dampers are not applicable for this project. There is no damper in the FGD outlet treated gas path. Employer is requested to confirm the Bidder's understanding.	Refer Amendment to technical specification in this regard.
277	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	6.03.01	20 of 49	A motorized bunker shut-off gate shall be provided at the inlet to each feeder.	Same is contradicting with Tender doc. Drawing no. 4410-109-POM-A-006 where motorized shut-off gates have been shown both at Weigh Feeder inlet and outlet. Employer is requested to confirm the requirement.	Specification requirement is clear in this regard. Bidders to Comply.
278	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	17.01.03	40 of 49	All gates at Booster Fan discharge shall be provided with 2x100% pressurization fans to achieve 100% sealing efficiency.	Same is contradicting with Tender doc. Drawing no. 4410-109-POM-A-005 where individual Seal Air system has been shown for each of the dampers. Employer is requested to confirm the requirement where bidder shall follow the specification requirement or Tender drawing. If bidder shall follow the Tender drawing document (4410-109-POM-A-005) Common Seal Air Skid (consisting 2x100% pressurization fans) shall be envisaged for dampers as per bidder's proven practice.	Specification requirement is clear in this regard. Bidders to Comply.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
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279	SECTION-VI PART-B			SUB-SECTION-I-M2 (Limestone & Gypsum Handling System)	2.00.00 (a)	1 of 112	The limestone delivered to the power station shall be of size 250 mm & below. However occasionally 1-2% limestone of 400 mm lump size may also be encountered.	Bidder shall not envisage the Crusher considering 400 mm lump size of limestone. Crusher shall be designed for maximum feed size of (-) 250 mm only. Employer is requested to provide the limestone particle size distribution as well to design the Crusher.	Bidder to provide Crusher meeting specification requirement. Bidder may consider sieve analysis as per general industry practice for lime stone
280	SECTION – VI, PART-A			SUB-SECTION-III-A1 (FGD)	16.02.00	8 of 8	Motorized Guillotine type gates with 2x100% seal air fans shall also be provided at suction & discharge of each Booster Fan. The Gates shall be designed for tight shutoff. The design of the gates shall ensure 99.95% leak tightness without seal air. The gates shall be 100% leak tight with seal air fans under the above conditions.	Common Seal Air Skid (consisting 2x100% pressurization fans) shall be envisaged for Booster Fan suction and discharge dampers as per bidder's proven practice.	Bidders to comply specification requirement.
281	SECTION – VI, PART-A			SUB-SECTION-III-A1 (FGD)	16.02.00	1 of 7	In Crusher house, Limestone from incoming Conveyor 1A will pass through dedicated Vibrating Feeder (VF-1) and dedicated Crushers (CR-1). Similarly Limestone from incoming Conveyor 2B will pass through dedicated Vibrating Screening Feeders (VF-2) and dedicated Crushers (CR-2) respectively. Each dedicated stream shall have a set of Rod gate and Rack & Pinion Gate before Vibrating Feeder.	Employer to clarify the requirement for having Vibrating screening feeder at Crusher upstream. Bidder shall not envisage any Vibrating screening feeder at Crusher upstream. Also bidder shall not recommend any Rod gate/ Rack & Pinion gate before Vibrating Feeders.	Bidders to comply specification requirement.
282	SECTION-VI PART-B			SUB-SECTION-I-M2 (Limestone & Gypsum Handling System)	2.00.00 (b)	1 of 112	For limestone handling system the nominal moisture content shall be taken as 20%.	Same shall be considered maximum 5% as per bidder's proven selection.	Bidder to comply the stipulations of the technical specifications

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283	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	5.06.06	16 of 49	The mist eliminator wash piping shall be constructed of rubber lined carbon steel or glass fiber reinforced plastics. The mist eliminator spray headers shall be made of FRP or rubber lined Carbon Steel, corrosions and erosion resistant in the inner and outer side (Silicon Carbide coating on metal/FRP surface exposed to slurry).	Bidder shall envisage Polypropylene Wash pipe/ Wash header for the same as per bidder's proven practice.	Specification requirement is clear in this regard. Bidders to Comply.
284	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	5.06.13	18 of 49	All metallic fasteners which are provided inside the absorber/absorber wet-dry interface ducting shall be of Alloy 59/ C276.	Bidder shall envisage Fluorothermoplastic fasteners for Mist Eliminator and Mist Eliminator Wash nozzles fixing as per bidder's proven practice.	Bidders to comply specification requirement.
285	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	5.06.13	18 of 49	All internal members shall be lined with minimum 2 mm Alloy 59/ C276.	Bidder shall envisage FRP material for Mist Eliminator Wash pipe supports as per bidder's proven practice.	Bidders to comply specification requirement.
286	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	5.06.15	18 of 49	The other bridges (supports) shall be lined with minimum 2 mm Alloy 59/ C276.	Bidder shall envisage FRP material for Mist Eliminator Wash pipe supports as per bidder's proven practice.	Bidders to comply specification requirement.
287	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	3.03.01	6 of 49	A Pneumatic operated multi louver damper with seal air arrangement shall also be provided by the Contractor in the clean gas duct after GGH.	Bidder clarifies that GGH is not applicable for this project. There is no damper in the clean gas duct after GGH. Employer is requested to confirm the Bidder's understanding.	Refer Amendment to technical specification in this regard.

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288	SECTION-VI PART-B			SUB-SECTION-I M1 (FGD)	3.03.07	7 of 49	A damper in the bypass duct is being provided by the Employer for quick opening to allow bypass to come into operation in case of emergency.	Same is contradicting with Tender doc. Drawing no. 4410-109-POM-A-005 where Motorized Guillotine damper is shown in bypass duct. Bidder clarifies that they shall not envisage any Guillotine gate damper at the bypass damper for isolation. Same shall be Quick acting Multi-louvre damper as per clause no. 3.03.07 mentioned in Sub-section-I M1 (FGD) under Technical Specification Section VI Part B. Same shall be provided with a common 2x100% seal air system and shall be acting like an isolation damper (complete isolation, 100% leak proof with seal air fan under operation) to isolate the bypass duct during FGD loop is under operation. Further In case of single point tapping, one Guillotine gate shall be provided additionally at the tapping from existing duct coming from ID Fan.	Quick acting Multi louvre biplane damper are envisaged in the bypass duct to existing Chimney and are in the Bidders scope. For Guillotine gates Please Refer Amendment to technical specification.
289	SECTION – VI, PART-A SECTION – VI, PART-B SECTION – VI, PART-A			SUB-SECTION-III-A1 FGD SUB-SECTION-I M1 FGD SUB-SECTION-III-A2 LIME STONE & GYPSUM HANDLING SYSTEM	2.06.00 7.04.09 1.02.00	7 of 8 25 of 49 2 of 7	- Washed and dewatered gypsum from the dewatering system shall be fed to a belt conveyor. The contractor shall discharge the gypsum cake above the Gypsum handling belt conveyor. - Gypsum cake from each belt filter shall be discharged through a hopper onto belt conveyor being provided by the Employer . Dewatered Gypsum discharged from the vacuum belt filter shall be taken by Conveyor 6A/B to the storage shed. The storage shed shall be sufficient to store gypsum equivalent to gypsum generation of minimum 7 days (Generation of all three units to be considered).	Bidder understandss that Gypsum transfer conveyors (from Vacuum Belt Filter outlet to Gypsum storage area) are in Bidders scope NOT in Employer scope. Terminal Point is not mentioned for Gypsum in the chapter (Section-VI, Part-A, Sub-section-IV). Employer is requested to confirm on Bidders understanding.	Refer Amendment to technical specification in this regard.

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290	SECTION-VI, PART-A			SUB-SECTION-III-A4 FGD ECW & AUXILIARY WATER SYSTEM	1.02.00	2 OF 2	<u>Consumptive water/ process water/ raw water for FGD system</u> Consumptive water/ process water for FGD system shall be provided from the raw water reservoir inside the plant. Complete raw water system from the reservoir upto the end consumption point includes the following: a) 2x 100% raw water pumps complete with valves, drives and accessories for FGD system of all the three units.	There is a contradiction in the specification for raw water terminal point. Bidder understand that employer shall provide raw water terminal point from tap off of raw water 700NB header for consumptive water/process water/raw water for FGD system.. Hence there is no requirement of raw water pump for FGD area. Employer is requested to confirm Bidder understanding.	Raw water pump to provide process water for FGD is in bidder's scope of work as per technical specifications. Only tap-off for connection pump suction pipe shall be provided by NTPC. Exact routing of piping shall be finalised during detailed engineering.
	SECTION-VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.04.00	1 OF 3	<u>Process Water</u> Employer shall provide Raw water tap off from 700NB header in raw water pump area near raw water reservoir for further connection by bidder.	Employer is requested to indicate raw water terminal point co-ordinates and suggestive route if any. Also, provide pipe sleepers/trestle arrangement drawing of existing area from where raw water shall be route to FGD area.	
291	SECTION-VI, PART-E			Drawing No. : 4410-999-POC-F-001, Rev-A			Yellow mark up along the road at E 7905.0 and E 7800.0 of FGD Area for absorber	Bidder understand that yellow mark up along road is road embarkment area. Employer is requested to confirm Bidder understanding as no legend is indicated in Tender drawings. Also, Employer is requested to mark up the area with NE co-ordinates (like NE mark up of Gypsum & Limestone storage/handling area) in FGD Area 1 & 2 for Bidder understanding of total area available for FGD Facilities. Bidder understand that there is no existing underground facilities in area allocated for FGD facilities. Employer to provide drawings If any existing underground facilities at allocated FGD area.	Bidder understanding is correct regarding yellow mark up. For co-ordinates Bidder may refer GLP. Exact co-ordinates shall be finalised during detail Engineering. Bidder understanding is correct regarding underground facilities.

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292	SECTION-VI, PART-B			SUB-SECTION-I-M1 (FGD)	1.06.01	4 OF 49	The location of FGD System and associated facilities have been indicated in the tender drawings No. 9578-999-POM-F-001 & General Layout Plan	There is no drawing with drawings No. 9578-999-POM-F-00 in Tender Specification. Employer is requested to provide above drawing to Bidder.	Refer Amendment in this regard.
293	SECTION-VI, PART-A			SUB-SECTION-II PROJECT INFORMATION			General Arrangement - Back end arrangement (Layout of ID System) Plan & Elevation	These drawing are not readable. Employer is requested to submit readable copy and AutoCAD file for these drawings.	ID SYSTEM DRAWING AGAIN ATTACHED at Annexure-II
294	SECTION-VI, PART-E			Drawing No. : 4410-999-POM-A-001, Rev-A			Borewell 2 - N 11755.0 E 7870.0	Borewell 2 is temporary or permanent. Employer to confirm.	Borewell 2 is temporary.
295	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	2.02.00	2 OF 9	Single input DIN rail mounting type temperature transmitter (mounted in JB) shall be provided by the Contractor for all temperature elements under Contractor's scope.	Bidder understands that all temperature transmitter shall be provided by contractor is single input DIN rail mounted type (mounted in JB) for all temperature elements (i.e. for HT motor, package equipment and process instruments) and complying the Clause 3.05.00 (b) of Sub-Section-III-C2, Measuring Instruments, Page 11 of 34, of Technical Specification Section-VI, Part-B.	Bidder's understanding is correct. As per clause 2.02.00/ sub section IIIC/ section-VII Part-A , single input din rail mounted type temp transmitters (mounted in JB) shall be provided which shall meet the technical specification clause 3.05.00/ sub section-III C2/ section-VII Part B.
296	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	4.00.00 (d)	5 OF 9	d) Cables required for interfacing PLC control system with Employers DDCMIS (both SG and BOP) located in CER shall be in bidder's scope.	Bidder requested to Employer to provide the tentative distance between FGD Absorber area and Employers DDCMIS CER for cable estimation purpose.	Bidder to refer clause 9.03.00, PART-A, Sub Section III-C, wherein it is mentioned that "Bidder to visit site to estimate the distance between FGD control room and Employer's CCR/CER". Accordingly, bidder to visit site to estimate the cable distance between FGD absorber and employer's DDCMIS placed in CER.
297	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.03.00	6 OF 9	For each equipment/drives/pumps where Local Operation is envisaged in addition to control system as mentioned in respective Mechanical Sections, Bidder to consider Local Push button station comprising following: a) Start Push Button b) Stop Push Button c) ON Running Lamp d) OFF Lamp e) MCC Disturbance Indicating Lamp	Bidder did not envisage any local Push button station of equipment/drives/pumps for FGD system. Employer is requested to confirm on Bidders consideration.	Bidder's proposal is not acceptable. Bidder to refer the relevant clauses of specification where equipment/drives/pumps for which Local Operation is envisaged has been mentioned. Bidder to provide local push button stations accordingly.
298	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.05.00	6 OF 9	The minimum quantity per unit of furniture envisaged in FGD control room is as mentioned below: a) Chair-4 nos. b) Printer table- 1 no c) Computer table- 2 no. d) Key pad- 1 no. e) Locker set -1 no	Bidder understands that these furniture shall be applicable for single control room consist of three unit, 3x660 MW. If there is two control room than these furniture shall be provided in double. Employer to confirm on Bidders understandings.	Bidder's understanding is not correct. It is clarified that the quantity of furniture mentioned in clause 6.05.00 a) to e) is on per unit basis . For example: In case of North Karanpura (3x660MW) project, the quantity of furniture to be supplied shall be thrice of the furniture quantity that is mentioned under clause 6.05.00 a) to e), Part-A, Sub Section III-C of the specification. Bidder to comply with the specification.

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299	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	6.07.00	7 OF 9	Bidder shall provide power supply distribution panels/cabinets/boxes for sub distribution of DC/Main UPS/Utility feeders on as required basis. The power supply distribution box shall include change over circuitry, switch fuse units, MCBs, terminal blocks etc. suitable for application.	Bidder understands that "change over circuitry" shall be applicable for Main UPS only. Non-UPS power shall be evenly distributed from three phase supply bus bar. 24V DC Charger shall have redundant panel. Hence, we are not envisaged "change over circuitry" in field mounted power distribution box.	Bidder's understanding is not correct. Bidder to provide "changeover circuitry" in power supply distribution panels/cabinets/boxes for sub distribution of DC/Main UPS/Utility feeders on as required basis.
300	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	9.01.00	7 OF 9	Contractor shall provide Remote Input Output (RIO) for PLC per unit, placed in Central Equipment Room (CER) for the same. However, contractor to consider IOs and cables for minimum number of hardwired signal exchange per unit as; follows DI - 80, DO - 80, AI - 20 and AO - 20.	Bidder envisaged that common Remote Input Output (RIO) panel for all three units and common system shall be used for hardwired signal exchange from FGD PLC to BOP DDCMIS. FGD Common system also included in this I/O's. Employer is requested to clarify on Bidders understandings.	Bidder's understanding is not correct. Remote Input Output (RIO) panel, located in respective unit (s) CER, for hardwired signal exchange between FGD PLC and unit's BOP DDCMIS shall be provided on per generating unit basis .
301	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I) CONTROL AND INSTRUMENTATION SYSTEM	9.02.00 (4)	9 OF 9	Contractor shall provide complete logics for FGD and associated system such as booster fan blade pitch control, FGD bypass damper control, FGD inlet and outlet gate control etc. FGD OEM shall furnish recommendations, if any, for implementation in employer's DDCMIS for boiler control.	Bidder shall be submitted booster fan blade pitch control logic for "For Information" only. This logic has been provided from (typical) past projects. The plant owners (NTPC) have then used the logic to incorporate the booster fan inlet pressure control into the plant boiler furnace draft control system. Boiler/NTPC shall be revised according to the plant specific control requirements. This revision should involve an integration of ID Fan and Booster Fan draft control with many possible digital/PID loop signals to prevent draft increase/decrease , response to MFT, loss of FSSS communications, and other protections in the design. Employer/NTPC will be the owner and approver for the furnace draft control and the booster fan pressure control. The Bidder logic is only given for a possible starting point only.	Bidder's proposal is not acceptable. Bidder to comply with the specification requirement.
302	SECTION – VI, PART-A			SUB-SECTION-VII, MANDATORY SPARES	Clause 4.00.00, sub clause 7.3.3 and Clause 5.00.00, sub clause 1.05.00	21 OF 38 and 25 OF 38	3. Other cables - 5% of each type, pair and size of actual installed quantity.	Bidder understands that this clause is applicable for pair cable (Cable type-F & G type for 4 pair and above only) and this clause is not applicable for Core cable. Employer is requested to clarify on Bidders understandings.	Bidder's understanding is not correct. The clause is also applicable for core cables. Bidder to comply with the specification requirement.

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303	SECTION – VI, PART-B			SUB-SECTION-III-C1, BASIC DESIGN CRITERIA	4.01.00	4 OF 4	For PCs, OWS, EWS, Servers, Printers and other peripherals, maximum temperature limit shall be 35 Deg. C. For mini-UPS, the same shall be 40 Deg.C.	Bidder understands that main UPS (Configuration-B) is used for this project and mini-UPS(Configuration-C) is not envisaged.	Bidder's understanding is not correct. Mini UPS is envisaged for 01 (one) no. of OWS cum EWS. Input supply for mini-UPS shall be taken from UPS power distribution board. Refer amendment in this regard.
304	SECTION – VI, PART-B			SUB-SECTION-III-C1, BASIC DESIGN CRITERIA	4.01.00	3 OF 4	Instruments, devices and equipments for location in outdoors/indoor/air-conditioned areas shall be designed to suit the environmental conditions indicated below and shall be suitable for continuous operation in the operating environment of a coal fired utility station and also during periods of air conditioning failure without any loss of function, or departure from the specification requirements covered under this specification.	Bidder understands that this clause is applicable for field mounted panels/cabinets/desks but it is not applicable for field mounted instruments. This is stated in Table that " Ambient Temperature (outside cabinets)" and " Required protection Class of panels/cabinets/desks" to be provided by contractor.	Bidder's understanding is not correct. The referred clause 4.01.00, PART-B, Sub Section-III-C1 is applicable for field mounted instruments also.
305	SECTION – VI, PART-B			SUB-SECTION-III-C2, MEASURING INSTRUMENTS	2.04.00	7 OF 30	HART Hand Held Calibrator : Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatibility transmitter. The Hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of Hand held calibrator is not suitable for communicating with all types of transmitters then separate Hand held calibrator will be provided for that specific type of transmitter.	Bidder understands about the quantity of Hand held calibrator in this package. Bidder envisaged that two nos. Hand held calibrator shall be fulfil the requirement. Employer is requested to clarify on Bidders understandings.	The quantity of hand held HART Calibrator shall be one number per generating unit. Refer amendment in this regard.
306	SECTION – VI, PART-B			SUB-SECTION-III-C2, MEASURING INSTRUMENTS	7.00.00	14 OF 30	Limit Switches: Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of Fire alarm Control System subject to a minimum of 60V, 6VA rating. Protection class shall be IP 55.	Bidder understands that the specification for limit switches stated here is applicable for all type limit switches like On/Off valves, process switches etc and stated limit switches is not specifically for Fire Alarm Control system. Employer is requested to clarify on Bidders understandings.	Bidder's understanding is not correct. It is clarified that Limit switches specification is applicable for end position switches provided with Open/close type pneumatic valves/dampers, manual valves/dampers.
307	SECTION – VI, PART-B			SUB-SECTION-III-C2, MEASURING INSTRUMENTS	8.00.00	16 OF 30	Coriolis Flow Transmitter : Viscosity range of Fluid is 0-500cst for HFO.	Bidder understands that this clause is applicable for gypsum/reagent slurry density but this clause indicates the HFO (Heavy Fuel Oil). Employer is requested to clarify on Bidders understandings.	Bidder's understanding is correct. Refer amendment in this regard.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
308	SECTION – VI, PART-B			SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	2.02.00	3 OF 27	Wherever Dual processor based PLC system has been specified, each PLC unit shall be provided with two processors (Main processing unit and memories) one for normal operation and one as hot standby.	Bidder understands that the Sub-Vendor/supplier provided PLC/control system shall be stand alone/non-redundant where working+standby machine provided (redundant machine provided). Employer is requested to clarify on Bidders understandings.	Bidder's understanding is not correct. It is clarified that all the processors shall be redundant in line with the specification requirement. However, the number of redundant processors shall depend on the number of I/Os and I/O handling capacity of the processors being provided.
309	SECTION – VI, PART-B			SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	9.05.00	19 OF 27	The UPS Power Supply for various systems shall consist of one or more of the following configuration. Bidder shall clearly bring out in the proposal the redundancy feature along with configuration diagram, single line diagram and data sheets etc. & this shall be finalised subject to employer's approval during details engineering.	UPS Configuration-B and UPS Configuration-C does not call for any redundancy criteria of UPS in the said clause. Bidder wishes to understand the redundancy criteria of UPS power supply system from Employer.	Refer amendment in this regard.
310	SECTION – VI, PART-E			SCHEME FOR UNINTERRUPTIBLE POWER SUPPLY SYSTEM-CONFIGURATION-B	0000-999-POI-A-019C	SHEET 2 OF 2	Scheme for uninterruptible power supply system-Configuration-B	This scheme does not call for UPS redundancy. Bidder wishes to understand the redundancy criteria of UPS power supply system from Employer.	Bidder's understanding is correct. Refer amended tender drg. no. 0000-999-POI-A-019C in this regard.
311	SECTION – VI, PART-E			SCHEME OF FGD-ABSORBER SYSTEM (SINGLE UNIT)	- 4410-109-POM-A-005		Scheme shows FI (Flow Indicator) and FT (Flow Transmitter) are installed in Booster Fan common discharge flue gas duct.	We understands that Flow Indicator (FI) is a digital display of electronic Flow Transmitter (FT). No separate Flow Indicator (FI) shall be envisaged in addition of Flow Transmitter (FT).	Bidder's proposal is acceptable.
312	SECTION – VI, PART-E			SCHEME OF FGD-ABSORBER SYSTEM (SINGLE UNIT)	- 4410-109-POM-A-005		Schemes shows DPT with DPI across ME in Absorber.	We understands that DP Indicator (DPI) is a digital display of electronic DP Transmitter (DPT). No separate DP Indicator (DPI) shall be envisaged in addition of DP Transmitter (DPT).	Bidder's understanding is not correct. DP Indicator (DPI) shall be separately provided along with DP Transmitter (DPT). Bidder to comply with the specification requirement.
313	SECTION – VI, PART-E			STANDARD CONFIGURATION DIAGRAM FOR PLC BASED OFFSITE CONTROL SYSTEM	0000-151-POI-A-013		Standard configuration diagram for PLC based offsite control system.	Bidder understands that this scheme is applicable for FGD PLC control system in following configuration. For Example: a) 3x660 MW : Two OWS+One OWS/EWS at FGD Control Room for FGD Operation. Employer is requested to clarify on Bidders understandings.	Bidder's understanding is not correct. Bidder to refer clause 6.01.00, PART-A, Sub Section-IIIC, where in it is mentioned that Operator Work Station (OWS) shall be supplied on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)-FOUR (4 Nos) b) OWS cum EWS (placed in FGD control room)-ONE (1 No) c) OWS (placed in central control room of each generating unit)-TWO (2 no.). Bidder to refer amendment in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
314	SECTION – VI, PART-A			SUB-SECTION-IV TERMINAL POINTS & EXCLUSIONS	1.13.01	3 of 3	Terminals of Employers HT switchgear.	Bidder request Employer to indicate the Location of Employers Existing HT switchgears room (i.e. Column No., Bay no., Level of TG Building for each units)	HT Switchgear is located in main plant AB bay.
315	SECTION – VI, PART-A			SUB-SECTION-III-B ELECTRICAL SYSTEM/EQUIPMENT	1.08.00	2 of 6	2) Contractor scope shall include laying of cable from employer board as shown in Electrical Single Line Diagram Drg No. 0011-109-POE-J-001 on the employers nearest trestle in the FGD area as shown in Drg no 0011 - 999-POC-F-001 subject to availability of space and suitability. In case of non availability of space in employer's trestle, contractor shall make necessary arrangements for cable tray erection & cable laying.	Bidder undersrand that spare cable trays (HT & Control) available in the employers nearest trestle from Employers Existing HT Switchgear building to Proposed FGD area. In case of non availability of spare cable tray in employer's existing trestle, Employer shall make necessary space on the nearest trestle for laying of new FGD cable trays (By Bidder) from Employers Existing HT Switchgear building to Proposed FGD area. So Bidder not envisaged any new cable trestle for laying of necessary cables from Employers Existing HT Switchgear building to Proposed FGD area. Bidder request Employer to indicate the existng trestle / cable route wherre non availability of spare cable tray in employer's trestle (Drg no 0011 -999-POC-F-001).	Bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. refer clause no:- 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant
316	SECTION – VI, PART-B			SUB SECTION-II E-1 General Electrical Specification	2.09.00	6 of 7	DG set(s) shall be capable of meeting 100% of essential load requirements of FGD system including starting of the largest motor (DOL) with other load connected without exceeding the permissible starting voltage drop.	Bidder wish to clarify that DG set sizing shall be as per sub-section -II-E-11 (Diesel Generator, Cl. No. 4.04.00, Pg. 3 of 19) Employer is requested to confirm on Bidders above clarification.	Bidder understanding is correct. However bidder shall also comply to the requirements of clause no:- 2.09.00
317	SECTION – VI, PART-B			SUB SECTION-II E-11 Diesel Generators	4.04.00	3 of 19	The DG set shall be capable of starting largest connected motor with terminal voltage drop being restricted to 15%. Generator loading before starting of this motor shall be considered as 50% of generator rating		
318	SECTION – VI, PART-B			SUB SECTION-II E-9 HT SWITCHGEAR	1.00.00	2 of 39	All MV Switchboards is provided with one spare motor feeder and one transformer feeder on each section for future requirements.	Bidder wish to clarify that spare motor & transformer feeder shall be consider in the SWGR if the motor & transformer feeder is applicable for that switchgear. (for example, IN 3.3kV switchgear Bidder don't have any transformer feeder, then Bidder will not consider any spare transformer feeder in this switchgear). Employer is requested to clarify the same.	Please refer amendment-01 of Technical Specification(Section VI)

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
319	SECTION – VI, PART-B			SUB SECTION-II-E-10 LT SWITCHGEARS & LT BUSDUCTS	1.01.01	1 of 58	f) ESP consumption for 100% BMCR operation shall be considered and further this load shall be uniformly divided among ESP Switchgear	This clause is not applicable to this project. Emplpyer is requested to confirm the same.	Bidders understanding is correct.
320	SECTION – VI, PART-B			SUB SECTION-II-E-10 LT SWITCHGEARS & LT BUSDUCTS	1.01.01	1 of 58	h)) The sizing of Unit Emergency boards shall be in according to the DG rating. The Emergency board shall have tie to both sections of unit Service Switchgear for catering unit loads in Blackout Conditions.	Bidder wish to clarify that one no. common DG sets along with Emergency Switchgear shall be considered for the common system loads & unit specific system loads. Emergency Switchgear shall feed to unit Emergency boards as per process unit Emergency load requirements. And the sizing of Unit Emergency boards shall be as per process unit Emergency load requirements. Employer is requested to clarify the same.	Bidders understanding is correct.
321	SECTION – VI, PART-B			SUB SECTION-II-E-10 LT SWITCHGEARS & LT BUSDUCTS	1.03.00	2 of 58	All LV Switchboard shall be provided with spare feeders / modules as specified in relevant caluse of Part-A of Technical Specification.	Bidder did not found the details of spare feeders / modules requirement in Part-A of Technical Specification. Employer is requested to furnish the same.	This clause is deleted. Refer Amendment to technical specification in this regard.
322	SECTION – VI, PART-A			SUB-SECTION-III-C (C&I)	6.03.00	6 of 8	For each equipmen/drives/pumps wherere Local Operation is envisaged in addition to control system as mentioned in respective Mechanical Sections, Bidder to consider Local Push button station comprising following: a) Start Push Button b) Stop Push Button c) ON Running Lamp d) OFF Lamp e) MCC Disturbance Indicating Lamp	Bidder did not envisage any local operation based on their past experience in FGD system, however Bidder has considered local Push Button station (latched type Emergency push botttons as per cl. no. 27.00.00 of SECTION – VI, PART-B, SUB SECTION-II-E-10 LT SWITCHGEARS & LT BUSDUCTS, Pg. 28 of 58) for all drives. Employer is requested to confirm on Bidders consideration.	Bidder's proposal is not acceptable. Bidder to refer the relevant clauses of specification where equipment/drives/pumps for which Local Operation is envisaged has been mentioned. Bidder to provide local push button stations accordingly.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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323	SECTION – VI, PART-A		sub Section-III , Electrical system / Equipment	1.12.00	4 of 6	Construction power : To meet the construction power requirement of the FGD and associate system the Employer shall provide 2 nos 415 feeder in LT switch gear . The contractor shall extend supply from these construction power feeders to meet the construction power requirement.....	Bidder request Employer to furnish the following inputs / clarifications: a) Bidder request Employer to provide the electricity per unit charges to estimate the electricity cost for construction power. b) Bidder request Employer to provide the distance / route of cable from LT SWGR to work site. c) Bidder also understands that the power for Testing & Commissioning shall be provided at free of cost	a)Electricity charges shall be as prevalent rate of DIS-COM.Refer subsection-IIIB,part-A,Construction power. b)Location of construction power feeders shall be provided during detail engineering. c)Bidder's understanding is correct.
324	SECTION – VI, PART-D		Erection Condition of contract	28.05.02	12 of 53	First Aid - The Employer will provide the contractor , in case of any emergency -----	Bidder requested Employer to provide the First Aid facilities in existing plant Hospital/dispensaries also along with Ambulance services if required.	Bidders to comply specification requirement.
325	SECTION – VI, PART-D		Erection Condition of contract	36.05.00 - F	19 of 53	Proper lighting of all the construction / erection area-----	a) Bidder understands Proper lighting shall be done by Bidder for its scope of work & the designated construction area only. b) As Employer supplying the construction Power from 2nos of 415 V LT feeder, bidder understands that the construction of power ring main is not in the scope of Bidder.	a) Bidder understanding is in order b) Construction of power ring main is not envisaged as per scope. However, necessary power supply arrangement (beyond the employers 2 nos 415V LT feeders) for construction work of the package to be arranged by bidder
326	SECTION – VI, PART-D		Erection Condition of contract	44.22.00	33 of 53	Hydra shall not be used for material transport	Bidder understandsing is that Farna shall be used in place of Hydra.	Bidders to comply specification requirement.
327	SECTION – VI, PART-D		Erection Condition of contract	36.05.00	20 of 53	Bidder shall install CCTV cameras at all Strategic Locations in the plant area which shall be linked to safety control room	Bidder requests Employer to provide the details nos. of such strategic location requiring CCTV camera	Bidders to comply specification requirement.
328	SECTION – VI, PART-A		Scope of supply and Services	2.00.00 (10)	3 of 4	Providing all necessary fire fighting devices/ Equipment/Fire tender etc. required during the project execution.....	Bidder shall provide all fire fighting devices / Equipment during the entire Project Execution period for its scope of work. However Bidder requested Employer to provide the Fire Tender of the existing Plant during emergency if required	Bidders to comply specification requirement.
329	SECTION – VI		SUB-SECTION-IV-D (Civil Works- North Karanpura Super Thermal Power Project- 3x660 MW)	Site Levelling (Clause-10.00.00- page 27 of 114)		Bidder shall ensure that road access and drainage facilities for each block is available when site levelling in that block is completed.	Bidder understands that roads and drains mentioned here is specific for access to the various blocks of FGD from the Main Plant Roads and drains(which shall be provided by Owner).	Bidders understanding is correct. Roads in the scope of bidder are as shown in tender drawing 4410-999-POC-F-001 titled "Layout Plan Of FGD System".

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Bidding Document No.: CS-4410-109-2

Document No.: CS-4410-109-2-CLRF-TECH-01

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
330	SECTION – VI			SUB-SECTION-IV-D (Civil Works-North Karanpura Super Thermal Power Project-3x660 MW)	Site Levelling (Clause-10.00.00- page 27 of 114)		Unless otherwise instructed by the Engineers, all roads and drains within a block shall be constructed by the bidder within a month from the date of completion of site levelling of that block.	Bidder understands that block mentioned is specific to FGD amenities. Bidder proposes that Site levelling for the area shall be done only after the construction of the FGD blocks for that area and till that time, only WBM roads to facilitate the construction of the block shall be provided. Final RCC roads and drains shall be executed only after site levelling of that area.	Bidder understanding is correct.
331	SECTION – VI			SUB-SECTION-IV-D (Civil Works-North Karanpura Super Thermal Power Project-3x660 MW)	Lime and Gypsum Handling and Associated Buildings Storm Water Drainage System (Clause-14.00.00- page 31 of 114)		The invert level of the in-plant and plant peripheral drains shall be kept such that water can be discharged by gravity to the main/trunk drains under all conditions.	Bidder understands that drain mentioned here is specific only for FGD amenities and for planning of such drains for FGD specific areas, main plant drain drawings as well as area drainage study report shall be shared by Employer	Main plant drain drwg will be made available at detailed engineering stage. Area drainage study is not available.
332	SECTION – VI			SUB-SECTION-IV-D (Civil Works-North Karanpura Super Thermal Power Project-3x660 MW)	GLP (Drawing No. 4410-999-POC-F-001)		Storage/Laydown area/Area for dumping of excavated material	No area has been earmarked for laydown/storage/ excavated material dumping other than the areas identified for FGD. Bidder request Elpoyer to please earmark areas at site for laydown/storage/ excavated material dumping.	Bidder to manage with in the space identified for his works as per tender drgs.
333	SECTION – VI			SUB-SECTION-IV-D (Civil Works-North Karanpura Super Thermal Power Project-3x660 MW)	GLP (Drawing No. 4410-999-POC-F-001)		Underground substructures, sewer pipes, water pipes, cables etc around the FGD	Bidder request Employer to please provide the drawings for underground pipes, cables, amenities , utilities etc around the FGD area .	Required drawings will be made available at detailed engineering stage, if available.
334	SECTION – VI			Subsection-IV-D Foundation System and Geotechnical data	1.00.00	77 of 114	Site Levelling & grading had been carried out and achieved Finished ground level (FGL) is RL(+) 460.0m, i.e there is maximum filling of 1.0m and maximum cutting of 1.6m in FGD area.	Bidder understand that Uniformed Finished ground level (including tree cutting, their disposal etc)will be arranged by Employer (at NTP) for the area's allocated for entire FGD area including material handling, storage facilities for FGD(Space for FGD mentioned in the layout drawing) Employer is requested to confirm on Bidders understanding.	Site levelling works should be in Bidder's scope as per tender drg , titled"Layout Plan Of FGD System" no. 4410-999-POC-F-001
335	SECTION – VI, PART-B			Subsection-IV-D Civil Works	39.00.00	65 of 69	Sand aggregate for Construction	In case of non-availability of river sand, Bidder understands that mechanical sand/crushed sand may be allowed for concrete work.	Manufactured sand made from crushing of stones meeting the requirement of IS:383 can be used for concrete work.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
336	SECTION – VI, PART-A			Subsection-III-D Civil Works	1.00.00	2 of 4	Uniform Finished Ground level (FGL) in FGD Absorber area shall be made available by the owner at a level specified in layout plan of FGD system	Bidder understand that Uniformed Finished ground level will be arranged by Employer (at NTP) for the area's allocated for complete FGD system including limestone & gypsum handling system instade of only Absorber area. Employer is requested to confirm on Bidders understanding.	Site levelling works should be in Bidder's scope as per tender drg , titled"Layout Plan Of FGD System" no. 4410-999-POC-F-001
337	VI	A	I	INTENT OF SPECIFICATION	1.03.01	3 of 18	Wet limestone based Flue gas desulphurization(FGD) for 2X 800 MW unit.....Common Gypsum Dewatering System	We understand this is typographical error. Plant Configuration is 3x660 MW. Owner to Confirm	Refer Amendment to technical specification in this regard.
338	VI	A	I	INTENT OF SPECIFICATION	2.00.00 (d)	4 of 18	In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, contractor shall use ash and ash based products in works as specified in these specifications, drawings and as per instructions of the Engineer. He shall also use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill.	Bidder understands that the Ash Based products shall be used only where the Owner Plant is already in operation and ash based products are readily available in the vicinity of the plant. Owner to confirm.	Specification requirement is clear in this regard. Bidders to Comply.
	VI	A	III-D	CIVIL WORKS	14	94 of 94	In line with Gazette Notification on Ash Utilization issued by MOEF and its amendment thereafter, Bidder shall use ash and ash based products in construction of his offices, stores, staff quarters and labour huts etc. He shall furnish a compliance report along with all details of use of ash and ash based products along with each bill. The above requirements shall be applicable to his sub-vendors also and Bidder shall be responsible for enforcing the same on his sub-vendors.		

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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339	VI	A	III-A1	FGD	6.02.00	6 of 8	The contractor shall provide 1x100% slurry pumps for pumping the slurry back to the absorber of any of the units in 8 hrs (max.)	There is contradiction in the quantity of Pumps for Pumping the slurry back to absorber. Owner to clarify.	Refer Amendment to technical specification in this regard.
	VI	B	I-M1	FGD	7.08.02	27 OF 49	The contractor shall provide 2 x100% pump to pump back the slurry from the sump back to the absorber in a maximum time of 8 hours		
340	VI	B	I-M1	FGD	5.04.00	15 of 49	Gypsum Bleed Pump The Pumps shall be designed to meet the stipulation of Clause No. 9.00.00 of this sub-section	Bidder understands that this is a typographical error. The Pumps shall be designed to meet the stipulation of Clause No. 8.00.00 of this sub-section. Owner to review and confirm.	Refer Amendment to technical specification in this regard.
341	VI	B	I-M1	FGD	3.01.00	5 of 49	Short temp excursion temperature of inlet gas (for approx. fifteen (15) minutes at a time) (deg. C) : 300	As per standard design & experience, 10 to 15 mins of short temperature excursion will be considered, which is sufficient enough to take care of the system during emergency situation. Request Owner to reconsider the same	Specification requirement is clear in this regard. Bidders to Comply.
	VI	B	I-M1	FGD	4.03.00	9 of 49	Fan component shall also be designed to withstand the excursions in flue gas temperature up to 300 degree Celsius, which may persist for about 30 minute duration		
342	VI	B	I-M1	FGD	5.06.24	19 of 49	It should be possible to discharge the absorber sump into the emergency drain tank within 2 hours.	Bidder proposed system can discharge slurry of absorber recirculation tank from normal level upto pump trip level in 2 hours. However, from pump trip level to bottom of the tank, the slurry will be drained to absorber sump (by gravity) and time required for the same will be as per industry practice. Request Owner to accept the same.	Bidders understanding is correct.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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343	VI	B	I-M1	FGD	10.01.00	29 of 49	SLURRY & PROCESS WATER TANKS All the slurry tanks (slurry tank, secondary hydro cyclone feed tank, vacuum receiver tank, waste water tank, lime neutralization tank etc.) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional <u>Corrosion allowance of 3mm</u> on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Bidder.	Inline with the tender specification, clause no.13.01.00, Sheet no. 33 51, Additional corrosion allowance of 1.5 mm shall be considered for process water storage tanks. However, slurry tanks (slurry tank, reclaim water tanks, secondary hydro cyclone feed tank, vacuum receiver tank, waste water tank, lime neutralization tank etc.) shall be considered with additional corrosion allowance of 3 mm.	Refer Amendment to technical specification in this regard.
	VI	B	I-M1	FGD	13.01.00	31 of 49	Process Water Storage Tanks & Pumps All the process water storage tank(s) shall be designed, fabricated, erected and tested in accordance with the IS:803, latest edition. Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness as calculated by IS:803,	Owner to review and confirm.	
344	VI	A	V	Salient Design Data	3.00.00	2 of 10	Flue Gas Analysis at Design Point & Guarantee Point	Owner shall recheck and confirm the flue gas analysis as the sum is exceeding 100%.	Refer Amendment to technical specification in this regard.
345	VI	A	V	Salient Design Data	3.00.00	2 of 10	Under Design Point : (iv) SO ₂ (% v/v wet) : 0.087 (vi) Inlet SO ₂ (mg/Nm ³ -wet) : 2407	As per the Flue gas composition at FGD system inlet @design point, SO ₂ is 0.087 (%v/v Wet) which is equal to 2483 mg/Nm ³ (wet basis). However, Inlet SO ₂ (mg/Nm ³ -wet) mentioned is 2407 mg/Nm ³ . Owner to review and confirm.	Refer Amendment to technical specification in this regard.
346	VI	A	V	Salient Design Data	3.00.00			Owner to confirm the quantity of HCL & HF in Flue gas composition	Refer Amendment to technical specification in this regard.
347	VI	A					General Arrg. -Back End Elevation : 0-00-020-76722 Rev. 2 (Layout of ID System-Elevation)	Bidder request owner to provide the CAD file of drawing as diemension in drawing is not visible.	Both the drawings attached again in pdf format. CAD format cannot be provided.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
348	VI	B	I-M2	LIMESTONE HANDLING PLANT	1.05.00	77 of 112	Limestone storage area dust extraction system: a) For dust control in limestone storage shed during stacking and handling of limestone, fans, ducting and bag filters with collection hopper shall be provided. The dust collected in the dust collection hoppers shall be discharged to the reclaim conveyor below the shed. b) For the paddle feeder provided for the reclaim hopper below the limestone storage shed, the dust extraction system comprising of suction hood, ducting and trolley mounted dust collection hopper with bag filters shall be provided.	Based upon experience, bidder propose Dry fog dust suppression system for this locations. Request Owner to accept the same.	Dust Extraction system is envisaged in Lime Stone Handling System to avoid addition of moisture to Limestone. Bidder to comply the stipulation of the technical specifications
349	VI	A	III-A2	LIMESTONE & GYPSUM HANDLING PLANTS	General scope of work	General scope of work	General scope of work	Bidder understand that mobile equipment's such as dozers, trucks etc. are excluded from the scope of Bidder. Owner to review & confirm.	Confirmed. Mobile equipment's such as dozers, trucks etc. are not included in the scope of Bidder
350	VI	A	III-A2	LIMESTONE & GYPSUM HANDLING PLANTS	2.01.01	3 of 7	Two (2) numbers Truck unloading system for unloading of limestone from trucks complete with drives, accessories all mechanical, electrical civil & structural works, including enclosure for dust containment during unloading.	Request owner to confirm the capacity of the limestone carrying truck to be considered for the design.	Gross weight 60 MT for limestone carrying truck shall be considered for design. Also Refer amendment in this regard.
351	VI	A	III-A2	LIMESTONE & GYPSUM HANDLING PLANTS	1.01.00	2 of 7	(i) The storage Capacity of Limestone Storage hopper shall be sufficient to store Limestone for minimum 10 days consumption considering all units at full load.	Bidder propose above ground silo with bucket elevator for total 10 days storage capacity instead of reclaiming storage hopper for limestone storage. Request Owner to accept the same.	Bidder to comply the stipulation of the technical specifications
352	VI	A	V	SALIENT DESIGN DATA	6.00.00	5 of 10	Table-3 LIMESTONE CHARACATERSTICS	Request owner to provide the Hard Groove Index (HGI) of Limestone in the Limestone characteristics.	Bidder is requested to design the system considering the available data in the specification & considering worst HGI for Limestone specified.
353	VI	E	-	LIMESTONEFLOW DIAGRAM	-	-	Belt feeder below each crusher is indicated in flow diagram.	The requirement of belt feeders below crushers shall be finalized by the bidder based on Crusher house layout. Please review and confirm.	Bidder to comply the technical specifications
354	VI	E	-	LIMESTONE & GYPSUM HANDLING PLANTS & LIMESTONE FLOW DIAGRAM	1.01.00	2 of 7	(vii) Conveyors 5A/B shall drop limestone in to Limestone Silos of FGD System through fixed Tripper on the first silo in the path. Alternatively diverter Plough is also acceptable in place of fixed tripper.	In Limestone flow diagram only fixed tripper is indicated to feed the limestone silo however in scope of supply, option of diverter plough is also indicated. Bidder understand that either of fixed tripper or diverter plough can be used. Please confirm.	Confirmed
355	VI	A	IV	Terminal points and exclusions	General scope of work	General scope of work	General scope of work	For Degree of Protection test, type test report shall be provided for review. Conducting test may impact cost & delivery schedule and it also required confirmation from vendor.	Bidder to comply with specification requirement.

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Bidding Document No.: CS-4410-109-2

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
356	VI	B	I-M4	Fire Detection & Protection System	1.02.00	1 of 18	<u>General Description</u> The complete Fire Detection and Protection Systems shall be as per the guidelines / codes / standards / rules of TAC / NFPA / IS : 3034 / OISD, etc., and all the systems, equipment and installation shall be got approved from TAC accredited professional(s)-India. <u>1.1 Hydrant System</u> Complete hydrant system (pipe, hydrant valves, landing valves, water monitors, hoses, branch pipes and nozzles etc.) for FGD area shall be provided as per TAC norms.	Bidder would like to clarify that Fire Detection and Protection Systems will be as per NFPA guidelines. Request Owner to Review and confirm.	Bidder to comply with specification requirement.
	VI	A	III-A3	Fire Detection & Protection System	4.00.00	3 of 5			
357	VI	B	I-M4	Fire Detection & Protection System	3.02.00	1 of 18	<u>Areas to be covered by HVW Spray System</u> (i) All transformers for FGD System having oil capacity above 2000Ltrs & located with-in plant boundary.	As per CEA Guidelines High velocity water spray system will be provided only if the transformer rating is 10 MVA and above. Bidder propose the same criteria. Owner to review and accept the same.	Bidder to comply with specification requirement.
358	VI	B	I-M4	Fire Detection & Protection System	5.02.00	2 of 18	<u>b) Linear heat sensing cable detection system</u> Gypsum and lime conveyor of FGD system and Cable Galleries covered under MVW Spray System. <u>c) Quartzoid Bulb Heat Detection System</u> Equipments protected by HVW spray system, conveyors protected by MVW spray system.	Bidder would like to clarify that Lime stone/Gypsum is a non-combustible material and hence no fire protection / detection system would be required. Owner to review and accept the same	NTPC agree with bidder's concern that fire protection is not required for Gypsum & lime conveyor. However, fire detection & alarm system has been envisaged for conveyor of gypsum/ lime handling system. Bidder to comply with specification requirements.
359	VI	B	I-M4	Fire Detection & Protection System	3.01.00	1 of 18	<u>HVW and MVW spray system</u> It shall consist of : spray pumps, pressurisation arrangements, water main network, ...	As per terminal points of specification, tapping point required for spray water will be provided at 150 NB header with 8kgf/cm2 pressure. So the spray pumps will not be required. Please review and confirm.	Bidder to refer relavent amendment in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
360	VI	A	V	Salient Design Data	7.01.00	7 of 10	Design Philosophy for Air Conditioning 3. All air conditioned areas shall be maintained at 24 deg. C $\pm$ (Plus or Minus) 1 deg. C and Relative humidity of 50% $\pm$ (Plus or Minus) 5%	Small isolated Control rooms with small cooling capacity requirement (upto 15 TR Total Cooling Load) and hence these rooms will be catered by Hi-Wall Split AC Unit / Cassette AC Unit as per Owner's specification requirement. However these rooms cannot be provided with RH Control (50 $\pm$ 5%) because Hi-Wall Split AC Unit / Cassette AC Unit do not have built-in heater & humidifier and separate Heater & Humidifier cannot be provided for these rooms because Hi-Wall Split AC Unit / Cassette AC Unit are non-ducted type system. Although there will be no RH control for these rooms however Cooling load calculation and equipment selection will be based on 50% RH. As per sub-section-III-A3 , part-A of tech. specification section-VI, air cooled condensing unit with AHU shall be provided for FGD control building. For other area, Bidder to refer cl. No. 7.01.00(15) of technical specification , sub-section-V salient design data . For heat load calculation of ac area, inside condition shall be taken as 24 deg c and Relative humidity of 50% $\pm$ (Plus or Minus) 5%.
361	VI	B	I-M3	Air Conditioning & Ventilation System	3.02.00	2 of 27	(iii) Battery Rooms & Oil rooms and fumes/odour generating areas - Combination of Supply air fan & Exhaust air fans.	Battery Rooms, Oil Rooms and Other fumes / odour generating areas shall be negatively ventilated by means of exhaust air fans / roof exhausters and intake louvers. Bidder's understanding is correct.Bidder to refer relevent amendment in this regard.
	VI	A	V	Salient Design Data	7.02.02	8 of 10	3.....Battery Rooms and Other fumes / odour generating areas shall be negatively ventilated by means of exhaust air fans / roof exhausters and intake louvers.	
362	VI	A	V	Salient Design Data	7.01.00	7 of 10	8..... Required electrical contacts in Control panel of A/C Plant and further wiring upto fire alarm panels shall be done by Bidder.	Bidder proposes to provide Required electrical Dry contacts in Control panel of A/C Plant to receive fire alarm signal from Fire alarm panel. However, please note that as the Fire alarm panel is not in bidder scope and the location of these panels are unknown, so wiring from HVAC Control Panel to Fire Alarm Panel shall be excluded from bidder scope of work.
	VI	A	V	Salient Design Data	7.02.02	9 of 10	5. Required electrical contacts in Control panel of A/C Plant and further wiring upto fire alarm panels shall be done by Bidder.	
363	VI	B	I-M1	Flue Gas Desulphurisaion System	15.03.00	35 of 49	<u>Elevators</u> <u>(ii) Design, Construction and finish of car & car door:</u> Car inside enclosure including inner side of door shall be of stainless steel plate of grade SS:304 of bright finish.	Car inside enclosure including inner side of door shall be of stainless steel plate. However the grade of the stainless steel shall be as per Manufacturer's Standard. Owner to confirm. Bidders to comply the specification requiremen

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364	VI	B	I-M1	Flue Gas Desulphurisation System	15.03.00	35 of 49	Elevators (ii) Door Construction: Hollow metal construction from 16 gauge thick steel sheet spray painted	The thickness of the doors and car walls shall be as per Manufacturer's Standard.	Bidders to comply the specification requirement
365	VI	B	I-M1	Flue Gas Desulphurisation System	15.05.00	36 of 49	Elevators Provide sound reducing material below machines in machine room.	Please review the need for Extra sound reducing material below machines in the machine room. However the noise levels will be guaranteed as per the applicable standards.	Bidders to comply the specification requirement
366	VI	B	I-M1	Flue Gas Desulphurisation System	15.06.00	36 of 49	Elevators Provide special corrosion resistant treatment on all elevator components. The protective treatment shall be subject to owner's approval.	The corrosion resistant treatment on all the elevator components shall be as per the Manufacturer's Standard. However the same shall be submitted to the Owner for information purpose.	Bidders to comply the specification requirement
367	VI	B	I-M1	Flue Gas Desulphurisation System	15.08.00	36 of 49	Elevators Fireman's switch shall be provided for each elevator	Please note that the Fireman's switch shall be provided for each elevator only at 1st landing level.	Specification requirement is clear in this regard. Bidders to Comply.
368	VI	E	-	Tender Drawings	1.00.00	6 of 14	-	Request to provide CAD copy of Layout of FGD area (4410-999-POM-A-001)	CAD format Drawing cannot be provided.
369	General	-	-	-	-	1&2 of 3	-	Request to provide CAD copy of ID fan to chimney sectional view drawings and GLP drawing	CAD format Drawing cannot be provided.
370	-	-	IV	Terminal points & Exclusions	1.00.00			Request to provide the drawing indicating all the terminal points. Since as mentioned in the specification, no drawings are available along with tender documents indicating C row.	Bidder to refer the general layout plan. Further, exact location will be finalized during detailed engineering.
371	VI	B	I-M6	Piping	2.02.04	3 of 16	Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing the piping system and to provide adequate flexibility. Flexibility analysis (using software packages such as Caesar-II etc.) shall be carried out for sufficiently long piping (straight run more than 300M)	Bidder propose to conduct the analysis as required by ASME B 31.1 Piping Code & not only based on long piping criteria mentioned in Bid specification	Specification requirement is clear in this regard. Bidders to Comply.
372	VI	B	I-M1	Absorber	5.01.00	13 of 49	IV)The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side	Bidder propose to use the Butterfly valve instead of Knife gate valve in Tender spec as per Bidder's standard design	Specification requirement is clear in this regard. Bidders to Comply.
373	VI	B	V-QM2	Lime & Gypsum Handling	1.05.06	3 OF 9	Zero Speed Switch, Under Belt Switch and Chute Blockage Switch:	For Degree of Protection test, type test report shall be provided for review. Conducting test may impact cost & delivery	Bidders to comply the specification requirement
			V-QE2	LT SWITCHGEARS & BUSDUCTS	SQE_10	1 OF 3, 2 OF 3, 3 OF 3			

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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			V-QE12	HT SWITCHGEARS	QA TABLE FOR HT SWITCHGEAR	1 OF 2	Degree of Protection test	schedule and it also required confirmation from vendor.	
			V-QE14	VFD	VFD PANEL	5 OF 5			
374	General							Owner is requested to clearly identify and provide the following information for each project: 1. Storage Area 2. Pre-Assembly yard 3. Space for Labor Colony 4. Space for Site Constrction Office	All areas & information will be provided as per the bidding document and specific location for the item not specified shall be mutually discussed after award.
375	VI	A	III-D	Civil Works	1.00.00	2 OF 4	1.00.00 SCOPE OF CIVIL WORKS The work to be performed under..... The nature of work shall generally involve earthwork in excavation & deep underground excavation, extensive de-watering,	The nearest existing strom water drainage facility shall be used by the bidder for the de-watering facilities. Owner to confirm.	Noted. However, muck deposition in the existing drains due to dewatering shall be removed by the bidder.
376	VI	A	III-D	Civil Works	1.00.00	2 OF 4	1.00.00 SCOPE OF CIVIL WORKS The work to be performed under..... Disposal of surplus excavated materials	Bidder request Owner to provide sufficient area for the same. Area allotted for disposal of surplus excavated material /stack pile location shall be as nearer to the site and to be indicated by Owner.	Bidder to Comply with the specification required
377	VI	A	III-D	Civil Works	2.00.00 Point no-4	3 OF 4	2.00.00 CONSTRUCTION FACILITIES The following are also in the Bidder's scope of work: 4. Providing all arrangements for the supply of construction water including bore-wells, water tankers etc.	Bidder request Owner to provide a Borewell facility near by the Site layout for the arrangement of construction water by further tapping or trasporting to the specified contrsuction loaction by Bidder.	Bidder to Comply with the specification required
378	VI	A (1)	III-B	Electrical Equipment/ System	1.09.00	3 of 6	Complete lighting system for internal and external areas for the plant, buildings, chimney and equipment in the bidder's scope.	Bidder understands that lighting requirements is only applicable for areas pertaining to FGD plant. Owner to review and confirm.	Bidder to provide complete lighting system for areas under bidder's scope

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379	VI	E (2)		Tender drawings	1.14.00	5 of 40	DWG NO.0000-999-POI-A-019B -Rev-A,Scheme for 24V DC power supply system Bidder request Owner to furnish the details and location of the Existing switchgear's for our further engineering .	Owner to confirm that the 2 nos. of 415V supply (one (1) no.from Existing 415V Unit Service Swgr and one (1) no.from Existing 415V Unit Emergency Service Swgr) to the 24V DC system (By Bidder) will be arranged by the Owner. Kindly confirm.	Bidder may refer to Electrical SLD 4410-109-POE-J-001/RevA. It is further clarified that no supply shall be extended from existing UES board for FGD. Existing HT swgr is located inside main plant building.
380	VI	B	III-C5	PLC Based Control System	9.06.01.07	21 of 27	The UPS system design shall ensure that in case of failure of mains input power supply to one of the chargers, the other charger whose mains input power supply is healthy, shall feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge to D.C battery at all load conditions.	As per Vol VI, Part-B, Sub-Section C5, cl.no.9.05.00 and as per Drg.no.0000-999-POI-A-019C (Scheme for Uninterruptible Power Supply System-configuration-B) , the UPS is of 1x100% charger & inverter configuration. Owner to kindly clarify and confirm the UPS configuration.	It is confirmed that as per clause 9.05.00, Part-B, Sub-Section C5 and tender drawing no. 0000-999-POI-A-019C, configuration-B UPS is envisaged fro FGD system .
381	VI	B (2) & E(2)	II-E1	General Electrical Specification, Tender drawings	2.05.00	4 of 7, 1 of 40	The Control Philosophy shall be as follows: (b) The motor feeders shall be controlled from the DDCMIS only . DWG NO.0000-151-POI-A-013-Rev-A "Standard configuration Diagram for PLC based Offsite Control Systems"	Bidder understands that all the motors in the proposed FGD will be controlled by FGD PLC/DCS. Owner to confirm.	Bidder's understanding is correct. Please refer Refer Amendment to technical specification in this regard.
382	VI	B (2)	II-E6	Cabling, Earthing & Lightning Protection	2.01.00 to 2.01.07	2 of 69	Design & Constructional feature	As these clauses in the tender specification refers to Boiler and other offset areas which are irrelevant to proposed FGD system, same shall not be applicable. Owner to review and confirm.	Bidder to refer relevant portion specific to bidders scope.
383	VI	B (2)	II-E6	Cabling, Earthing & Lightning Protection	4.04.14 (4)	11 of 69	In switchyard, control cables of each bay shall be laid on separate racks/trays.	Switchyard is not part of prposed FGD system, same shall not be applicable. Owner to confirm.	Bidder's understanding is in order.
384	VI	B (2)	II-E7	HT Cables	3.01.00	4 of 7	19/33 KV Grade Power Cables	These grade Power cables are not applicable. Kindly confirm	All the HT cable sizes and grade shall be as per tender SLD
385	VI	B (2)	II-E1	General Electrical Specification	2.08.00	6 of 7	DC Voltage: 220V/ 110V		
386	VI	B (2)	II-E9	HT Switchgear	3.00.00(i)(5)	7 of 39	Control Supply Voltage: 240V DC unearthed		

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387	VI	B (2)	II-E10	LT Switchgears & LT Busducts	3.01.02 & 3.01.03	4 of 58	DC SYSTEM 1) System Voltage 240VDC 2-Wire, Unearthed CONTROL SUPPLY VOLTAGE 1) Trip & closing coil of circuit breaker 240V DC/120V DC 2) Spring charging motor 240V DC/120V DC	The DC voltage level shall be 220V DC as indicated in the Electrical SLD. Request owner to confirm	Battery Voltage shall be 220V DC. However, operating DC voltage will be 240V as board is charged from charger normally in float mode.
388	VI	B (2)	II-E9	HT Switchgear	4.2.00 (b)	9 of 39	Outgoing breakers shall be suitable for switching transformers and motors at any load. They shall be capable of being used for frequent direct-on-line starting of squirrel cage induction motors of following ratings : 1) 3.3KV Above 160 kW up to 1500 kW (The contractor may adopt 415V/3.3KV for drives rated in the range of 160-210 kW) 2) 6.6 kV Above 200 kW 3) 11 kV Above 1500 kW	Bidder understand that the following voltage levels shall be followed: 1). 3.3kV : Above 200kW up to 1500kW 2). 11kV : Above 1500kW	Bidder's understanding is correct. Please refer Refer Amendment to technical specification in this regard.
389	VI	B	II-E1	General Electrical Specification	1.06.00	1 of 7	The voltage level for motors shall be as follows: a) Upto 0.2 KW : Single phase 240V AC / 3 phase 415V AC b) Above 0.2 KW and upto 200 KW : 3 phase, 415V AC c) Above 200 KW and upto 1500 KW : 3 phase, 3.3 kV AC d) Above 1500 KW : 11 Kv The bidder may adopt 415V/3.3 KV for the drives rated in the range of 160-210 KW.	Owner to review and confirm.	
390	VI	B (2)	Sub Section II-E9	HT Switchgear	4.5.1	11 of 39	The circuit breaker / contactor will normally be controlled from remote control panels (DDCMIS) as well as from Switchgear SCADA System (via Numerical Relays) through closing and shunt trip coils.	As per Vol VI, Part-B, Sub-Section E9, cl.no.4.3.00, contactors may be offered for outgoing motor feeders for drives with frequent start/stop. As per Vol VI, Sub-Section E1, cl.no.2.05.00 (b), motor feeders will not be controlled from Switchgear SCADA. Owner to clarify the same.	

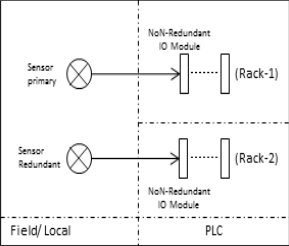
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391	VI	B (2)	II-E10	LT Switchgears & LT Busducts	1.01.00 (f) & (i)	1 of 58	(f) ESP consumption for 100 % BMCR operation shall be considered and further this load shall be uniformly divided among ESP Switchgears. (i) For Main Plant (TG & SG areas) and Service Building, each Lighting DB shall have 1x100% transformer. For all other areas, each Lighting DB shall have 2x100% transformers.	ESP system, Lighting DB in Main plant areas is not part of Bidder scope. The same is not applicable. Owner to confirm.	Bidders understanding is correct.
392	VI	B (2)	II-E10	LT Switchgears & LT Busducts	1.04.00	2 of 58	It shall be preferred to have all LV switchboards for the entire plant from a single manufacturer from maintainability and spares management point of view.	For FGD package, Bidder proposes the LV switchboard shall be as per the Owner's vendor list.	This clause is deleted. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)
393	VI	B (2)	II-E10	LT Switchgears & LT Busducts	5.00.00	12 of 58	In order to establish the compliance with the requirements of this technical specification, prototype panels shall be made and offered for the Employer's inspection and approval before the start of manufacturing of the panels for this project.	This requirement is difficult to comply. Request Owner to review and confirm.	Bidder to comply with Technical Specification.
394	VI	B (2)	II-E10	LT Switchgears & LT Busducts	31.01.00	31 of 58	Three phase Bus trunking system conforming to IEC 61439-6/IS 8623 (Parts 1 & 2) shall be provided for connecting the Main and Standby DG sets to Unit Emergency Switchgear.	This is not applicable to the FGD system. The same has not been considered by the Bidder.	This clause is deleted. Please refer AMENDMENT TO TECHNICAL SPECIFICATION (SECTION VI)
395	VI	B (2)	II-E15	Lighting	3.03.03	5 of 17	Emergency DC lighting is to be provided, through self contained DC emergency fixtures with four hours back-up duration, at strategic locations, in auxiliary/ offsite buildings wherever DC supply system is not available.	As per bidder standard recommendation back up duration for 2 hours is sufficient enough , battery with 4 hr backup not readily available with OEM's. Request Owner to reconsider the same.	Technical Specifications are clear. Bidder to comply with technical specification requirements
396	VI	B (2)	II-E15	Lighting	4.07.00	11 of 17	The sensors shall be recess mounted, programmable type suitable for lighting load of 6A with variable off delay settings. The detection area shall be minimum 5 metres for standard room height of 3mt. All the calibrated settings shall be stored in non-volatile memory of PIR sensor which shall be unaffected by power supply fluctuations.	Bidder understand this is applicable for proposed FGD Control Room only. Request Owner to confirm.	It is applicable for Control room, as well as any meeting/conference room if any

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
397	VI	B (2)	II-E16	Battery	1.00.00, 9.00.00	1 of 14, 11 of 14	DC health monitoring system shall be offered integral with each battery set for Main Plant & Switchyard batteries. DC health monitoring system	Bidder understand this is not applicable to FGD package/FGD plant area. Owner to check and confirm	Bidders understanding is correct.
398	VI	E(1)	-	Electrical Single Line Diagram for FGD Package)	Drg.no.4410-109-P0E-J-001- Rev A	14 of 14	Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A)	Owner to furnish the existing Station boards and Unit boards details for Bidder's reference.	Bidder to refer Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A). Boards are located in main plant area (AB Bay). Further details shall be furnished during Detailed engg.
399	VI	E(1)	-	Electrical Single Line Diagram for FGD Package	Drg.no.4410-109-P0E-J-001- Rev A	14 of 14	Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A)	As per as per Single line Diagram (11KV FGD Motor's are fed from Existing spare feeders of Unit Switchboards) Bidder understand that the required 11KV feeder for FGD Motor's shall be provided by Owner. Request Owner to confirm.	Bidder to refer Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-P0E-J-001- Rev A). Maximum one motor from each unit board shall be fed from owners 11kV Unit switchgear.
400	VI	A	III-C	Interfacing with employer's DDCMIS	9.00.00	8 of 9	-	Bidder understand that the required logic modification to be done in Boiler control System(Logic modification, signal exchange with FGD, graphics creation (if any) is not in the scope of bidder. However bidder will provide necessary inputs during detail engineering.	It is clarified that logic modification, graphic creation in boiler control system is not in the scope of the bidder. However, signal exchange between boiler control system and FGD control system shall be in the scope of bidder.
401	VI	B	III-C2	SPECIFICATION FOR ELECTRONIC TRANSMITTERS	2.0.1	3 of 30	16. Adjustment/calibration / maintenance: From hand held HART calibrator/ centralized PC based system (as applicable).	Bidder understand that there is no HART Management System (HMS) /centralized PC based system envisaged. Smart Transmitter will be communicated with Hand Held HART Calibrator.	Bidder's understanding is correct. Refer amendment in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.		
402	VI	B	III-C5	PLC BASED CONTROL SYSTEM	3.01.01	8 of 27	Input used for interlock/protection shall be dual redundant. Each of the redundant binary & analog inputs shall be wired to separate input modules.....  The same will be followed for tripple redundant sensors. Dual redundant IO modules are not required to be considered.	Bidder's understanding is correct.
403	VI	B	III-C5	PLC BASED CONTROL SYSTEM	3.01.03	8 of 27	All single analog & binary inputs including the limit switches of valves/dampers MCC/SWGR check-backs of all drives & information related signals shall be wired to single (i.e. non-redundant) input modules. For monitoring status of motor feeders, MCC, PCC and SWGR, now a days it is prevalent to use soft communication. This will reduce the cabling cost and commissioning time considerable also this will provide more data about motor feeder to operator for better monitoring.	Bidder's proposal is not acceptable. Bidder to comply with the specification requirement.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
404	VI	B	III-C5	PLC BASED CONTROL SYSTEM	3.01.04	8 of 27	The on-off status of HT drives etc., however, be wired to two input modules in parallel.	Hence bidder request NTPC to accept intelligent MCC concept.	
405	VI	E	-	Scheme of Absorber System	Drawings No. 4410-109-POM-A-005	11 of 14	Flow measurement at FGD inlet, FGD Outlet and Stack.	In the "Scheme of Absorber System", flue gas flow measurement is indicated at FGD inlet, outlet and at stack(CEMS), Bidder suggest as the flow is going to remain same in the flue gas outlet and at the Chimney , it is not necessary to measure flow at the FGD outlet and at chimney as indicated. Hence bidder suggest to measure flow only at FGD inlet and at the Chimney(CEMS). Owner to confirm.	Bidder's proposal is not acceptable. Bidder to comply with the specification requirement.
406	VI	B	IV-D	Civil Works	3.14.03	12 of 114	The Minimum thickness of shell (for RCC Chimney)shall not be less than 500mm	The minimum thickness of the shell shall be arrived as per requirements of the design code IS : 4998 (Part-I) 1975	Bidder to comply to the requirements of technical specification.
407	VI	B	IV-D	Civil Works	3.09	8 of 114	Cage ladders (min. 450mm Wide) shall be provided for access of roof of Single storey MCC rooms etc.,	Access to roof of all MCC buildings shall be through Cage ladder or RCC Stair case. Please clarify.	Cage ladder to be provided for access to roof of single storey MCC room. For multi storey MCC room RCC stair case to be provided.
					6.08	24 of 114	Access to RCC Roof of MCC Building shall be through RCC Staircase		
408	GENERAL							Bidder understands that the trestles in customer scope (if any) can be used for Duct Support in case of space constraint for routing the duct till the Absorber in FGD Space identified for the bidders in case required. Owner to confirm.	No support from the structure/ buildings under NTPC's scope shall be allowed.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
409	VI	B	IV-D	CIVIL WORKS	7.00.00	24 of 114	RCC paving of minimum 150 mm thick with M25 grade concrete, over an under bed as specified herein shall be provided for areas mentioned below.	No areas are mentioned below in the specification . Owner to clarify	For scope of area paving refer clause no. 1.00.00, Sub-section-IIID Civil works, Section-VI, Part-A of technical specification
410	VI	B	IV-D	CIVIL WORKS	4.0	19 of 114	All facility buildings shall be provided with open surface brick drains of minimum size of 300 mm width and 300 mm depth all around the periphery	All buildings shall be provided with open surface brickdrains, Bidder understands that the floor wash shall be connected to these open surface brick drains or it needs to be connected to a sump pit outside the building from which it shall be connected to overall plant drainage. Owner to Confirm	The peripheral drains around the buildings are meant for carrying the surface rain water and also the water from rain water down comes to the nearest branch drain from the location of the building. The waste water generated during flushing and cleaning of the equipment shall be collected and re-used/treated as per clause 7.00.00, sub-section-III-A1 FGD, Section-VI, Part-A of technical specification
411	SECTION-VI / Part-B			SUB-SECTION-I-M1	04 of 49	1.09.00	The equivalent weighted average of sound level measured at a distance of 1.5 m above floor level in each elevation and one meter horizontally from the base of any equipments furnished and installed under these specifications, expressed in decibel to a reference of 0.0002 microbar, shall not exceed 85 dB(A).	Deviation: It is possible to meet guaranteed noise level of 85 dBA for all equipments except for Ball Mill and crushers.	Refer Amendment to technical specification in this regard.
				(FGD)				The guaranteed values for these equipments are	
								• Ball Mill : 90 dBA	
								• Crusher : 100 dBA	
								Kindly Confirm	
412	SECTION-VI / Part-B			SUB-SECTION-I-M1	05 of 49	3.01.00	Flue Gas Velocity:	Deviation:	Bidder shall comply the specification requirements in this regard.
				(FGD)		Sl. no: 5	Maximum flue gas velocity through the Absorber (m/s)- Not more than 4 m/s at design point	As per our FGD design practice, maximum gas velocity through the Absorber shall be 4.0-4.5m/s.	
							Kindly confirm.		
413	SECTION-VI / Part-B			SUB-SECTION-I-M1	05 of 49	3.01.00	Recirculation Slurry pH:	Deviation:	Bidder shall comply the specification requirements in this regard.
				(FGD)		Sl. no: 6	Not Less than 5.5 under all operation conditions	Based on our FGD design practice, slurry pH in the Absorber is between 5 and 6.5. FGD will be designed for the same.	
							Kindly confirm.		
414	SECTION-VI / Part-B			SUB-SECTION-I-M1	13 of 49	5.01.00	The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side.	Deviation:	Bidder shall comply the specification requirements in this regard.
				(FGD)		Sl. no: iv		Normally in case of recirculation pump area, in case of any pump stoppage the gate needs to quickly close without leakages in the slurry lines. In case of knife gate valves, there may be leakages after few operations due to wearing of components. In such applications, we propose to provide pneumatic operated butterfly valves that are widely provided in FGD plants.	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
415	SECTION-VI / Part-B			SUB-SECTION-I-M1	14 of 49	The contractor shall offer and demonstrate mixing arrangement such that n-1 number of agitators are sufficient to avoid the slurry settlement in the absorber tank in case of one agitator under breakdown (n-total no. of working agitators).	Deviation:	In case for the Absorber design offered if only vertical agitators will be provided, then one complete agitator assembly (including motor) for each unit can be offered as a warehouse spare in addition to the mandatory spares.
				(FGD)			As per our FGD design, under normal FGD operation, the jet Air Sparger (JAS) works to keep the slurry in suspension and no agitators are required to be in operation. The Agitators are required only during FGD stoppage to prevent the deposit settlement. For this purpose, we are offering two numbers of Agitators. However, to meet tender requirement, one spare will be provided as a warehouse spare.	
416	SECTION-VI / Part-B			SUB-SECTION-I-M1	16 of 49	The design of flue gas ducts and inlet and outlet hoods of the FGD as well as guide vanes and baffle plates shall ensure a homogeneous flue gas flow with respect to the distributions of:	Clarification:	Bidder shall comply the specification requirements in this regard.
				(FGD)		(i) temperature	Customer's requirement "deviation from average: less than $\pm 10\%$ " is too strict and it is not required for the stable operation at the actual plants based on MHPS' experiences.	
						(ii) velocity	The deviation from average is generally 15-20% and MHPS designed and delivered FGD plants based on the deviation from the average for approx. $\pm 15\%$.	
						(iii) dust content	Bidder requested to change deviation from " $\pm 10\%$ " to " $\pm 20\%$ ".	

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Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter								
							(iv) slurry injection and distribution. The above shall be proven by two phase Computational Fluid Dynamics simulations (liquid and gas). The scope of modelling shall include flue gas path inside the absorber vessel including inlet and outlet duct. Homogeneity shall be ensured, if the deviation from average is less than +10%. Further, in the Absorber outlet hood no internals such as guide vanes and baffle plates shall be allowed.		
417	SECTION-VI / Part-B			SUB-SECTION-I-M1	16 of 49	5.06.06	Mist Eliminator: Three stage chevron type Mist Eliminators (ME) made of Polysulfone or stainless steel shall be provided at the exit of the absorber.	Clarification: As per our proven practice, Mist Eliminator will be made of polypropylene (PP) or FRP.	Bidder shall comply the specification requirements in this regard.
				(FGD)				Kindly confirm.	
418	SECTION-VI / Part-B			SUB-SECTION-I-M1	19 of 49	5.06.24	It should be possible to discharge the absorber sump into the auxiliary absorbent tank within 2 hours.	Clarification: We propose 8 hours to discharge the slurry from absorber / absorber sump into the emergency drain tank to have optimum design of pumps. Please confirm	Bidder shall comply the specification requirements in this regard.
				(FGD)					
419	SECTION-VI / Part-B			SUB-SECTION-I-M1	24 of 49	7.04.01	Vacuum Belt Filters:	Limestone purity of 89% as CaCO ₃ is necessary to get 90 wt. % of Gypsum Purity So Gypsum purity will be guaranteed based on 89 % of Limestone purity as CaCO ₃ (FGD Guarantee point).	Specification requirement is clear in this regard. Bidders to comply the specification requirement.
				(FGD)				Please confirm	
						Sl no: c	Gypsum purity : 90 % (minimum)		
420	SECTION-VI / Part-B			SUB-SECTION-I-M1	27 of 49	7.08.03	Agitation shall be provided to prevent settlement of slurry by side entry agitators with emergency flush start system. Sufficient number of agitators shall be provided in the tank by the contractor to prevent the solids from settling down.	As per proven FGD practice, the installation height (shaft installation height) of the agitator will be located above the limestone/Gypsum accumulation level of the tank. Bidder will offer agitator without emergency flushing system Please confirm.	Bidder shall comply the specification requirements in this regard.
				(FGD)					

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
421	SECTION-VI / Part-B			SUB-SECTION-I-M1	31 of 49	12.02.00	Clarification: As per proven practice, all the pipes handling slurry shall be provided with FRP material. Please confirm.	Bidder shall comply the specification requirements in this regard.
				(FGD)				
422	SECTION-VI / Part-B			SUB-SECTION-I-M1	29 of 49	10.01.00	Slurry & Process Water Tanks: Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the Contractor	Clarification: In clause no: 10.01.00, additional corrosion allowance for tank is mentioned as 3 mm whereas in clause no: 13.01.00, it is mentioned as 1.5mm.
				(FGD)				
423	SECTION-VI / Part-B			SUB-SECTION-I-M1	31 of 49	13.01.00	Process Water Storage Tanks & Pumps: Additional Corrosion allowance of 1.50 mm on the minimum tank shell thickness as calculated by IS:803, latest edition shall be provided by the bidder	Kindly confirm the additional corrosion allowance to be considered for the process water tank. Refer Amendment to technical specification in this regard.
				(FGD)				
	SECTION-VI / Part-A			SUB-SECTION-V (Salient Design Data)	02 of 10	3.00.00	FGD Guarantee Point & Design Point : Clarification: HCl and HF content in Flue gas has got implication on Limestone consumption, FGD Equipment sizing, Recirculation flow rate and waste water quantity. Bidder request owner to provide HCl and HF Content in Coal.	Refer Amendment to technical specification in this regard.
424				I-M1		Booster Fan : Additional a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-Nox system	We understand from the tender that 44 % margin to be applied over the summation of P1 & P2 where P1 is pressure requirement for the FGD system as arrived from the tender sizing conditions for booster fan P2 is 100 mm wcl to take care of pressure loss due to future installation of De-Nox system.	Bidders understanding is correct in this regard.
	VI/B			4.01.00	8 of 49		Kindly clarify Bidder understanding.	

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
425				I-M1	4.04.00	10 of 49	Booster Fan :	The Booster Fans for the FGD project are of similar construction to that of axial reaction ID fans and is handling the same volume and flue gas parameter as that of ID fans. In case of Patratu 3x800 MW & Talcher 2x660 MW tenders, NTPC has already issued amendment for ID fan max speed as 750 rpm. Bidder would like to offer FGD Boosters Fans with 750 rpm (max speed).	Refer Amendment to technical specification in this regard.
							Fan rotational speed : 600 rpm (max)		
	VI/B								
426	VI/B			I-M1	4.04.00	10 of 49	Booster Fan :	The Booster Fans for the FGD project are of similar construction to that of axial reaction ID fans and is handling the same volume and flue gas parameter as that of ID fans. In case of Patratu 3x800 MW & Talcher 2x660 MW tenders, NTPC has stipulated :	Refer Amendment in this regard.
							Fan casing material thickness : Abrasion and wear resistant, high BHN steel having minimum 8.0 mm thickness or 12 mm mild steel with liner of thickness 10 mm (min.)	"ID Fan casing material thickness: Abrasion and wear resistant, high BHN steel having minimum 8.0 mm thickness or 12 mm mild steel with liner of thickness 10 mm (min.) Alternatively, 22 mm thickness casing of mild steel is also acceptable."	
								Bidder would like to clarify that offered FGD Booster Fans casing shall be of mild steel without liners and with minimum thickness as per design requirement/ manufacturer's standard.	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
427	Section-VI, Part A			Sub Section- III- A1 – FGD	Page 4 of 8	4.01.03	4.01.03 . . . Guillotine gates shall be provided at the <u>inlet</u> & outlet <u>of the each Booster fan.</u>	As per the first 3 clauses (i.e., 4.01.03, 16.02.00 & Scheme of FGD Absorber system), FGD Booster Fan Inlet Gates are to be supplied by the bidder. Whereas, as per Clause no: 3.03.01, the FGD Booster Fan Inlet Guillotine Gates are being provided by the Employer i.e., NTPC will provide. Clause no: 3.03.01 is contradicting with the first 3 clauses referred above. Kindly clarify the scope of supply of FGD Booster Fan Inlet Gates.
							&	
							&	
							16.02.00. Motorized Guillotine type gates with 2x100% seal air fans shall also be provided at <u>suction</u> & discharge <u>of each Booster Fan.</u>	
					Page 8 of 8	16.02.00	&	
	&						Terminal point "FGD Scope" is mentioned before Booster Fan Inlet Gates.	
				Scheme of FGD- Absorber System	&	&		
	Part-E							
	Tender Drawings / Section-VI			&	-	Scheme of FGD- Absorber System		
							&	
	&			Sub-Section-I-M1 (FGD)		&		
428							3.03.01. . . Guillotine gate type damper <u>is being provided by the Employer</u> before the suction of each Booster fan.	Refer Amendment to technical specification in this regard.
	Section-VI, Part-B					3.03.01		
						&		
					Page 6 of 49			
428	Section-VI, Part-B				Page 2 of 49	1.03.02	1.03.02. . . Further, <u>Quick opening Bi-plane motorized/pneumatic damper</u> along with 2x100% seal air fans <u>shall be provided in the by-pass duct.</u>	As per the clause no. 1.03.02, FGD Bypass Damper is to be supplied by the bidder. Whereas, as per Clause no: 3.03.07, the FGD Bypass Damper is being provided by the Employer i.e., NTPC will provide. Clause no: 3.03.07 is contradicting with clause no: 1.03.02 referred above. Kindly clarify the scope of supply of FGD Bypass Damper (Damper between ID fan and existing chimney).
							&	
							3.03.07. <u>A damper in the bypass duct is being provided by the Employer</u> for quick opening to allow bypass to come into operation in case of emergency. The damper shall be capable of quick opening during emergency conditions within a time of 10-20 secs.	
						&		
					Page 7 of 49	3.03.07		

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
429	Part-E			Scheme of FGD- Absorber System	-	Scheme of FGD- Absorber System	There is no Damper in the duct from Absorber Outlet to Wet Stack Inlet.	As per the Scheme of FGD Absorber system mentioned in Part-E of tender specification, there is a Separate Wet Stack for FGD operation. Also, no damper is applicable in the duct connecting Absorber Outlet and New Wet Stack.	Bidder to comply the specification requirement. Refer Amendment to technical specification in this regard.
	Tender Drawings / Section-VI							Hence, we understand that the damper mentioned in Clause no: 3.03.01 is not applicable and in-line with the P&ID (scheme drawing) since separate wet stack is provided for FGD operation. Since there is no Damper in the FGD outlet treated gas path (connecting Absorber outlet and separate wet stack), we understand that clause no: 3.03.08 is also not applicable.	
				&		&	&	Kindly clarify.	
	&								
				Sub-Section-I-M1 (FGD)		3.03.01	3.03.01 . . . A Pneumatic operated multi louver damper with seal air arrangement shall also be provided <u>by the Contractor in the clean gas duct after GGH.</u>		
	Section-VI, Part-B				&				
							&		
					Page 6 of 49				
						&	3.03.08 . . . In the FGD outlet treated gas path the frame of the damper shall be made of STEN-1 or better material, the blades shall be made of SS317LMN or better material and the seals shall be made of Alloy C- 276 or better material.		
					&	3.03.08			
				Page 7 of 49					

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
430	Section-VI, Part A			Sub Section- III- A1 – FGD	Page 4 of 8	4.01.03	4.01.03 . . . One (1) no <u>FGD by pass gate</u> shall be provided in the existing duct connecting to existing chimney.	When the FGD is in operation, the FGD Bypass Damper will be closed (ensuring 100 % sealing efficiency with seal air fans). However, the FGD Bypass Gate cannot be kept closed as emergency situation may arise suddenly. (The Gate will take not less than 3 to 4 minutes considering the Height of the Gate Blade to slide open). In case the FGD Bypass Gate is also kept closed and emergency situation arises, the purpose of providing the Quick Operating Damper in Bypass duct is lost and serves no purpose. So, this Gate will be open all the time – whether FGD is in service or FGD not operating. Hence, only Quick-acting Biplane Damper is required and Guillotine Gate is not required in the bypass duct (duct from ID Fans to existing chimney). Globally, only damper is being supplied in this duct and Guillotine Gate is not required.	Refer Amendment to technical specification in this regard.
				&			&	Kindly accept.	
	&								
				Sub-Section-I-M1 (FGD)	&	&	1.03.02. . . <u>Motorized Guillotine type gates</u> shall be provided at <u>(ii) in the bypass duct. Further, Quick opening Bi-plane motorized/pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct.</u>		
	Section-VI, Part B								
					Page 2 of 49	1.03.02	&		
							3.03.07. <u>A damper in the bypass duct</u> is being provided by the Employer for <u>quick opening to allow bypass to come into operation in case of emergency. The damper shall be capable of quick opening during emergency conditions within a time of 10-20 secs.</u>		
						&			
				&	3.03.07				
					Page 7 of 49				

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter				Clause No.				Page No.
431	Section-VI, Part A			Sub Section- VII Mandatory Spares	Page 4 of 38,	1.02.00 Gates in Flue Gas System	1.02.00 → 2. Actuator (1 no. of each type & rating)	For FGD Gates, we are considering mandatory spare Electrical Actuators under clause 1.02.00 Gates in Flue Gas System → 2. Actuator (1 no. of each type & rating) in Page no: 4 of 38.	Refer Amendment in this regard.
						&			
					&	"ELECTRICAL" → Electrical Actuators		Hence, we are not considering the same electrical actuators for FGD Gates under "Electrical Actuators → 1. Actuators (1 no of each type and rating)" in Page no: 35 of 38 – to avoid duplication which also increases the cost. Please confirm.	
							&		
					Page 35 of 38				
							Electrical Actuators → 1. Actuators (1 no of each type and rating)		
432	VI-Part-A			1A	25	4.01.06	In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.02(d) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity..... first660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.	Clarification: Since Wet Limestone Grinding system requirement for this tender and NTPC bulk tender is similar. Bidder requested Customer to amendement the Provenness criteria of Wet Limestone Grinding system in line with NTPC Bulk tender as follows "In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.01.01 (d) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.01.01 (d) above for the Wet limestone Grinding mills. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments". Please confirm	Bidder to refer Amendment in this regard.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
433	IV, Part-B			II-E6	22 OF 69	9.00.00.b)	Clarification: For FGD,HT MCC,LT MCC's , PCC's will be placed in a single building.	Number & location of MCC's shall be finalised during detailed engg. based on final loads & their distance.
							MCC's of common system like Gypsum & Limestone handling will be placed in any one of the control room (Common for all the units).	
							Kindly confirm.	
434	IV, Part-B			II-E1	4 OF 7	2.03.00	MCCB shall be provided for 100A, 125A, 160A, 200A, 250A.	Bidder to comply with technical specification requirement.
							The motor feeders for 110 kw and above Air circuit breaker controlled.	
							Feeders upto 200A, will be of SFU Controlled.	
							From 200 to 630A shall be of MCCB Controlled.	
							Above 630A shall be ACB Controlled.	
							Kindly confirm.	
435	Part E			-	Page 14 of 14	Drg No- 4410-109-POE-J-001 11 KV FGD motors	3.3 kv& 415V FGD Motors are only envisaged for FGD and hence 11kv motors are not considered.	Bidder to comply with technical specification requirement.
436	VI-Part-A			1	3 of 18	1.03.01	Wet limestone based Flue gas desulphurization (FGD) for 2X 800 MW unit...	Refer Amendment to the Technical specification.
							Clarification: We understand that this line must be "Wet limestone based Flue gas desulphurization (FGD) for 3x660MW units..."	
							Kindly confirm.	
437	VI-Part-A			1	3 of 18	1.03.02	One (1) numbers of elevator for Limestone Grinding System building.	Bidder to comply with technical specification requirement.
	VI-Part-A			III-A1	3 of 8	3.01.08	...one (1) number passenger cum goods elevator of minimum capacity of 1000 kgs for easy access & movement of man/materials. etc	
	VI-Part-A			III-A1	6 of 8	8.01.00	One (1) number passenger cum goods elevator of minimum capacity of 1000 kgs in Limestone Grinding System	
							Kindly confirm.	

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Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter								
438	VI-Part-B			IV-D	8 of 114	3.07.00	The Gypsum storage shed shall be RCC framed structure with structural steel work shed with....	Clarification: We understand that the bottom side retaining wall only is RCC. The remaining portion is structural steel work shed with... Kindly confirm.	Bidder to refer separate amendment in this regard.
439	Clarification:			VI-D	24 of 69	6.08.00	Access to RCC roof of Gypsum dewatering building, FGD Control room building, MCC building, ball Mill building shall be through RCC staircase and roof access to all other buildings shall be through cage ladder as per requirement	Clarification:	Bidder to comply with technical specification requirement.
	VI-PART-B			CIVIL WORKS				RCC staircase will be provided for roof access for FGD Control room/MCC buildings.	
								Cage ladder may be allowed for access to roofs of all other buildings with roof sheeting.	
								Kindly accept	
440	VI-PART-B			VI-D	-	-	Access to operating floors/platforms of Absorbers, ball Mill Building, Gypsum dewatering building etc.	Clarification: It is proposed to provide steel staircases for access to operating floors of all buildings except FGD Control room/MCC building. Kindly confirm.	Bidder to comply with technical specification requirement.
441	VI-PART-B			VI-D	-	-	Ball Mill Building:	Clarification:	Type of building structure (Steel/RCC) and cladding system shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any). However, roof shall be of RCC as per technical specification re-quirement.
				CIVIL WORKS				Type of construction of Ball Mill building is not mentioned in the technical specification.	
								Bidder proposes to use structural steel building with roof sheeting and side cladding (sheeting and cladding with permanently colour coated sheeting).	
								Kindly confirm.	
442	SECTION-VI, PART-B			SUB SECTION-I-M2	1 OF 112	2.00.00	For LHP/GHP both the streams shall be considered to be operating simultaneously.	As per our understanding two streams of conveyors (1 working+1 standby) shall be provided at Rated capacity 150 MTPH each.	Bidder's understanding is in order

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)**

Bidding Document No.: CS-4410-109-2

Document No.: CS-4410-109-2-CLRF-TECH-01

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
443	SECTION-VI, PART-B			SUB SECTION-I-M2	2 OF 112	2.02.00	The intake and onward discharge capacity to be 150 TPH per Box Feeder.	Bidder to comply the stipulation of the technical specifications
	SECTION-VI, PART-A			SUB SECTION-III-A2	1 OF 7	1.01.00	<u>Each Apron feeder shall be of 75 MTPH rated capacity.</u> The rated capacity of conveyor 1A/B shall be 150 MTPH. Alternatively two numbers <u>bulk receiving unit along with surface feeders etc. each rated for 75TPH capacity</u> shall be provided.	
444	SECTION-VI, PART-A			SUB SECTION-III-A2	1 OF 7	1.01.00	In Crusher house, Limestone from incoming Conveyor 1A will pass through dedicated Vibrating Feeder (VF-1) and dedicated Crushers (CR-1). Similarly Limestone from incoming Conveyor 2B will pass through dedicated <u>Vibrating Screening Feeders</u> (VF-2) and dedicated Crushers (CR-2) respectively.	Whether Vibrating Feeder or Vibrating <u>Screening</u> Feeders is to be considered. We understand that in case of Vibrating Feeder, 100% feed from the feeder shall pass directly to the Hammer Mill Crusher. Kindly confirm.
445	SECTION-VI, PART-A			SUB SECTION-III-A2	2 OF 7	1.01.00	Stacking Conveyor 3A/B will drop limestone to <u>over ground storage hopper</u> provided within a shed via travelling trippers. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B.	We have considered over ground limestone <u>stockpile</u> with 80% of the total storage capacity and underground hopper with 20% of the total storage capacity. Kindly confirm.
446	SECTION-VI, PART-A			SUB SECTION-III-A2	5 OF 7	2.01.18	<u>Two numbers limestone sampling units</u> one each for conveyors 1A/B & 5A/B for sampling of as received limestone and crushed limestone being fed to the FGD System complete with all accessories and electrical, civil, structural works, supporting structures, approach/maintenance platforms etc.	We propose to provide only one number Limestone Sampling Unit at limestone crusher house for sampling of uncrushed limestone. LSU for crushed limestone is not envisaged. Kindly confirm whether same is acceptable.
447	SECTION-VI, PART-B			SUB SECTION-I-M2	2 OF 112	2.02.00	The Box Feeder should be a robust, proven, above the ground for unloading from trucks/ <u>self-tipping trucks or from loader shovels.</u>	We are considering that only self tipping trucks shall feed to the BRU/Box Feeder and therefore requirement of truck tippler is not envisaged for this project. Self Tipping trucks/loader shovels etc. shall be in customer's scope. Kindly confirm.
							<u>Travelling Tripper</u>	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
448	SECTION-VI, PART-B			SUB SECTION-I-M2	3 OF 112	2.02.03	(b) Type : Motor driven rail mounted, <u>two way chute discharge</u>	The mobile trippers of Limestone inside shed shall be two way feed, i.e. one way feeding to itself i.e. conveyor and side chute feeding to bunker slot on one side. Meaning we shall consider bunker slot on one side. Kindly confirm.	Confirmed
449	SECTION-VI, PART-B			SUB SECTION-I-M2	3 OF 112	2.02.03	Design Capacities & Margins:-	As per our understanding Duty Requirement for Crushers & Vibrating <u>Screening</u> Feeder (or Vibrating Feeder based on confirmation) shall be 1x100% i.e. 150 MTPH each (Rated Capacity). Kindly confirm.	Refer amendment in this regard.
		1. Crushers 2x50%							
		2. Vibrating <u>screening</u> feeders 2x50%							
450	SECTION-VI, PART-A			SUB SECTION-III-A2	6 OF 7	2.01.27	Service water, cooling water and potable water system for complete limestone handling plant including Pumps ,drives, sumps, piping etc and all mechanical, electrical and civil works.	We propose to provide air cooled scoop couplings (if applicable) for crushers and hence cooling water shall not be required. Kindly confirm.	Refer amendment in this regard
451	SECTION-VI, PART-A			SUB SECTION-III-A2	5 OF 7	2.01.22	One (1) number of passenger cum goods elevator with drives, all electrical, mechanical, civil, structural & associated foundation works, accessories and	As mentioned in the flow Diagram <u>Rack & Pinion type elevator</u> shall be provided with applicable mandatory spares. Kindly confirm the type and quantity of the elevator.	Refer amendment in this regard
		electrical to serve various floors of limestone crusher house.							
452	4410-000-2-POM-A-002			Limestone Flow Diagram			<u>Dust Suppression</u> & Dust Extraction both systems are mentioned for LHP.	We understand that only Dust Extraction system is envisaged for Limestone Handling Plant and Plain Water Dust Suppression system for Gypsum Stockpile. Kindly confirm.	Refer amendment in this regard
		☐ CW ☐ DS ☐ SW ☐ DW ☐ DE							

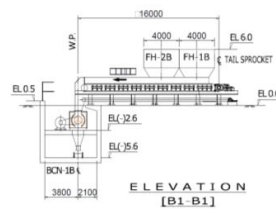
CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)**

Bidding Document No.: CS-4410-109-2

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Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION															
	Section / Part / Chapter																							
453	4410-000-2-POM-A-002			Limestone Flow Diagram			800 mm Belt Width is envisaged for all conveyors i.e. in uncrushed as well as crushed zone. <table><tr><td>CONV.1A/1B</td><td>TROUGHED CONVEYOR 800MM WIDE BELT</td><td>2</td></tr><tr><td>CONV.2A/2B</td><td>TROUGHED CONVEYOR 800MM WIDE BELT</td><td>2</td></tr><tr><td>CONV.3A/3B</td><td>TROUGHED CONVEYOR 800MM WIDE BELT</td><td>2</td></tr><tr><td>CONV.4A/4B</td><td>TROUGHED CONVEYOR 800MM WIDE BELT</td><td>2</td></tr><tr><td>CONV.5A/5B</td><td>TROUGHED CONVEYOR 800MM WIDE BELT</td><td>2</td></tr></table>	CONV.1A/1B	TROUGHED CONVEYOR 800MM WIDE BELT	2	CONV.2A/2B	TROUGHED CONVEYOR 800MM WIDE BELT	2	CONV.3A/3B	TROUGHED CONVEYOR 800MM WIDE BELT	2	CONV.4A/4B	TROUGHED CONVEYOR 800MM WIDE BELT	2	CONV.5A/5B	TROUGHED CONVEYOR 800MM WIDE BELT	2	Conveyor Belt Width shall be 800 mm for uncrushed zone & 650 mm for crushed zone as per technical specifications. Kindly confirm.	Confirmed Also Refer amendment in this regard.
CONV.1A/1B	TROUGHED CONVEYOR 800MM WIDE BELT	2																						
CONV.2A/2B	TROUGHED CONVEYOR 800MM WIDE BELT	2																						
CONV.3A/3B	TROUGHED CONVEYOR 800MM WIDE BELT	2																						
CONV.4A/4B	TROUGHED CONVEYOR 800MM WIDE BELT	2																						
CONV.5A/5B	TROUGHED CONVEYOR 800MM WIDE BELT	2																						
454	SECTION-VI, PART-B			SUB SECTION-I-M2	2 OF 112	2.02.01	Shell Thickness : 12 mm (min.)	Shell Thickness for drive pulleys shall be min. 12 mm. For other pulleys it shall be as per pulley calculations.	Specification requirement is clear. Shell thickness of all pulleys shall be 12 mm. Bidder to comply the technical specifications															
455	SECTION-VI, PART-B			SUB SECTION-I-M2	2 OF 112	2.02.01	Belt ratings shall be selected in such a way that there are only two (2) ratings of belting.	Type of belting shall be 2 ratings per belt width. Also, belt rating for High Angle Conveyor (if used) shall be excluded from the limitation of 2 types of rating. Kindly confirm.	Bidder to comply the stipulations of the technical specifications															
456	SECTION-VI, PART-B			SUB SECTION-I-M2	2 OF 112	2.02.01	Belt ratings..... only two (2) ratings of belting. This however excludes sealing belt (for sealing slots of tripper floor) and belting of belt feeders.	We have not considered sealing belt for travelling tripper for limestone as well as Gypsum. Kindly confirm.	Sealing Belt shall not be considered for Lime stone storage shed ,however sealing belt shall be provided in Tripper for sealing for sealing above Limestone storage Silos.															
457	SECTION-VI, PART-B			SUB SECTION-I-M2	3 OF 112	2.02.06	Crushers, wagon tipplers , apron feeders, side arm j-rail hoists (travel and hoisting) , elevators, rack and pinion gates, all the drives in sampling units, various pumps of.....	Wagon Tippler, Side Arm J-Rail Hoists are not envisaged for this project. Kindly confirm.	Refer amendment in this regard.															
458	SECTION-VI, PART-A			SUB SECTION-III-A2	5 OF 7	2.01.23	 two (2) number of suspended magnets on each conveyor 1A/B complete with handling arrangement, reject chutes, reject trolleys, supporting arrangement and all mechanical, electrical, civil, structural works and accessories.	In view of provision of ILMS, MD we propose that suspended magnets may not be required. Kindly confirm. We not have envisaged any pent house and if SM are to be provided kindly confirm the location for the same.	Refer amendment in this regard.															

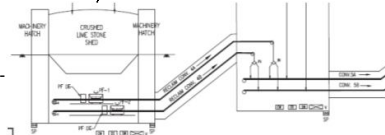
CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter								
459	SECTION-VI, PART-E			Layout Plan of FGD System : Drg No.: 4410-999-POC-F-001	1 OF 2	1.00.00	-	After studying the scheme as indicated in the plant layout and the flow diagram, we find some of the conveyor profiles are not feasible to achieve. As the scheme is indicative as mentioned in flow diagram we understand that bidders have the freedom to optimize the scheme by addition/deletion/relocation of the facilities, use High Angle Conveyor, Bucket Elevator however maintaining the overall functionality & philosophy of the LHP & GHP system. Kindly confirm.	Bidder to comply the scheme as outlined in referred Tender Drawings
460	-			Lime Stone Flow Diagram 4410-000-2-POM-A-002	-	-	-	Kindly confirm whether the following arrangement shall be acceptable:- Box Feeder/Apron Feeder shall feed uncrushed limestone directly to Hammer Mill Crusher placed at ground level. Crushed limestone shall then be stacked using travelling tripper and be sent to limestone silo using paddle feeder and onward conveyor/bucket elevator arrangement. It would however affect the provision of equipments such as ILMS, MD etc. before crusher. 	Bidder to comply the stipulations of the technical specifications

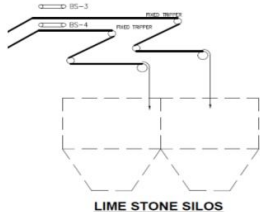
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	Section / Part / Chapter			Clause No.	Page No.																				
461	SECTION-VI, PART-A			SUB-SECTION-VII MANDATORY SPARES	12 OF 38	2.00.00	<table><tr><td>K)</td><td></td><td>BUCKET ELEVATOR</td><td></td></tr><tr><td>(i)</td><td></td><td>Buckets</td><td>10% of total population</td></tr><tr><td>(ii)</td><td></td><td>Belt for bucket elevator</td><td>10% of total length</td></tr><tr><td>(iii)</td><td></td><td>Linkages</td><td>20% of total population</td></tr></table>	K)		BUCKET ELEVATOR		(i)		Buckets	10% of total population	(ii)		Belt for bucket elevator	10% of total length	(iii)		Linkages	20% of total population	Mandatory spares for Bucket Elevator have been specified, however the requirement/specification of Bucket Elevator is not given in the tender specifications/flow diagram. Whether Bucket Elevator could be used for uncrushed as well as crushed limestone zone. Also, shall the spares be required to be provided even if Bucket Elevator is not considered in the scheme. Kindly confirm.	Refer amendment in this regard.
K)		BUCKET ELEVATOR																							
(i)		Buckets	10% of total population																						
(ii)		Belt for bucket elevator	10% of total length																						
(iii)		Linkages	20% of total population																						
462	4410-000-2-POM-A-002			Limestone Flow Diagram	-		If bucket elevator is provided to feed limestone from the paddle feeder & its associated conveyor, interchangeability to feed to the 2 bucket elevator for each stream may not be feasible. Kindly confirm if the same shall be acceptable??	Bucket Elevator is not envisaged. Bidder to comply the stipulations of the technical specifications																	
463	SECTION-VI, PART-A			SUB SECTION-III-A2	5 OF 7	2.01.25	Four (4) numbers of electronic type belt scales on conveyors 1A/B & 5A/B for continuous weighing, complete with all mechanical, electrical, civil, structural works and accessories.	It may not be feasible to provide belt scale to measure limestone feed to silo. Whether belt weigh feeder be acceptable and whether interchangeability of feeding to the 2 silo will be required from the bucket elevator. Kindly confirm.	Bucket Elevator is not envisaged. Bidder to comply the stipulations of the technical specifications																
464	-			-	-	-	-	Whether High Angle Conveyor could be used for uncrushed as well as crushed limestone zone.	High Angle Conveyor is not envisaged. Bidder to comply the stipulations of the technical specifications																
465	-			-	-	-	-	Angle of repose considered for Limestone 37 degree and for Gypsum 45 degree. Kindly confirm.	Angle of repose considered for Limestone 37 degree and for Gypsum 35 degree.																
466	SECTION-VI, PART-A			SUB-SECTION-VI FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES	12 OF 14	5.00.00	Guaranteed power consumption of conveyors and associated equipments (vibrating screen, crushers, belt feeders, paddle feeders) of a single stream for limestone and gypsum handling at rated capacities.	We shall consider duty factor as 1 for LHP & GHP as the same has not been mentioned in tender document for LHP & GHP.	Refer amendment in this regard.																

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	Section / Part / Chapter			Clause No.	Page No.																																
467	-			-	-	-	For equipments with 50% duty requirement (if applicable) the guaranteed capacity shall be the rated capacity. Kindly confirm.	Please note that the statement is not applicable for the package.																													
468	SECTION-VI, PART-A			SUB-SECTION-VII	12 OF 38	2.00.00	<table><tr><td>(ii)</td><td>Compressor</td><td>8</td><td>Nos.</td></tr><tr><td>(iii)</td><td>Air filter element</td><td>8</td><td>Nos.</td></tr><tr><td>(iv)</td><td>Oil filter</td><td>6</td><td>Nos.</td></tr><tr><td>(v)</td><td>Discharge Check Valve</td><td>3</td><td>Nos.</td></tr><tr><td>(vi)</td><td>Oil Pump Parts (including distance ring, eccentric rings, Pump element, Pin, Key, O-Rings) as applicable</td><td>2</td><td>Sets</td></tr><tr><td>(vii)</td><td>Inlet Valve Assembly</td><td>2</td><td>Nos.</td></tr><tr><td>(viii)</td><td>Electronic regulator</td><td>3</td><td>Nos.</td></tr></table>	(ii)	Compressor	8	Nos.	(iii)	Air filter element	8	Nos.	(iv)	Oil filter	6	Nos.	(v)	Discharge Check Valve	3	Nos.	(vi)	Oil Pump Parts (including distance ring, eccentric rings, Pump element, Pin, Key, O-Rings) as applicable	2	Sets	(vii)	Inlet Valve Assembly	2	Nos.	(viii)	Electronic regulator	3	Nos.	Requirement of mandatory spare - "Compressor" is for the dust extraction system for limestone. Kindly confirm.	Refer amendment in this regard.
		(ii)	Compressor	8				Nos.																													
(iii)	Air filter element	8	Nos.																																		
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		MANDATORY	SPARES																																		
469	SECTION-VI, PART-A			SUB SECTION-III-A2	6 OF 7	2.01.27	Service water, cooling water and potable water system for complete limestone handling plant including Pumps ,drives, sumps, piping etc and all mechanical, electrical and civil works.	We shall be taking portable water & service water tapping from nearest resource and hence shall not be considering any separate pumping station for LHP & GHP. Kindly confirm that the same is acceptable.	Portable water and service water shall be provided by employer at one point as defined in Terminal Points & Exclusions. Further distribution for LHP & GHP is in bidders scope.All pumps and pipes shall be provided by bidder if required.																												
470	4410-000-2-POM-A-002			Limestone Flow Diagram	-	-	-	As per the scheme shown we understand that each fixed tripper i.e. conv. 5A/5B shall feed to both the silo. Kindly confirm. 	Refer amendment in this regard.																												
471	4410-000-2-POM-A-002			Limestone Flow Diagram	-	-	Rack & Pinion Elevator - Quantity 2 nos., Capacity 1 T each	As per our scheme requirement of only 1 rack & pinion elevator in crusher house shall be sufficient. Kindly confirm whether elevator is envisaged for any other location.	Refer amendment in this regard.																												

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	Section / Part / Chapter			Clause No.	Page No.				
472	VI –PART-B			IV-D	8 OF114	3.07.00	The Gypsum storage shed shall be RCC framed structure with structural steel work shed with permanently colour coated profiled steel sheet roof and side cladding, grade slab and RCC foundations etc. Roof shall be provided with troughed profile permanently colour coated sheet with adequate slope for quick drainage of rain water.	We understand that gypsum storage shed proposed to be constructed is of steel structure and not of RCC frame work .Kindly confirm.	Bidder to refer separate amendment in this regard
473	VI –PART-B			IV-D	8 OF114	3.07.00	Gypsum storage shed.	We understand the hollow (tubular) section can be used for the construction of gypsum shed. Please confirm.	No Tubular sections are al-lowed for construction of gypsum shed.
474	VI-PART-A			III-A2	7 of 7	3.01.00(d)	Two numbers (02) motorized travelling tripper on conveyors 6A/B for feeding the gypsum to the storage shed	We understand that intermediate supporting trestles can be provided for the support of motorized travelling trippers inside the gypsum shed. Please confirm	Confirmed, supporting trestles are in bidders scope.
475	VI-PART-A			III-A2	3 OF7	2.01.00(b)	Two number bulk receiving units for ROM Limestone of size (-)250 mm each rated for 75TPH along with access ramp -----	Please furnish the permissible longitudinal slope to be adopted for the construction of approach ramp.	Shall be finalised with successful bidder during detail engineering.
476	VI-PART-A			III-A2	4OF7	2.01.14	Two (2) numbers motorized travelling trippers each of 150TPH rated capacity on-----	We understand that intermediate supporting trestles can be provided for the support of motorized travelling trippers inside the lime	Confirmed, supporting trestles are in bidders scope.
477	VI-PART-A			III-A2	5OF7	2.01.16	One number of covered storage shed for crushed limestone storage hopper including civil, structural, architectural & electrical works.	Please furnish the construction details for the lime stone shed.	Shall be finalised with successful bidder during detail engineering.
478	VI-PART-A			III-A2	5OF7	2.01.16	One number of covered storage shed for crushed limestone storage hopper including civil, structural, architectural & electrical works.	We understand that hollow (tubular) section can be used for the construction of lime stone shed. Please confirm.	Bidders understaning is not correct. Bidder to comply with the specification requirement. Bidder is requested to read the specification in totality.
479	VI –PART-B			Annexure-c	77 OF114	3.07.00	Onus of correct assessment/ interpretation and understanding of the existing subsoil condition / data is on the Bidder. The natural ground reduced levels (RLs) of FGD Area as per topographical survey drawing varies from RL 459.0m to 461.6m-----	Please furnish the topographical survey drawing for the proposed lime stone and gypsum handling area.	Specification requirement is clear in this regard.
480	VI –PART-B			IV-D	32 OF114	14.00.00	The invert levels of the drains shall be decided in such a way that the water can easily be discharged to the natural water bodies above the high flood.	Please furnish HFL (highest flood level) of plant.	The plant finished ground level is above HFL. Bidder has to connect the drains to Main Plant drain .

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
481	VI/A (1)			III-C	82 of 94	2.01.00 (c)	However, for vibration measurements and protection minimum 2 number (X and Y direction) sensors per bearing shall be provided.	Kindly confirm whether Vibration Monitoring System (VMS) is in the scope of this project? If yes, kindly provide the Detailed specification for VMS.	Bidder's understanding is not correct. Vibration transmitters shall be considered for vibration monitoring of all critical HT drives in Bidder's scope & same shall be hardwired to FGD PLC system. However, bidder to refer Clause 1.02.07, sub section I-M2, PART B and Clause 2.01.11, sub section III-A2, PART-A of technical specification wherein Vibration Monitoring System is envisaged for each mill and crusher. Bidder to comply with the specification requirement. For detailed specification of VMS refer amendment.
482	VI/A (1)			III-C	84 of 94	2.06.01	Contractor shall depute Technical Experts of the OAM /OEM/OES/ (Original Analyzer Manufacturer/Original Equipment Manufacturer/Original Equipment supplier) for each of the above system at Site, who will be fully qualified to perform the required duties, supervision of maintenance, repair etc. for a period of six month	We presume that the CEMS Equipment supplier (OAM/OEM/OES/System integrator etc.) is eligible for delivering the services of Comprehensive AMC (CAMC). Kindly confirm.	Bidder's understanding is correct. However, as envisaged in the specification clause 2.06.01, technical expert of Original Analyser Manufacturer/Original Equipment Manufacturer/Original Equipment supplier, fully qualified to perform the required du-ties, supervision of maintenance, repair etc. for supplied systems, shall be deputed to site for de-livering the services of Comprehensive AMC (CAMC).
483	VI/A (1)				87 of 94	6.05.00	The minimum quantity per unit of furniture envisaged in FGD control room is as mentioned below:	As per the description given in the specification, there is only one FGD Control room common for all the Units.	Bidder's understanding is not correct. Bidder to supply minimum quantity of furniture as mentioned in the specification on per generating unit basis. For example: In case of North Karanpura (3x660MW) project, the quantity of furniture to be supplied shall be thrice of the furniture quantity that is mentioned under clause 6.05.00 a) to e), Part-A, Sub Section III-C of the specification. Bidder to comply with the specification.
								We presume the quantity of furniture indicated in this clause is common for all the Units.	
				III-C		Drawing No. 0000-151-POI-A-013	Standard Configuration Diagram for PLC based Offsite Control systems	Kindly clarify and confirm.	
	VI/E (2)			C (Control & Instrumentation					
					1 of 40				

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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484	VII/A (1)			III-C	86 of 94	6.03.00	For each equipment/drives/pumps where Local Operation is envisaged in addition to control system as mentioned in respective Mechanical Sections, Bidder to consider Local Push button station comprising following: We understand no separate hardwired back up consoles are required in FGD control room. The entire operation in FGD control room shall be through DCS/HMI.	Bidder's understanding is correct. However, bidder to refer the relevant clauses of specification where equip-ment/drives/pumps for which Local Operation is envisaged has been men-tioned. Bidder to provide local push button stations accordingly.
							Kindly confirm.	
485	VII/A (1)			III-C	88 of 94	9.01.00	Hardwired Signal exchange: Hardwired signal exchange between BOP DDCMIS (under Employer's scope) and FGD PLC (under Contractor's scope) like bypass damper status, inlet and outlet gates status, ID Fans status, ESPs status, Boiler Load Index (BLI), MFT etc. shall be provided on as required basis, for implementation of protections and interlocks. Contractor shall provide Remote Input Output (RIO) for PLC per unit, placed in Central Equipment Room (CER) for the same. However, contractor to consider IOs and cables for minimum number of hardwired signal exchange per unit as follows DI – 80, DO – 80, AI – 20 and AO – 20. NTPC shall provide 2 (Two) nos. of 24V DC power supply feeders in CER for powering RIO panel. Kindly provide the Tentative route length distance between the following: (i) RIO Panel and employer DCS. (ii) RIO Panel and 24 V DC feeder (Customer provided) (iii) FGD RIO Panel & FGD Control room for all the projects. Also modification and changes required at the Customer's DCS end/station LAN for FGD interface is also not in the scope of the Bidder. Kindly confirm.	It is clarified that i) RIO panel and employ-er's DCS are placed at the same location i.e. Central Equipment Room (CER). Tentative route length between RIO panel (Placed in CER) and em-ployer's DCS shall be 200 meters approximately for all projects. ii) Tentative route length between RIO panel (Placed in CER) and 24 V DC feeder (NTPC scope) shall be 200 meters approxi-mately for all projects. iii) For route length be-tween FGD RIO panel (placed in CER) and FGD control room, bidder to refer clause 9.03.00, PART-A, Sub Section III-C, wherein it is mentioned that "Bidder to visit site to estimate the distance be-tween FGD control room and Employer's CCR/CER". Other FGD RIO panel loca-tion shall be finalized dur-ing detailed engineering
486	VII/A (2)			VII	57 of 69	1.07.03	MANDATORY SPARES: 5.00.00 CONTROL AND INSTRUMENTATION 1.07.00 PLC CONTROLS SYSTEM 1.07.03 CENTRAL PROCESSOR UNIT:	Kindly clarify what is Central processing Unit, does it mean the controller module of the DCS system? Kindly confirm.
								Bidder's understanding is correct.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
487	VI/B (3)			III-C1	5 of 98	3.04.00	Bidder shall be required to ensure supply of spare parts	Normally Electronic cards/module phased out in 8-10 years due to continuous up-gradation in technology, hence we request Customer to suitably modify the given clause as given below: With reference to clause 3.04.00, Part-B, Sub Section III-C1 of technical specification, it is clarified that lifetime of the plant is envisaged as 15 years for which bidder shall ensure supply of the spare parts. Bidder to comply with the specification.
							for lifetime of the plant. In case, the Bidder feels that certain equipment/component is likely to become obsolete, the Bidder shall clearly bring out the same in his Bid and indicate steps proposed to deal with such obsolescence.	
							"Bidder shall ensure availability of Spares for 10 years. Beyond this period, in case of phasing out of production of spares parts, a notice of 12 months in advance regarding this shall be provided to Owner in order to enable them to order & stock bulk requirement of spares.	
488	VI/B (3)			III-C4	51 of 98	5.00.00	Marshalling/Termination system cabinets	Customer is requested to consider Cable termination at marshalling cabinet or any other equivalent methodology being followed by the manufacturer for several projects in the past may also be permitted to be adopted in this project. Bidder's proposal is not acceptable. Bidder to comply with the specification.
							Kindly confirm.	
							Notes:	
							4. For connection between field JB and DDCMIS marshalling cabinet	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
489			III-C5	57 of 98	PLC BASED CONTROL SYSTEM		Bidder's in-house manufactured DCS which is field proven in power plants gives the Customer following advantages:	It is clarified that in addition to the specification requirements, bidder's proposal is also acceptable subject to: i) Proposed DCS based control system for FGD fully meets functional requirements as mentioned in the specification. ii) Proposed DCS based control system for FGD is as per bidder's standard and proven practice. iii) The DCS based control system shall be reviewed and approved by employer during detailed engineering.
	VI/B (3)						(i) Better immunity to noise.	
						PLC BASED CONTROL SYSTEM	(ii) Scalable and Flexible system	
							(iii) Comprehensive Diagnostics	
							(iv) Centralised alarms, events and historian	
							(v) Faster inter communication	
							(vi) Unified Information Management,	
							(vii) Common engineering platform & Unified diagnostics,	
							(viii) Single family hardware solution,	
							Reduction of hardwired interface or soft links,	
							(ix) Ergonomic and user friendly man-machine interface.	
			III-C5	58 of 98	1.04.00		(x) Effective spares and inventory management.	
	VI-B (3)						(xi) Better response time.	
							(xii) Single window for future expansion.	
							(xiii) Better Spares Management & Inventory reduction. etc.	
490							(xiv) Supports renovation and modernization.	Bidder's proposal is acceptable in view of bidder's proposal to supply DCS based control system for FGD.
							Hence Customer is requested to accept DCS based controls also for FGD.	
						Contractor shall provide independent control systems for safe, efficient and reliable operation of each of the plant auxiliary systems.		
	VI/B (3)		III-C5	60 of 98	2.03.00	All dynamic memories shall be provided with buffer battery back up which shall be for at least 360 hours. The batteries shall be lithium or Ni-Cd type.	Bidder's in-house manufactured DCS has Flash EPROM for non-volatile configuration which does not require battery backup.	
							Customer is requested to consider this option.	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
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491	VI/B (3)			III-C6	86 of 98	1.01.01 (a)	Out of the tests listed, the Bidder/sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.	As per the list given at clause no. 3.00.00 TYPE TEST REQUIREMENT FOR C&I SYSTEMS, there are no type tests mentioned to be specifically conducted for this contract under column 5. Kindly confirm that type test need not to be conducted specifically for this project and type test certificates are sufficient for each item to be supplied in this project.	Bidder's understanding is correct. Bidder to further refer clause 1.01.01 b), PART-B, Sub Section III-C6 wherein the acceptance criteria for type test certificates has been men-tioned. Bidder to comply with the above mentioned clause while submitting the type test certificates for NTPC approval.
492	SEC VI / PART B			I M1	6 OF 49	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Bidder understands that cladding can be done with explosion bonding or hot rolling or combination of both to achieve the required quality as per ASTM B 898-11.	Bidder shall provide the proposed cladding methods as per the NTPC approved fabrication procedures, test and Quality plan such that it meets the plant operation requirements.
							Please confirm.		
493	SEC VI / PART B			IV D	39 OF 114	20.00.00	Electrodes	Please provide the detail/type of electrodes to be used in welding of titanium/C276.	Type of Electrode will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
494	SEC VI / PART B			IV D	39 OF 114	20.07.00	Edge Preparation for Welding	Please provide edge preparation detail for titanium/C276 material.	Edge preparation detail will be as per Qualified WPS. This qualified WPS needs to be submitted for NTPC approval.
495	SEC VI / PART B			I M1	6 OF 49	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Please provide the material code to be followed for alloy C-276.	Specification requirement is clear in this regards. Bidder shall comply the specification requirements.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
496	SEC VI / PART B			I M1	6 OF 49	3.02.07	The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11.	Kindly furnish the following specifications for chimney liners.
								1. Permissible tolerances on thickness of clad sheet and base material.
								2. Permissible tolerances on flatness for clad sheet and base material.
								3. Specify the quality tests which will be conducted on the clad sheet for assessing mechanical and chemical properties and on the chimney cans after fabrication.
								4. Indicate any special requirements applicable for welding and fabrication of chimney at site.
								5. Indicate any restriction in size of base metal and clad plate to be used for fabrication of flue cans.
								6. Mention tensile and yield strength of the clad material to be achieved.
497	SEC VI / PART B			IV D	2 OF 114	2.03.00	Bidder or its agency should have in the past built at least one (1) Reinforced concrete chimney of minimum 100m height.	Bidder understands that, there is no other prequalification requirements related to fabrication and erection of titanium/ c276 clad steel flue liner in chimney.
								Please confirm.

Specification requirement is clear in this regards. Bidder shall comply the specification requirements.

Bidders understanding is correct.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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498	VI/B			IV-D	31 of 114	14.00.00	Storm water drain shall be designed taking into account the finished ground levels of the plant area, drainage pattern, intensity of rainfall, etc. with a return period of 50 years. These values shall be based on rainfall intensity of 90mm/hr.	The referred clauses are contradictory. Kindly clarify the rainfall intensity to be considered for designing the plant storm water drain.	The value of minimum rainfall intensity shall be taken as 75 mm/hr. Refer amendment issued separately.
	VI/B			IV-D	41 of 114	21.00.00	The plant storm water drainage shall be designed taking into account the finished grade levels of the plant area, drainage pattern, intensity of rainfall, etc., The storm water drainage shall cater to storm water run off resulting from one hour rainfall intensity, with a return period of 50 years. The value of minimum rainfall intensity shall be taken as 75mm/hr.		
499	VI/B			IV-D	24 of 114	7.00.00	In case Bidder opts for steel super-structure with RCC floors/ roof, the bidder shall necessarily use Troughed permanently colour coated metal decking sheets having minimum thickness of 0.8mm as permanent shuttering...	In case Bidder opts for steel super-structure with RCC floors/roof, kindly specify the cladding system to be adopted (Brick Cladding / Metal Sheet Cladding).	Type of cladding system if not specified in the technical Specification shall be decided by the bidder considering the functional requirement, schedule of construction and site constraints (if any).
500	VI/B			IV-D	25 of 114	7.00.00	Passages shall be provided inside the FGD block connecting to the outer periphery road to have access to the various facilities/buildings...	(1) Within the FGD blocks, kindly specify whether the balance area (i.e. area excluding various facilities/buildings, passage areas, plinth protection to facility buildings, additional paving of 5m width all around the tank foundations and other facility buildings beyond the extent of plinth protection, etc.) is to be paved or left unpaved.	Extent and type of paving in FGD block shall be in accordance with Technical specification. However, any functional requirement of paving for FGD facilities not specifically mentioned in technical specification is also in the scope of bidder.
							All facility buildings shall be provided with 750 mm wide plinth protection all around...		
							An area of minimum 5 m width all around the tank foundations and other facility buildings shall be paved. This paving shall be beyond the extent of plinth protection...		
501	VI/B			IV-D	25 of 114	7.00.00	The paving shall be provided with slope of 1:500 to dispose the surface water/wash water to the nearest drain.	(2) In case paving is required for the balance area, kindly specify the type of paving (Normal Duty paving/Heavy Duty paving) to be adopted.	

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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502	VI/B			IV-D	19 of 114	4.02.00	Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be less than 400 gms/sq.m. as per IS:6745.	The referred clauses are contradictory. Kindly clarify the weight of zinc coating to be considered for galvanising.	Specification requirement is clear in this regard. However Zinc coating referred in Clause No. 4.02.00 is applicable for galvanized MS pipes rain water downcomer only. For all structural steel members galvanisation shall be as per clause No. 26.00.00 unless noted otherwise.
	VI/B			IV-D	45 of 114	26.00.00	The weight of the zinc coating shall be at least 610 Gms. / m ² unless noted otherwise.		
503	SEC-VI/PART-B			IV-D	77 OF 114	1.01.0	However, site levelling in Hopper, Crusher House, Lime & Gypsum storage area etc. shall be done under this package and as per Topographical survey drawing existing ground levels are varying from 461.9m to 465.6m and FGL to be achieved in this area shall be as indicated in GLP. Bidder...	Finished ground level (FGL) indicated in GLP (drawing no 4410-999-POC-F-001, titled "Layout plan for FGD system" is tentative only. Bidder can decide the suitable FGL by optimizing the earthwork during detailed engineering. Please confirm.	FGL indicated in the GLP is final. Bidder to comply with the specification requirement.

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FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)

Bidding Document No.: CS-4410-109-2

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CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
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506	SECTION- VI/PART E & Drg No. 4410-109-POE-J-001			----	---	GENERAL NOTE NO 6	NO OF MOTORS/FEEDERS SHOWN IN THE SLD IN TYPICAL AND FEEDING ARRANGEMENT SHOWN AT VARIOUS LOAD CENTRE IS INDICATIVE IN NATURE SHOWING THE FUNCTIONAL REQUIREMENT.	1. Customer to confirm that all the 11 KV motors required in this tender shall be fed from customer switchboards as shown in the tender drawing. only 3.3 KV motor shall be fed from FGD switchboard.	1.Bidder to refer Electrical Single Line Diagram for FGD Package (Drg.no.4410-109-POE-J-001- Rev A). Maximum one motor from each unit board shall be fed from owners 11kV Unit switchgear. 2. Bidder may refer to clause no 2.00.00 of chapter E1 for sizing cri-teria of respective equipment.
							HT/LT SWITCHGEAR: Feeding arrangement	2. Since 11KV FGD switchgear is fed from 3 I/C of 16 MVA rating each as per the key diagram, Customer to confirm the rating of 11 kv FGD switchgear. Customer to also inform the operational philosophy of these 3 I/C & 2 B/C. Customer shall clarify the sizing criteria of 11/3.45KV FGD transformer as the transformer can feed the entire switchboard through B/C.	
507	SECTION- VI/ PART A			III-B	03 OF 6	1.09.00	Lighting Masts	Number of Lighting Masts is not specified in the specification. Please confirm the minimum number.	The same shall be decid-ed during detailed engineering
508	SECTION- VI /PART B			II-E16	01 OF 14	1.00.00 & 9.00.00	DC health monitoring system shall be offered integral with each battery set for Main Plant & Switchyard batteries.	DC health monitoring system is excluded from bidder's scope of supply for 220V DC Battery for FGD area.	Bidders' understanding is correct.
			11 of 14						
509	SECTION- VI /PART C				74 OF 82		PA SYSTEM	There is no specification for PA system in detailed technical specification Part A & B- Electrical. However, in Part C the reference standards only are mentioned. Please confirm whether PA system is to be considered a part of FGD or not. If to be considered, please provide the detailed specification for the same.	PA system is not in the scope of the contractor.
510	VI/A			III-A1 FGD	8 OF 8	17.00.00	Contractor shall provide separate air receivers of adequate capacity for meeting the instrument and service air requirements.	Customer is requested to provide the quantity and capacity of IA / SA air receiver.	Specification requirement is clear in this regard. Bidder to comply the specification requirement.
							Bidder has considered one 2 M3 of air receiver for complete station for Instrument air & Service air application each.		
							In case higher pressure/flow requirements are envisaged for instrument & service air Contractor shall make its own arrangement	1.) Customer to inform the maximum Flow & Pressure that shall be available from customer existing system. Please provide existing P&ID and sizing of air compressor.	

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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							Bidder understands that IA / SA requirement for FGD shall be provided from customer existing system. Hence Bidder has not considered standalone compressed air system for FGD.	Bidder to note that piping header is available at C row (running along CD bay rack). Exact location will be finalized during detail engineering. Pressure available is approx 5-7 kg/cm2.
							2.) Customer to inform the T.P details for IA/SA for further distribution for FGD purpose.	
	SEC VI, PART-B			I-M1	33 OF 49	14.09.00	Contractor shall provide motorized hoists and trolleys for all items requiring maintenance and weighing 500 kg or more.	Referred clauses are contradictory w.r.t selection of electric or manual hoist. We shall follow clause 2.02.12 of sub-section V/Section VI Part A for selection of electric or manual hoist.
							Items weighing more than 50 kg and required to be replaced for maintenance shall be provided with manual hoists/trolleys with runway beams/supporting structure etc.	
								Bidder to comply with the specification requirement. The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.	Page No.				
511	SEC VI, PART-B			I-M2	25 OF 112	1.02.00	For the hoists with more than 2.0 tonne lifting capacity or more than 10.0 m lift with the exception of hoists for GTU & bend pulleys motor operated hoist blocks for both long travel & lift shall be provided.	Kindly confirm.	
	Section-VI, PART-B			I-M2	5 OF 112	2.02.12	Hoists	The referred clauses of technical specifications are very clear and pertains to the requirements of Limestone Handling System & Gypsum Handling System and shall be read independent of the hoist requirement brought out in Sub-section I-M1, Section VI, Part-B.	
							Drive		
							(i) More than 2.0 tonne or more than 10.0 m lift or hoists coming out-side the buildings		
			(ii) Other hoists including the hoists for handling take-up pulley and take-up weight	Motor driven for both travel & lift.					
							Manual for both travel & lift.		
512	Section-VI, PART-B			I-M1	33 OF 49	14.09.00	Access ladders with suitable platform shall also be provided for approach to all motorized hoists/trolleys mounted on their runway beams for the maintenance of hoists/trolleys.		
							Considering the layout & space constraints, it may not be feasible to provide all electric hoists with maintenance / repair platforms with handrails. Hence maintenance platform shall be provided depending upon feasibility.	Specification requirement is clear in this regards. Bidder shall comply the specification requirements.	
513	Section-VI, PART-A			Sub-Section-VII	11 OF 38	H	Mandatory Spares of Limestone & Gypsum Handling:	1) Mandatory spares of Electric hoists have been mentioned under the referred clause/ area only.	Bidder shall comply with the specification requirements given under the clauses referring to the equipment under the sub section VII.
							ELECTRIC HOISTS	Kindly clarify whether Mandatory spares are to be considered for Electric Hoists in area, other than specified in referred clause. In case the same has to be considered, then kindly inform about applicable list of mandatory spares to be followed.	
							2) Further, no spares are mentioned for chain pulley blocks. We understand that no spares shall be provided for chain pulley blocks (if applicable). Please confirm.		
514	Section-VI, PART-B			I-M2	26 OF 112	1.02.00 (d)	Festoon arrangement of feeding power to trolley assembly.	We propose to provide DSL type current feeding arrangement instead of festoon arrangement, as better hook approach can be achieved in case of DSL. Please accept.	DSL type current feeding arrangement is also acceptable.
	Section-VI (TS)					Two (2) limestone slurry tanks, each tank sized to meet 12 hrs total limestone slurry	Please clarify the capacity of storage tank.	Specification requirement is clear with regard to	

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.			
515	Part-A			3.01.04	3 of 8	storage requirement for <u>two units</u> at Design point,	Capacity of Slurry storage requirement shall be for all units
	Sub-Section-III-A1						
	Flue Gas Desulphurisation System						
516	Section-VI (TS)			5.01.00	4 of 8	The employer envisages a common gypsum dewatering system for the two (2) units.	Please clarify the capacity of storage tank. Capacity of Slurry storage requirement shall be for all units
	Part-A						
	Sub-Section-III-A1						
	Flue Gas Desulphurisation System						
517	Section-VI (TS)			28.00.01	8 of 8	Wet stack of 150 metre height shall be provided with a stack condensate collection system to avoid the carryover of the condensate/acidic dews/water droplets/Gypsum coming out of the stack.	Bidder understands that the end point of Stack is 150m far from ground. Please clarify the meaning of 150 metre height.
	Part-A						
	Sub-Section-III-A1						
	Flue Gas Desulphurisation System						
518	Section-VI (TS)			18.00.05	8 of 8	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc.	Bidder would like to apply external piping from wet stack to absorber reaction tank in order to drain the condensate without storage/neutralizing tank. Bidder have experience applying to previous project.
	Part-A						
	Sub-Section-III-A1						
	Flue Gas Desulphurisation System						
519	Section-VI (TS)			18.00.06	8 of 8	Stack outlet liquid collector shall be designed in such a way so that the liquid condensate film near the exit of the stack is collected instead of carrying with the exit gas. Bidders shall provide all these details in its bid.	Liquid collector design only can be finalized after carry out the physical model by design agency. Therefore, detail design data shall be provided in detail design stage.
	Part-A						
	Sub-Section-III-A1						
	Flue Gas Desulphurisation System						

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter			Clause No.				Page No.
520	Section-VI (TS)			18.00.05	8 of 8	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided.	Please clarify that the word "Both" means "All" the stack	Refer Amendment to technical specification in this regard.
	Part-A							
	Sub-Section-III-A1							
	Flue Gas Desulphurisation System							
521	Section-VI (TS)			1.00.00(g)	1 of 5	Air Conditioning System: Contractor shall provide microprocessor/PLC/GIU based control system for control and monitoring of air conditioning system as per manufacturer's standard practice.	Please clarify whether common microprocessor/PLC/GIU based control system for control and monitoring can be provided for both air conditioning and ventilation system.	Common microprocessor/PLC/GIU based control system for control and monitoring for both air conditioning and ventilation system can be provided. Control and monitoring of air conditioning and ventilation system from FGD control system is also acceptable.
	Part-A			2.00.00(g)	2 of 5	Ventilation System: Contractor shall provide microprocessor/PLC/GIU based control system for control and monitoring of ventilation system		
	Sub-section-III-A3							
	Plant Utilities							
522	Section-VI (TS)			1.00.00, 1.5 b&c	4 of 5	b) All Conveyors and Cable Galleries shall be provided with Linear Heat Sensing Cable detectors.	Please clarify the type of detector to be used in cable galleries i.e. Linear Heat Sensing Cable detector and /or Multisensor type detectors.	Bidder has wrongly mentioned the clause reference no. However, bidder to refer cl. No. 4.00.00 {1.5-(b) &(C) }. " All conveyor and cable galleries shall be provided with Linear Heat Sensing Cable detector and All cable galleries shall also be provided with Multisensor type detector."
	Part-A					c) All cable galleries shall be provided with Multisensor type detectors.	Also please clarify above requirement for the conveyor area related to cable rack.	
	Sub-section-III-A3							
	Plant Utilities							
523	Section-VI (TS)			1.00.00.1.4	4 of 5	Five numbers each type of Portable fire extinguishers consisting of water type, dry chemical powder type, CO2 type shall be provided in various facilities of FGD system.	Bidder understands that, "Five nos. each types" means 5 nos. CO2 type, 5 nos. DCP Type, 5 nos. water type to be provided in areas or to be distributed as per TAC's norms.	Bidder has wrongly mentioned the clause reference no. However, Bidder to refer relevant amendment.
	Part-A						Please confirm.	
	Sub-section-III-A3							
	Fire Fighting System							

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION	
	Section / Part / Chapter		Clause No.	Page No.				
524	Section-VI (TS)			1.07.00	2 of 6	DG set (if applicable)	Please clarify whether the main power plant DG set spare capacity is available for FGD system emergency loads. If spare capacity is available in the main DG set, please indicate the available capacity for FGD system.	No emergency load of FGD area is envisaged in main plant DG. Please refer drg No 4410-109-POE-J-001. All emergency FGD load is to be fed from FGD emergency MCC and DG set under bidders scope. No interconnection with main plant DG shall be permitted.
	Part-A							
	Sub section-III-B							
	Electrical System/ Equipment							
525	Section-VI (TS)			1.08.00	2 of 6	Contractor shall provide cable trays and their accessories with support arrangements, trestle, trenches, duct bank etc. as required for the cables under his scope of supply for the complete system. <u>However the Cable tray, supports and tray earthing for contractor cables on employer cable vault shall be supplied by employer.</u>	The Cable tray, supports and tray earthing for contractor cables on employer cable <u>trestle</u> shall be supplied by employer also. (Not limited to employer cable vault). Please confirm.	Bidder's understanding is NOT correct. Bidder to provide cable tray and its supports for his scope of cable on employer trestle. In case of non availability of space in employers trestle, bidder to make necessary arrangements for cable tray erection and laying. Refer clause no:- 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant.
	Part-A							
	Sub-section-III B							
	Electrical System/Equipment							
526	Section-VI (TS)			1.10.00	4 of 6	Complete below ground earth mat and above ground equipment earthing system and lightning protection for the plant and equipment under contractors scope along with its interconnection to the nearest employers earth grid at two points.	Existing earth grid plan drawing nearby FGD and ESP area required for bidder's bidding design. Please provide.	The same shall be provided during detailed engg. However bidder may visit the project in order to get itself acquainted with existing electrical of plant.
	Part-A							
	Sub-section-III B							
	Electrical System/Equipment							
527	Section-VI (TS)			3.02.00	6 of 49	The duct from Absorber outlet to wet stack inlet shall be made of clad sheet of minimum 2mm thickness of either Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8mm thick mild steel base metal.	Please confirm whether alternative material such as Borosilicate block / Acid brick / Fiber Glass Reinforced Plastic can be used in place of Titanium or C-276 alloy.	Specification requirement is clear in this regard. Bidders to comply the specification requirement.
	Part-B							
	Sub-section-I-M1							
	Flue Gas Desulphurisation							
528	Section-VI (TS)			3.01.00	5 of 49	1. Design internal pressure at 67% yield strength (mm wc): +660 and -150 mmwc or maximum conceivable head of Booster fan (if provided), whichever is higher	There is a different requirement for design pressure.	Refer Necessary amendment in this regard.
	Part-B						Therefore, please clarify whether +660 and -150mmwc or +660 and -660mmwc.	
	Sub-Section-I-M1					Duct Design Pressure : All flue gas ducts shall also be designed for ± 660 mm w.g., or maximum conceivable pressure of the relevant fans, whichever is higher at 67% of yield		
	Flue Gas Desulphurisation System							
				16.01.03	37 of 49			

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Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter								
529	Section-VI (TS)			15.01.00	34 of 49	(ii) Design/Construction/Installation Codes Latest addition of IS:14665(all parts) and also meeting any additional requirements of IS:4666, IS:1860 and IS:3534	IS: 14665(all parts) supersedes IS: 4666, IS: 1860 and IS: 3534. Hence we will refer only IS: 14665(all parts).	Specification requirement is clear in this regard. Bidders to comply the specification requirement.	
	Part-B						Please confirm		
	Sub-section-I-M1								
	Flue Gas Desulphurisation System								
530	Section-VI (TS)			15.06.00	36 of 49	Provide Special corrosion resistant treatment on all elevator components. The protective treatment shall be subject to Employer's Approval.	Please clarify the type of corrosion resistant treatment to be provided over the elevator components room if there is any specific requirement as such.	Same will be discussed with the successful bidder during the detail engg. Stage.	
	Part-B								
	Sub-section-I-M1								
	Flue Gas Desulphurisation System								
531	Section-VI			3.01.00	1 of 26	Unitary Air Filtration (UAF) units of min. capacity 75,000 m3/hr. or capacity calculated considering 8 air changes per hour whichever is higher, shall be provided for Non-Air Conditioned areas of FGD and ZLD (as provided) control building (e.g. Switch gear rooms, cable galleries, etc.) MCCs and Switchgear room etc. Supply air fan Back draft dampers	In clause no. 3.01.00 it is mentioned that UAF type ventilation should be provided for Switch gear rooms.	Bidder has wrongly mentioned the clause reference no. However, Bidder to refer relevant amendment.	
	Part-B			3.02.00			However in clause 3.02.00 a table is provided wherein it is mentioned to provide supply air fan and back draft dampers for MCCs and Switch gear room. Please confirm the type of ventilation to be used.		
	Sub-section-I-M3								
	Air Conditioning and Ventilation System								
532	Section-VI (TS)			5.15.00. Note-3,	13 of 18,	Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire	As Inert gas system is not specified in scope of work in FGD area, the Bidder does not need consider inert gas system. Please confirm.	Bidder's understanding is correct. Amendment will be issued in this regard.	
	Part-B					Cross zoning of the signal from two adjacent multi sensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and...			
	Sub-section-I-M4								
	Fire Detection & Protection System								
				5.18.00.ii)					
					14 of 18				
533	Section-VI (TS)			7.06.00	16 of 18	Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam....	As foam system will not be required, water monitors also not required either. Please cofirm.	Bidder to refer relevant amendment.	
	Part-B								
	Sub-section-I-M4								
	Fire Detection & Protection System								

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION		
	Section / Part / Chapter			Clause No.				Page No.	
534	Section-VI (TS)			MDL	15 of 24	GA Drawing & Datasheet of 12T Hoist for Ball Mill Building	Capacity of Hoist/crane shall be as per equipment weights/specification and shall be provided during the bidding stage. Please confirm	Specification requirement is clear. Bidder shall comply with the specification requirements.	
	Part-B			387		GA & Datasheet of 25T Hoist			
	Sub-section-I-M7			388					
	MDL								
535	Section-VI (TS)			542	21 of 24	MQP for Chimney Elevator	Both Elevators are same. Please confirm.	Bidder understanding is correct.	
	Part-B			640	23 of 24	MQP of Elevator(Rack & Pinion)			
	Sub-section-I-M7 MDL								
536	Section-VI (TS)			2.03.00	4 of 7	For 415V system, busduct assemblies shall be used for incoming connection from transformers to the switchboard and interconnecting sections between switchboards wherever transformer rating is 1000KVA or above.	Bidder suggests Power Cable can also be applied for incoming connection from transformer to the LV SWGR board depend on result of calculation for load demand. Please confirm.	Technical Specification is amply clear and to be complied.	
	Part-B								
	Sub-section-II E1								
	General Electrical								
	Specification								
537	Section-VI (TS)			3.03.01	4 of 11	Bus support insulators shall be interchangeable, high creep, high strength and made of fine glazed solid porcelain manufactured by wet process or high strength cast resin insulators.	Bidder suggests FRP can also be applied for material of insulator and bushing. (FRP is normal practice in current industry for BUS Duct) Please confirm.	Bidder to comply Technical Specification	
	Part-B								
	Sub-section-II E3								
	Medium Voltage Bus Ducts								
538	Section-VI (TS)			2.14.04	4 of 6	All cables shall be armoured type if laid in CHP area or directly buried.	If cable doesn't laid in CHP area or directly buried, Bidder can use unarmoured Single & Multi core cables with cable tray & conduit. Please confirm	Bidder understanding is correct	
	Part-B								
	Sub-section-II E4								
	LT Power Cables								
539	Section-VI (TS)			2.14.02	3 of 6	cables shall be armoured type if laid in CHP area or directly buried.	Same with above.	Bidder understanding is correct	
	Part-B								
	Sub-section-II E5								
	LT Control Cables								

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	Section / Part / Chapter			Clause No.				Page No.
540	Section-VI (TS)			2.01 .04	2 of 69	No sub zero level cable vault/trenches shall be provided below control building/switchgear	Bidder understands "Main Plant" means TG & SG Area.	Bidder understanding is correct
	Part-B					rooms in main plant.	So, Sub zero level cable vault/trenches can be provided below control building/switchgear rooms in FGD system. Please confirm.	
	Sub-section-II E6							
	Cabling Earthing & Lightning Protection							
541	Section-VI (TS)			3.03.01	5 of 69	Pipes offered shall be complete with fittings and accessories	1. In case of applying Non-armoured Cable, Bidder shall use Flexible Conduit & Box connector for Equipment connection.	Bidder to comply with technical specification
	Part-B						2. In case of applying armoured Cable, Bidder shall use Cable gland instead of using flexible conduit (with Box connector) for Equipment connection.	
	Sub-section-II E6						Please confirm	
	Cabling Earthing & Lightning Protection							
542	Section-VI (TS)			3.02.05	5 of 69	Cable trenches shall be provided only in Switchgear/MCC rooms.	Same with above.	Bidder understanding is correct
	Part-B							
	Sub-section-II E6							
	Cabling Earthing & Lightning Protection							
543	Section-VI (TS)			2.16.04	4 of 6	All cables shall be armoured type if laid in CHP area or directly buried.	Same with above.	Bidder understanding is correct
	Part-B							
	Sub-section-II E7							
	HT Cables							
544	Section-VI (TS)			1.00.00	1 of 39	Motor Feeder: <u>KW Rating</u> / [System Vol* 1.732 * (Eff) *(Pf)] *1 .1 (at least)	Bidder understands <u>KW Rating</u> for Motor Feeder sizing is BHP(kW) value. (Not Name plate rating value for Motor.)	Bidders understanding is not correct. Feeder sizing shall be done as per motor name plate kw rating at 50 deg C
	Part-B							
	Sub-section-II E9						Please confirm.	
	HT Switchgear							

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	Section / Part / Chapter			Clause No.	Page No.		
545	Section-VI (TS)			1.04.00	2 of 58	Standardization	Bidder applies the unification for the LV SWGR within Bidder's scope of supply.
	Part-B					It shall be preferred to have all LV Switchboards for the entire plant from a single manufacturer from maintainability and spares management point of view.	
	Sub-section-II E10					It shall be preferred to follow a standardization of Terminal Numbers across all LV Modules for ease of Interconnection and maintenance.	
	LT Switchgear & LT Busduct					Please confirm.	
546	Section-VI (TS)			43.01.00	45 of 58	Bidder understands Protection for LV MCC Feeder Module as below. Please confirm.	Selection table of clause 43.01.00 to be referred
	Part-B					- Feeder rating 0 ~ 99Amp : Fuse Protection	
	Sub-section-II E10					- Feeder rating 100 ~ 400Amp : MCCB Protection	
	LT Switchgear & LT Busduct					- Feeder rating 400 ~ 1120Amp : ACB Protection	
547	Section-VI (TS)			43.02.00	45 of 58	Bidder understands Protection for Motor Module on LV MCC as below. Please	Selection table of clause 43.02.00 to be referred
	Part-B					- Motor rating 1.1 ~ 110 kW : Fuse Protection	
	Sub-section-II E10					- Motor rating 110 ~ 200 kW : ACB Protection	
	LT Switchgear & LT Busduct					(MCCB is not used for Motor Module)	
548	Section-VI (TS)			3.00.00 (i)	2 of 19	Fuel service tank 8 hours running	Bidder to provide 1 (one) day tank of 990 ltr fuel capacity along with FO loading and unloading system for each DG set
	Sub-section-II-E11			8.02.03	10 of 19	A day oil tank 990 litres fuel capacity shall be provided by Bidder	
	Diesel Generators						
549	Section-VI (TS)			5.03.00	3 of 19	Bidder understands that the DGPCC will be scope of employers.	The alternator outgoing supply of DG set shall be fed into FGD Emergency MCC which is under bidder's scope. Refer SLD and amendment
	Part-B						
	Sub-section-II-E11					Please confirm.	
	Diesel Generators						

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	Section / Part / Chapter								
550	Section-VI (TS)			6.01.01	4 of 19	All DG sets shall be controlled independently through separate control panel.	Please confirm that DG set shall be supplied to cover for all the units. (1W + 1S / 3units)	Min 1 (one) number of DG set common for entire FGD plant shall be provided by bidder for meeting emergency process loads envisaged for FGD plants. Refer tender SLD	
	Part-B								
	Sub-section-II-E11								
	Diesel Generators								
551	Section-VI (TS)			6.01.01	4 of 19	It shall also have auto initiation through command from remote from Owner's panel.	Our understanding is not clear in this regard, whether Bidder's have to remotely connect all the DG Sets with their FGD control system or it will be connected to main station DCS under NTPC scope of supply.	Bidders have to remotely connect all the DG Sets with their FGD control system. Refer amendment	
	Part-B						Please clarify.		
	Sub-section-II-E11								
	Diesel Generators								
552	Section-VI (TS)			7.00.00	6 of 19	Diesel Generator control panel	Bidder understands that any kind of grid synchronization and earth fault protection	Bidder to provide electrical protections as per technical specifications. Refer amendment	
	Part-B						Any earth fault protection is not considered.		
	Sub-section-II-E11						We considered only 1 master trip relay for common fault both electrical &		
	Diesel Generators						Please confirm.		
553	Section-VI (TS)			7.11.00	8 of 19	Suitable 4 to 20mA transducer with dual output shall be provided in control panel for voltmeter & frequency meter for Owner's use.	Our understanding is not clear in this regards. Please provide the requirement of these transducer in owner's panel.	Refer amendment	
	Part-B								
	Sub-section-II-E11								
	Diesel Generators								
554	Section-VI (TS)			7.12.00	8 of 19	The bidder is required to provide coupling relay (with diodes) having 24V DC energising coil in the control panel for the following for owner's use:	Our understanding is not clear in this regards. Please clarify why owner requires these relays at owner's panel.	Refer amendment	
	Part-B					DG start/Stop, DG voltage raise/lowered, DG speed raise/lower, DG auto start.			
	Sub-section-II-E11								
	Diesel Generators								

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	Section / Part / Chapter								
555	Section-VI (TS)			8.04.01	10 of 19	The radiators tubes shall be copper with sufficient heat transfer area.	As per manufacturer standard engine shall be provided with low carbon steel tubing and aluminium fins radiator core.	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B						Please confirm.		
	Sub-section-II-E11								
	Diesel Generators								
556	Section-VI (TS)			8.06.00(j)	11 of 19	Necessary foundation bolt and base channels for the engine, alternator, fuel service tank and for all other equipment include this packae.	As the DG set shall be supplied with specially designed AVM pad, foundation bolts is not applicable in LT (415 V) DG set. Please confirm if Bidder can proceed with above understanding.	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B								
	Sub-section-II-E11								
	Diesel Generators								
557	Section-VI (TS)			9.02.01	12 of 19	Voltage – 415V, Frequency – 50hz (+3 to -5%)	As per manufacture standard voltage variation shall be ±5% & frequency variation	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B						Please confirm.		
	Sub-section-II-E11								
	Diesel Generators								
558	Section-VI (TS)			12.01.03	18 of 19	Check of fuel consumption – A check of the fuel consumption shall be made throughout the load run test. The fuel consumption should not exceed the design values.	As regards the fuel consumption test, kindly note that due variation of DG load specific fuel measurement test cannot be conducted at site, same can be done by tentative method only or we shall however provide the internal test report of manufacturer for specific fuel consumption.	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B						Please confirm.		
	Sub-section-II-E11								
	Diesel Generators								
559	Section-VI (TS)			13.04.00	18 of 19	Function test on DG set complete with AVR and speed governor.	As AVR and governor being the part of engine and alternator control so no separate functional tests for the same can be done.	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B						Please confirm.		
	Sub-section-II-E11								
	Diesel Generators								

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Sl. No.	ENQUIRY SPECIFICATION				Clause No.	Page No.	SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter								
560	Section-VI (TS)			14.01.00 & 15.01.00	18 of 19 & 19 of 19	Vibration test is to be carried out at site.	Measurement of sound level and vibration test cannot be performed at site/works as there will other equipment vibrations. However the vibration shall be within the level of 250 micron and as per CPCB norms presently applicable with the acoustic enclosure reduction in the sound level shall be 25dBA.	Technical specifications are clear. Bidder to comply with technical specification requirements	
	Part-B					Noise level measurement shall be done generally following the guidelines given in in IS: 12065. The measurement shall be carried out with a calibrated integrating sound level meter as per IS: 9779. This test is to be carried out at site.	Please confirm.		
	Sub-section-II-E11								
	Diesel Generators								
561	Section-VI (TS)			1.01.00	1 of 30	OUTDOOR TRANSFORMER	Bidder suggests indoor service can also be applied for LV Transformer (11kV/0.4kV or 3.3kV/0.4kV) for this PJT.	Refer Amendment in this regard.	
	Part-B					Please confirm.			
	Sub-section-II E12								
	Outdoor Transformers								
562	Section-VI (TS)			1.01.00	1 of 2	All work shall be carried out as per the following standard/codes as applicable	Since IS 4722 is not applicable for traction equipment, it shall not be applicable for Elevator motor.	Bidders understanding is correct. Reference std. as applicable shall be followed in line with the specification	
	Part-B					IS:4722, IS:325	Please confirm.		
	Sub-section-II-E13								
	Elevator Electrical								

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	Section / Part / Chapter								
563	Section-VI (TS)			3.02.02	4 of 17	Emergency AC Lighting System	Bidder understands "Main Plant" means TG & SG Area. So, Emergency AC Lighting System is not applied for FGD Plant Area.	Emergency AC lighting system mentioned in areas as per technical specifications to be provided. Refer amendment.	
	Part-B					This system shall be provided for certain important areas in the main plant.	Please confirm.		
	Sub-section-II E15								
	Lightning								
564	Section-VI (TS)			3.03.04	5 of 17	For Coal Handling plant./FGD Plant Area	Please confirm that 'Strategic locations' where emergency DC lighting system shall be supplied for FGD Plant Area are as below.	Bidder understanding is correct. However strategic location also include each floor of TP and TP staircase(if any)	
	Part-B					100W, 220V DC Lighting fixture shall be provided in underground portion of conveyor, each switchgear room, control room, office room, pump house, ~~	- FGD SWGR Room		
	Sub-section-II E15						- FGD Control Room & Office, Control equipment rooms		
	Lightning						- Staircases for FGD Elec & control BLDG		
							- Pump House		
565	Section-VI (TS)			4.00.00.10.(I)	8 of 17	Lighting Panels shall be of following types:	Please clarify the definition/usage of each type of lighting panels.	The definitions and its details have already been provided in technical specs	
	Part-B								
	Sub-section-II E15								
	Lightning								

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	Section / Part / Chapter				Clause No.	Page No.			
566	Section-VI			4.00.00	3 of 5	HVW Spray System:	Please clarify spray pumps to be provided for spray system or tapping will be provided from nearby existing header		Co-ordinate points for hydrant & spray water header shall be furnished during detailed engg. However, one no. tapping each for hydrant & spray shall be provided around 50m vicinity. However, Bidder to refer relevant amendment.
	Part-A			1.2.1.3		Automatic fire detection cum high velocity water spray system shall be provided for various transformers (having oil capacity 2000 liters or more) envisaged under this package. Tapping for HVW spray system shall be provided from nearby existing hydrant header.			
	Sub-section-III-A3					MVW Spray System:			
	Fire Detection & Protection System					Automatic fire detection cum medium velocity water spray system for the various cable galleries envisaged under this package. Tapping for MVW spray system shall be provided from nearby existing Spray header			
567						HVW AND MVW SPRAY SYSTEM			
						General			
	Section-VI Part-B Sub-section-I-M4 Fire Detection & Protection System			3.01.00	1 of 18	It shall consists of Spray Pumps, Pressurization arrangements, water mains network, deluge valves, alarm valves, flow switches, isolation valves, Y type strainers.			

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	Section / Part / Chapter			Clause No.	Page No.			
568	Section-VI			5.15.00. Note-3,	13 of 18,	Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire	NTPC to note Inert gas system is not specified in scope of work in FGD & ZLD area. Hence we have not considered inert gas system.	Bidder's understanding is correct. Amendment will be issued in this regard.
	Part-B					Cross zoning of the signal from two adjacent multi sensor detectors shall be employed to initiate the fire extinguishing system of inert gas protected areas and...		
	Sub-section-I-M4,			5.18.00.ii)				
	Fire Detection & Protection System				14 of 18			
569	Section VI / Part –B/			2.02.12(i)	5 of 112	More than 2.0 tonne or more than 10.0 m lift or hoists coming outside buildings- Motor driven for both travel & lift.	NTPC to clarify the minimum weight of item for which motorized hoist is to be considered as there is ambiguity.	Specification requirement is clear in this regard. Bidders to comply the specification requirement pertaining to the area specified.
	Sub section-I-M2							
	Section VI / Part –B					Contractor shall provide motorized hoist and trolleys for all items requiring maintenance and weighing 500 kg or more.		
	/Sub section-I-M1							
				14.09.00	33 of 49			

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	Section / Part / Chapter			Clause No.				Page No.	
570	Section VI / Part –B			1.01.00	1 of 2	All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.	Since IS 4722 is not applicable for traction equipment, it shall not be applicable for Elevator motor.	Bidders understanding is correct. Reference std. as applicable shall be followed in line with the specification	
	/Sub section-II-E13								
571	Section-VI (TS)			4.00.00.10.(I)	8 of 17	Lighting Panels shall be of following types:	Please clarify the purpose of 3kVA transformer located inside of LP-3 type lighting panel itself.	LP-3 shall be used for feeding of RC receptacle as mentioned in technical specification. Kindly refer clause no:- 4.00.00.10.h	
	Part-B								
	Sub-section-II E15								
	Lightning								
572	Section-VI (TS)			12.00.00 (Roads)	30 of 114	Concrete pavement for roads shall be min. 250mm thick slab	Please clarify which particular specification about roads needs to be followed.	Bidders to comply to the requirements of technical specifications.	
	Part-B								
	Sub-Section IV-D								
	Civil Works								

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.			
573	Section-VI (TS)			31 of 114	Dry lean concrete shall be minimum M10 grade and concrete pavement slab shall be minimum M35 grade concrete.	Please clarify which particular specification about roads needs to be followed.	Bidders to comply to the requirements of technical specifications.
	Part-B						
	Sub-Section IV-D						
	Civil Works						
574	Section-VI (TS)			41 of 114	RCC paving of min. 150mm thick with M25 grade concrete	Please clarify which particular specification about roads needs to be followed.	Bidders to comply to the requirements of technical specifications.
	Part-B						
	Sub-Section IV-D						
	Civil Works						
575	Section-VI (TS)			48 of 114	Interconnecting walkway between various structures, buildings & facilities shall be finished with 22mm chequered concrete tiles	Please confirm - between which structures / buildings are interconnecting walkways required? Further, if the interconnecting walkways (if any) are steel structures, can we use steel chequered plate / gratings in place of chequered concrete tiles?	As the layout of FGD system is in Bidder's scope, ascertaining the requirement of Interconnecting walkway between various structures, buildings & facilities is in the scope of Bidder. For finishing schedule, Bidder shall comply
	Part-B						
	Sub-Section IV-D						
	Civil Works						
576	Section-VI (TS)			56 of 114	All steel surfaces should be provided with two component moisture curing zinc silicate primer coat, followed by polyamide curved epoxy (with MIO content) intermediate & aliphatic isocyanate curved acrylic final coat, all in shop	What separate paint is required other than the primer, intermediate & final coat already provided in the shop? Please clarify.	For steel sections and structures which are to be transported on sea, anticorrosive paint before shipment shall be provided to take care of sea worthiness.
	Part-B						
	Sub-Section IV-D						
	Civil Works						
577	Section-VI (TS)			57 of 114	All steel sections & fabricated structures, which are required to be transported by sea, shall be provided with anti-corrosive paint before shipment to take care of sea worthiness	Same with above.	For steel sections and structures which are to be transported on sea, anticorrosive paint before shipment shall be provided to take care of sea worthiness.
	Part-B						
	Sub-Section IV-D						
	Civil Works						
578	Section-VI (TS)			40 of 82	The scope of service under training of Employer's engineers shall include a training module covering upto six (6) man months in the areas of Operation & Maintenance.	Please clarify more detail requirement for training schedule such as plant visit, visit to Manufacture's work and product.	Please refer Annexure-VII of Section-VI, Part-C of Technical Specification.
	Part-C						
	Sub-Section IV						
	General Technical Requirement						

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	Section / Part / Chapter			Clause No.	Page No.			
579	General Queries						Please confirm questions below.	
							a. Can any additional cable / piping / ducting load be taken from the existing structures?	Bidder understanding is not correct. No any load to be taken from Existing structure.
							b. Shall NTPC clear the FGD area of all debris prior to the contractor's start of work?	Area specified for FGD shall be cleared for debris however if some debris will be in the area before start of fgd work same will have to be cleared by bidder.
							c. What is the lead distance for disposal of excavated debris?	Bidder to comply the technical specification.
580	SECTION-VI SUB-SECTION-II-E1			Page 4	1.12.00	The responsibility of coordination with electrical agencies /TAC/Pollution control board and obtaining all necessary clearances shall be of the contractor.	Please specify what clearances to be obtained.	Specification requirement is clear. Bidder to comply the technical specification.
581	SECTION-VI SUB-SECTION-IV-D						Geological information shall be provided. Owner to clarify the details of earthquake liquefaction, collapsible soil layer if any, and the bearing capacity of natural base foundation.	Geological study has not been done. However, available geotechnical data has already been provided in the tender documents. Further, liquefaction potential, collapsible soil etc. to be assessed by the Bidder
582	SECTION-VI SUB-SECTION-IV-D						Owner to clarify the type of building foundation? Whether it is natural base, pile foundation, or compound foundation	Available geotechnical data has already been provided in the tender documents. Type of foundation (open foundation/pile foundation), founding depth etc to be assessed by the Bidder based on requirement of bearing capacity/functional requirement of super structure/foundation.

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	Section / Part / Chapter				Clause No.	Page No.			
583	SECTION-VI SUB-SECTION-IV-D							Site building photos if any.	Shall be provided to successful bidders.
584	SECTION-VI SUB-SECTION-IIIC							Owner to clarify the arrangement of CEMS for absorber inlet. Whether it shall monitor the SO ₂ , O ₂ , ash concentration, temperature, pressure, volume Nox, CO ₂ , moisture etc.	It is clarified that CEMS system as specified under clause 2.03.00, sub section IIIC, Section-VI, Part-A is envisaged for stack emission monitoring. Further, minimum requirement of measurements/ instruments at absorber inlet and absorber outlet are specified in the tender drawings. In case additional measurements/ instruments are required as per the standard and proven practice of bidder, the same shall be provided with in this contract without any extra cost.
585	SECTION-VI SUB-SECTION-IIIC							Owner to clarify the arrangement of CEMS for absorber outlet. Whether it shall monitor the SO ₂ , O ₂ , ash concentration, temperature, pressure, volume Nox, CO ₂ , moisture etc.	It is clarified that CEMS system as specified under clause 2.03.00, sub section IIIC, Section-VI, Part-A is envisaged for stack emission monitoring. Further, minimum requirement of measurements/ instruments at absorber inlet and absorber outlet are specified in the tender drawings. In case additional measurements/ instruments are required as per the standard and proven practice of bidder, the same shall be provided with in this contract without any extra cost.
586	SECTION-VI SUB-SECTION-IIIC							Owner to clarify whether the Mercury Analyser is required for absorber inlet.	Mercury analyser is not envisaged at absorber inlet. However, in case Mercury analyser is required at absorber inlet, as per the standard and proven practice of bidder, the same shall be provided with in this contract without any extra cost. Bidder to further refer clause 2.03.00, PART-A, Sub Sec IIIC, of technical specification wherein flue gas analysers envisaged under CEMS is mentioned. Bidder to comply with the specification requirement.
587	SECTION-VI SUB-SECTION-IIIC							Owner to clarify whether fire fighting system is required for control building, power distribution room, Electric room, cable interlayer etc.	Bidder's understanding is correct
588	SECTION-VI SUB-SECTION-IIIC							Owner to clarify whether CCTV system is required? If yes, pls provide detail specification for CCTV.	It is clarified that CCTV system is not in the scope of the bidder.
589							On the discharge of Sump pump for Limestone Grinding area Sump NRV is envisaged	As these pump are expected to handle leakoff slurry, pump shall be provided without NRV on pump discharge	

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	Section / Part / Chapter				Clause No.	Page No.			
590							Discharge of Sump Pump for Limestone Grinding Area Sump	As per DWG No: 011-109-POM-A-002 discharge of Sump Pump for Limestone Grinding Area Sump to be taken to Limestone Slurry Storage Tank Whereas as per DWG No: 011-109-POM-A-003 same is to be taken to Absorbent tank. Owner to clarify discrepancy.	Referred drawing not related to FGD North Karanpura.
591							Level Control Station For Tank	We understand common Level control station to be provided for both process water tanks. Owner to confirm.	
592	Section-VI/ PART-A /Sub section-III, 1.04.00			1 of 5			Paints & Painting	It is to be noted that some of the equipments/ systems are being imported. In International market, RAL or BS color coding is being adopted for specifying colors. In view of this RAL & BS color coding system is to be allowed	Noted. Will be dealt as per tender technical specifications.
593	Section-VI/ PART-A /Sub section-III, 1.04.00			2 of 5			Paints & Painting	For ducts and surfaces wherever Insulation is being used painting specification as per Sr. no (i) and (ii) shall only be used.	Bidders query is not clear.
594	Section-VI/ PART-A /Sub section-III,A1, 2.04.00			2 of 9			 Contractor shall terminate the Flue Gas Duct (at a suitable point on the common flue gas duct to Chimney- upstream of the chimney terminal point and outside the chimney)	We understand common flue gas duct upto existing chimney shall be provided by owner. FGD contractor shall supply & Erect bypass dampers & instruments on this duct. Owner to confirm.	NOT RELEVANT TO NKSTPP FGD
595	Section-VI/ PART-A /Sub section-V, 2.0.00 & 3.00.00			3 of 26 & 3 of 26			Guarantee Point & Design Point Data	In both claused 2.00.00 & 3.00.00 Meja -I, 2X660MW power project is mentioned. Please clarify which data is to be consided for MEJA-I Power plant.	NOT RELEVANT TO NKSTPP FGD
596	Section-VI/ PART-A /Sub section-III,A1, 6.01.00			5 of 9			Employer shall provide a common Auxiliary Absorbent tank, common for all the units, of sufficient capacity for storage of absorber slurry of one unit.	Clarify scope & Location of Auxiliary absorbent tank	specification requirement is clear in this regard. Bidder to comply the specification.
597	VI, Part-A, Sub-Section-IV 1.00.00			1 of 3			Terminal Point	Isolation valve at terminal point for , Potable water DM water, Clarified water, Fire water & Instrument & Service air shall be provided by owner. Owner to clarify	Valves at terminal points are in Bidders scope.

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598	Section-VI/ PART-A /Sub section-IV-1.02.00			1 of 3		Terminal point: One tapping from the common flue gas duct going towards the existing chimney (in case of twin flue chimney)	i) As per this clause it one tapping from common flue gas duct is envisaged for FGD tapping However as per drawing 0011-109-POM-A-101, two nos are tapping are envisaged from each ID fan discharge duct for FGD tapping. NTPC to clarify for twin flue chimney what shall be tapping point. ii) In case tapping is from common duct NTPC to clarify whether isolation damper is required at tapping point Or Not.	Specification detail menmtioned by Bidder is not correct. However specification requirement is clear in this regard. Bidder to comply the specification.
599	Section-VI/ PART-A /Sub section-IV-2.00.00			3 of 3		Exclusions	Please provide list of Exclusions.	specification requirement is clear in this regard. Bidder to comply the specification.
600	Section-VI/ PART-A /Sub section-III-A4			1 of 3		Hot secondary water pipe from the PHE's, discharging into the FGD System as process water	i)As such requirement of secondary cooling water shall be very small, In view of this NTPC to clarify whether entire process water tapped from blowdown line is to be passed through ECW system PHE or only partial flow as per system requirement can be passed through PHE. ii) Process water may be used before OR after process water storage tank as per layout requirement.	Specification detail menmtioned by Bidder is not correct. However specification requirement is clear in this regard. Bidder to comply the specification.
601	Section-VI/ PART-A /Sub section-III-A5,1.02.02			3 of 6		NTPC reserves the right to freeze a basic layout for each NTPC plant post technocommercial discussions.	We understand NTPC will provide finalised basic layout before submission of commerecial bid & it will be provided to bidders well in advance before submission of commerecial bid. Please clarify.	Clause not found in Technical specification. Not RELEVANT TO NKSTPP FGD
602	Section-VI/ PART-A /Sub section-III- 1.06.00			3 of 5		All the first fill and one years topping requirements of consumbales such as grease, oil lubricants servo fluid etc. which will be.....	i) We understand this one year topping requirement includes, toppings required during commissioning, trial runs, initial operation etc. ii) We understand consumbales required for maintenance of equipments of equipment are to be supplied. Chemical required for the process are excluded from bidders scope. NTPC to clarify.	specification requirement is clear in this regard. Bidder to comply the specification.
603	Section-VI/ PART-B /Sub section-I- M1-2.00.0			5 of 51		 Complete installation of liners shall be made under supervision of the liner supplier as per their guidelines.....	Linesrs used in the FGD system are standard lines & shall be installed as per standrd duidelines of manufactures without supervision of supplier.	Bidder to comply the specification requirement.
604	Section-VI/ PART-B /Sub section-I- M1-3.01.0, Sr. No-2			5 of 51		The Entire Flue Gas system , Flue Gas Ducts, Absorber shall be designed to meet following conditions : Sr. No 2 : Design Inlet Gas Temp : 150 deg.	We understand design inlet gas temp to absorber is 150 deg C.Please clarify.	specification requirement is clear in this regard. Bidder to comply the specification.

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605	Section-VI/ PART-B /Sub section-I- M1-3.01.0, Sr. No-1			5 of 51		The Entire Flue Gas system , Flue Gas Ducts, Absorber shall be designed to meet following conditions : Sr. No 1 : Design linternal pressure at 67% yield strength : +660 & -150 mmwc or Maximum concievable head of booster fan , Whichever is higher.	As per clause no 16.01.03 , all the flue gas duct shall be designed for +/- 660mmwc or maximum conceivable pressure of the relevant fan..... NTPC to clarify design pressure on -ve side to be considred for duct design.	Refer necessary amendment in this regard.
606	Section-VI/ PART-B /Sub section-I- M1-3.02.04			5 of 51		The duct to absorber inlet shall be made of carbon steel of minimum 7mm thickness.the duct , from Absorber outlet to bypass duct shall be made of carbon steel of minimm 7mm thickness with 2mm(minimum) thickness lining / cladding / wallpaper of alloy C276/Alloy 59 or better material.	It is to note that as Absorber outlet is connected to dedicated chimney, there is no connection from absorber outlet to bypass duct & requirement indicated for absorber outlet to bypass duct is not relevant . NTPC to clarify.	Refer necessary amendment in this regard.
607	Section-VI/ PART-B /Sub section-I- M1-3.03.07			7 of 51		Quick quick acting biplane damper shall be provided by the contractor..... The damper shall be capable of quick opening during emergency condition within a time of 10-20sec. Bidder should indicate the required opening time for	i) As quick opening biplane damper is to be provided, Guillotine gate damper will be redundant, in view of this it is praposed to provide only quick opening biplane damper in bypass duct. ii) In case if bypass guillotine gate type damper is to be provided in the existing duct. It is praposed that opening time of biplane damper shall be same as that of guillotine gate type of damper.	Bidder to comply the specification requirement. Please also refer Amendment to the technical specification.
608	Section-VI/ PART-B /Sub section-I- M1-3.03.09			7 of 51		The dampers shall be pneumatically operated and controlled from the control room.....	As per P&ID 0011-109-POM-A-001(a) , Guillotine gate type dampers are to be provided with motorised actuator.NTPC to clarify discripancies in the type of actuator to be provided	Bidder to comply the specification requirement. Please also refer Amendment to the technical specification.
609	Section-VI/ PART-B /Sub section-I- M1-4.01.01-(iv) & 4.01.02-(vii)			9 of 51 & 10 of 51		Gas Temp (Deg C) = 150	We understand this is the temperature of the gas being handled by Booster fan including temperature rise in the booster fan.	Bidder's understanding is correct.
610	Section-VI/ PART-B /Sub section-I- M1-7.08.01			29 of 51		 It should be possible to discharge the each absorber into the emergency drain tank within 2 hrs.	As per present schem envisaged in the technical specification Gypsum bleed pump shall be utilised for emptying of absorber tank. Capacity of this pump will not be adequate to transfer entire slurry in absorber tank within 2 hours. If entire absorber tank slurry is to be transferred within 2 hours then separate pumps are to be provided for this purpose. NTPC to review & clarify.	Bidder to comply the specification requirement.

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611	Section-VI/ PART-A /Sub section-VI-5.00.00-xiv			21 of 24		xiv)Auxiliary Cooling (Normally working)water pump set one (1) to supply cooling water on secondary side of the PHE.....	In case if discharge of booster pump is passed through PHE then separate Auxiliary Cooling water pump shall not be used therefore , power consumption of Auxiliary Cooling water will not applicable in this case..	All working Booster / FGD Auxiliary (secondary) cooling water pumps shall be considered for calculation of power consumption. May please refer amendment.
612	Section-VI/ PART-A /Sub section-VI-7.00.00			23 of 24		The contractor shall gurantee 98% availability of FGD plant including..... For a continuous period of 120 days. An availability guarantee test shall be consucted to assure this level of availability for a period of 240 days as per the procedure below.	Please clarify if availability test is for 120 days Or 240 days.	Specification requirement is clear. Bidder shall comply with the specification requirements.
613	Section-VI/ PART-B /Sub section-I-M1-5.06.18-(i)			20 of 51		The last spray level upstream the mist eliminator shall be operated only in counter-flow	In DW Tower also known as Liquid Column Desulfurization Tower liquid column shall be injected from bottom i.e. in co-current fashion . This is a standard proven design for FGD absorber. Owner is requested to modify this clause accordingly.	The requirement is applicable for spray tower design. In case, Bidder other design the same shall be discussed with the bidder during post bid meeting after submission of techno-commercial bid.
614	Section-VI/ PART-B /Sub section-I-M1-3.02.07			6 OF 49		 The chimney flue liner cladding shall be made of 2mm thick Titenium(Grade 2 as per ASME SB265) Or C276 alloy over 8mm thick (minimum) mild steel base metal of flue lines.....	It is proposed to provide borosilicate block lining for the chimney flue. NTPC is requested to allow for Borosilicate lining for the chimney.	Bidders to comply the specification requirement.
615	Section-VI/ PART-A /Sub section-VII						Not applicable line items shall not be provided by bidder, if same are not applicable in bidder's design/ Supplied Equipments. Owner to confirm bidder understanding is correct.	Bidders to comply the specification requirement.
616	VI, Part-C 30.00.00			42 of 83		Noise Level:- shall not exceed 85 dBA. However Ball Mills the noice levels as per following shall also be acceptable: a) Ball Mill < 90 dBA	i) As per clause no 9.01.00, Sr. No-6, on page no 21 of 26, Section VI, PartA, Sub Section V, Noise level for Air Compressor is 90 dB. ii) It is proposed that noise level for Crusher shall be < 102 dBA Owner to clarify.	Refer Amendment in this regard.
617	General FGD Area Layout					Pipes & Cables	Owner to provide routings of existing pipes & cables which may be laid in the allocated area for FGD system.	Required drawings will be made available at detailed engineering stage, if available.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
618	General FGD Area Layout						Pipe Rack / Trestle	Contractor shall use employers pipe rack/trestle to support their pipes and cable trays from employer TP point location to FGD area. Owner to confirm bidder understanding is correct.	Stipulations, as given under Clause 13.00.00 Sub Section- III-A1 Section –VI, Part-A, shall be complied with w.r.t trestles. -Bidder shall comply with technical specification requirement clause no: - 1.08.00.2 Sub Section- III-B, Section –VI, Part-A.
619	General						ID fan Performance Curves	Owner to provide ID fan performance Curve.	Noted. ID fan performance Curve will be provided to the successful bidder.
620	General						Code & Standard	As equipment may be procured from China, i) Equivalent GB standard shall be followed for Design of equipment of FGD System like structure, pumps, supports etc. ii) Material shall be as per equivalent Chinese code.	Specification requirement is clear. Bidder shall comply with the specification requirements.
621	SECTION – VI, PART-A SUB-SECTION-III-A1 FGD CL 1.03.00			1 of 9			The contractor's scope shall include... common limestone grinding system...	A common limestone, unloading, storage, grinding, slurrification and dosing system for FGD and ZLD systems is proposed. This would reduce footprint and contain capital costs. Please clarify & confirm.	Bidders to comply the specification requirement.
622	SECTION – VI, PART-A SUB-SECTION-III-A6 ZLD CI 1.01.00			1 of 3			Pre treatment system shall consist of FGD waste water storage tank (2x50%) to store FGD waste water, GGH washing water, etc	Bidder proposes 1x100% tank sized for 30 m3/h inflow (Barh-I) and 20 m3/h inflow (Nabinagar) instead of 2x50% tanks, this will facilitate the operation flexibility. Please confirm. Also please clarify all the waste water sources leading to ZLD, such process wastes, cooling water wastes, if any.	NOT RELEVANT TO NKSTPP FGD
623	SECTION – VI, PART-A SUB-SECTION-III-A6 ZLD CI 1.02.00			1 of 3			Contractor shall provide one independent train (1x100%) or two independent trains (2x50%) of Evaporative concentration system.	Bidder proposed to provide 1x100% Evaporative Concentration System. Please confirm.	NOT RELEVANT TO NKSTPP FGD
624	SECTION – VI, PART-A SUB-SECTION-IV Terminal Points & Exclusions CI 1.07.00			2 of 3			FGD waste water pipes shall terminate along with isolation valve at 5 meters near HCSD mixing tank	We presume this is not applicable in Barh & Nabinagar since ZLD is provided. Please clarify.	Bidder Query is not relevant to NKSTPP FGD. However Specification requirement is clear.
625	SECTION – VI, PART-A SUB-SECTION-IV Functional Guarantees & LD CI 4.02.00			18 of 24			Waste Water: The contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be 10 m3/h averaged over a 24 hour period for each unit.	Please clarify whether the guaranteed purge quantity mentioned as 10 m3/h per unit is common for all the projects. Please clarify the exact flow rate to be considered for designing the ZLD.	Specification requirement is clear in this regard. Bidder to comply the specification. ZLD is not applicable for North Karanpura FGD.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
626	SECTION – VI, PART-A SUB-SECTION-III-A6 ZLD CI 1.02.00			1 of 3		Contractor shall provide one independent train (1x100%) or two independent trains (2x50%) of Evaporative concentration system.	Bidder proposes the hybrid ZLD system. The system comprising of Primary secondary clarifiers followed by 2X50% streams of UF & RO system. Further reject will be fed into the downstream consisting of evaporator and crystalliser as in NTPC specification with reduced capacities. The proposed system is techno-economical & proven system. This type of scheme is already proposed in FGD system by leading consultants of India. Please review & reply.	NOT RELEVANT TO NKSTPP FGD
627	SECTION – VI, PART-C General Technical Requirements CI 30.00.00			42 of 83		Noise levels <85 dBA for FGD equipment and <90 dBA for Ball Mills	Please clarify the acceptance of noise levels for ZLD equipment - near field & far field.	NOT RELEVANT TO NKSTPP FGD
628	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI 2.00.00			3 of 32		Conditions of Service - 'All Design Pressure of all device, piping, and auxiliary facilities...Device and tank maximum allowance: operating pressure x 1.5' and also 'piping and auxiliary facilities: 150 lb class flange, STD wall pipe'	This may not apply for larger "fit for service" equipment like Evaporators and Crystallizers. The same will be based on manufacturer recommendations on design pressures for piping and tanks based on proven experience in the past executed project. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
629	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI E2			9 of 32		Evaporative concentrator shall be designed to start / stop every day	Please clarify the requirement, it is presumed that FGD & ZLD will operate at full capacity continuously.	ZLD is not applicable in case of FGD North Karanpura.
630	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI E6			9 of 32		Pressure vessel in evaporative concentration shall be designed as per ASME Sec VIII or equivalent code listed above.	Evaporator is typically not a pressure vessel and not necessarily designed as per ASME Sec VIII. Kindly accept the manufacturer standard practice.	ZLD is not applicable in case of FGD North Karanpura.
631	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI E14			10 of 32		Hoists shall be provided for all vessels in evaporative concentration system as per the Manufacturer's proven practice	Manufacturer recommended practice will be followed for handling / maintenance. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
632	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI E15			10 of 32		Vessel support shall be designed same as materials for vessel. Different material cannot be welded to vessel.	Manufacturer proven practice of providing the supports of same/different material as the vessel will be followed. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
633	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI F2			10 of 32		Centrifuge to dehydrate solids form evaporative concentration shall be consist of Centrifuge 2x50%	Centrifuge does not 'dehydrate solids' it makes wet cake or solids suitable for landfill. Please review & confirm,	ZLD is not applicable in case of FGD North Karanpura.
634	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD CI 22d			14 of 32		Size: 1/2"-inch OD minimum	As per the manufacturer standard, minimum suction size is 1/4" OD tube. Kindly accept the same.	ZLD is not applicable in case of FGD North Karanpura.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
635	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD Cl 3.02.01(4)			15 of 32		...the contractor shall provide duplicate pumps (2x100%) or multiple standby pumps for the same service.	Duplicate pumps are not needed for all pumps. As per the OEM recommendation the applicable connected redundancies and store standbys are considered. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
636	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD Cl 3.02.03 (2)			20 of 32		Slurry tanks shall be provided with screen at the inlet nozzles.	It is proposed to follow as per the manufacturer standard practice. Screens if required will be provided to protect downstream equipment (such as heat exchangers) as per the proven experience. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
637	SECTION – VI, PART-B SUB-SECTION-I-M7 ZLD Cl 3.02.05 (6)			20 of 32		Additional required equipment for Vapour Compressor : i) Shaft driven lube oil pump	As per the OEM/manufacture electrically driven lube oil pump is proposed instead of shaft driven due to limitations in design of certain compressor manufacturers. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
638	Process Flow Diagram ZLD			3 of 3			The scheme shows steam driven crystalizer, whereas write up calls for MVR. Please clarify.	ZLD is not applicable in case of FGD North Karanpura.
639	SECTION – VI, PART-A SUB-SECTION-IIA-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660)			18 of 30 & 28 of 30		Cooling water Analysis Table 4: Clarified water analysis	The cooling water analysis & table 4 clarified water analysis are contradictory. The COC mentioned cooling water analysis is 2.5, COC 5-5.5 was mentioned in table 4. Bidder is following the Table 4 water analysis & COC as 5-5.5. Please confirm.	Not relevant to NKSTPP FGD
640	SECTION – VI, PART-A SUB-SECTION-III-A6 ZLD Cl 1.04.00 i)			3 of 3		All first fill & One year topping requirement of consumable such as chemicals, grese....etc	It is proposed to provide the chemicals till commissioning & handing over of the plant. The Three(3) months chemicals at rated capacity are considered for the proposal. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
641	SECTION – VI, PART-A SUB-SECTION-III-A6 ZLD Cl 1.01.00			1 of 3		Sludge dewatering etc	Sludge dewatering followed by sludge/cake disposal shall be by client. Please confirm.	ZLD is not applicable in case of FGD North Karanpura.
642	SECTION – VI, PART-A SUB-SECTION-I INTENT OF SPECIFICATION CL 4.04.00 & 4.05.00			15 of 19 & 16 of 19		Route-1, Route 2 & provenness criteria for critical equipments....	The main qualifying requirements are mentioned in Route-1 & Route-2. Additionally provenness criteria for critical equipments are indicated in the clause for evaporator, crystalliser etc. It is proposed to consider either of the two qualifying/provenness criteria is applicable. Also the equipment application shall not be restricted to only coal fired power plant. As wide application implementation in process industries may be considered for evaluation.	ZLD is not applicable in case of FGD North Karanpura.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter				Clause No.	Page No.			
643	Technical Specification,Section-VI,Part-A, Subsection-III-A3,Fire Fighting System, Clause no:1.00.00			Page 1 of 2			Fire water shall be tapped off from Existing Fire Water main header for Hydrant and Spray system.	It is requested to mark the terminal point in Plant layout drawing.	Shall be provided to during detail Engineering.
644	Technical Specification,Section-VI,Part-A, Subsection-III-A3,Fire Fighting System, Clause no:1.00.00(point no 1.1,1.2,1.3)			Page 1 of 2			Fire water shall be tapped off from Existing Fire Water main header for Hydrant and Spray system.	Owner is requested to provide the pressure available at terminal point for both Hydrant & Spray system.	Shall be provided to during detail Engineering.
645	Technical Specification,Section-VI,Part-A, Subsection-III-A3,Fire Fighting System, Clause no:1.00.00(point no 1.2,1.3) & Technical Specification,Section-VI,Part-B, Subsection-I-M4,Fire Fighting System, Clause no:3.01.00			Page 1 of 18			Fire water shall be tapped off from Existing Fire Water main header for Spray system. & Spray System shall be provided with Spray Pump.	We will design the Spray system considering the tapping point from existing system. Necessary Orifice shall be provided(if required). No Spray pump has been considered. Please confirm.	Refer Amendment in this regard.
646	Technical Specification,Section-VI,Part-A, Subsection-V,Salaient Design Data & Sizing, Clause no:8.02.00			Page 18 of 26			The Pipelines routed in RCC Trenched shall be provided with Coating & wrapping.	As per practice Coating & wrapping is not required for the pipes which is laid in the trench and open to Air. Outside paint for the pipe shall be provided. Owner is requested to confirm.	Reffered clause not found.
647	Technical Specification,Section-VI,Part-A, Subsection-V,Salaient Design Data & Sizing, Clause no:8.02.00			Page 18 of 26			The Pipelines routed in RCC Trenched shall be provided with Coating & wrapping.	It is proposed to provide pedestal instead of Trench. Wherever pedestal is not possible,Trench will be provided. Please confirm.	Reffered clause not found.
648	Technical Specification,Section-VI,Part-B, Subsection-I-M6,LHP, Clause no:3.2.00			Page 2of 73			Limestone shall be conveyed using same conveyors as for coal before being taken to dedicated limestone crusher house.	We are not considered Fire Figthing system for Existing Conveyor for LHP. If Additional conveyor or any modification will done for FGD system, Fire fighting System will be provided for that additional system only. Please confirm.	Reffered clause not found.
649								R-Infra consider the various areas which are mentioned in the Plotplan dedicated for FGD system . No other area has considered by us. Owner to confirm.	Confirmed.
650								Owner is requested to provide the scope and terminal point for Service Air, Instrument Air, Service Water for FPDS system.	Specification requirements are clear. Bidder shall comply with the specification requirements.Bidder to reffer clause no. 1.09.00, Part-A,section-VI, Sub-section-IV, Terminal Point & Exclusions for FDPs.
651	Section-VI, Part-B, Sub-section-I-M6, Clause No. 4.10.0			140 of 274			Vibrating feeder shall be of electromechanical type and shall be provided to feed limestone to crusher. While in same same sub-section-I-M6, Clause No. 3.3.0, page 129 of 274 two (2) numbers of Vibrating grizzly/screening feeders.	Please clarify whether we shall consider vibrating feeder or Vibrating grizzly/screening feeder.	Sub Section I-M6 is related to Piping. However for for clause No. 2.02.01, Sub section I-M2 bidder to comply with technical specification.

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Sl. No.	ENQUIRY SPECIFICATION						SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
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652	General							Please provide existing Coal flow diagram and transfer tower AS built GA drawings before crusher (editable copy) for preparing new layout for Lime Stone handling System.	General Layout Plan of the plants is already given in the tender documents. Other drawings, if required, shall be provided to successful bidders. However Limestone delivery to North karanpura plant is through Truck.
653	General							What shall be the belt conveyor system capacity, belt width and belt speed to be selected. Please clarify.	Specification requirements is clear. Bidders to comply the specification requirement.
654	Part-B, Volume VI, Sub Section-I-M, FGD system Clause 6.06.01					Page 24 of 51	For tank volume calculation, solid concentration (by weight) in the slurry shall be assumed, not more than 20% or actual required whichever is lower.	Please allow the concentration to be decides by vendor as per their technology for overall optimization.	Bidder shall comply with the requirements of Technical Specifications.
655	Part-B, Volume VI, Sub Section-I-M, FGD system Clause 6.02.05					Page 21 of 51	For dust free operation each silo should be provided with a covering arrangement and a self cleaning bag filter system of suitable capacity containing blower, automatic/on-load cleaning system, etc	Considering the clean air requirement for bag purging, we recommend for Instrument air tol be used for cleaning of bags of bag filters in place of blower. Please relook into the requirement of blower and confirm.	Bidder shall comply with the requirements of Technical Specifications.
656	Section-VI, Part-A, Sub Section-III-C, Cl: 2.01.00 (c), (d)					2 of 8	For binary and analog inputs required in major equipments of FGD system, protection triple-sensing devices shall be provided.	It may not be possible to provide 2 out of 3 configuration for all the interlocks of HT drives/ other equipment due to mechanical/ space constraints in drives such as motor winding, motor/ fan/ pump bearing temperature etc. In such cases, single sensors only will be envisaged, e.g. 1 duplex RTD for each bearing/ winding phase.	Bidder's proposal is not acceptable. Bidder to comply with the specification requirement.
657	Section-VI, Part-A, Sub Section-III-C, Cl: 4.00.00 (d), (e) & Section-VI, Part-E, Drawing no: 0000-101/102-POI-A-021					5 of 8 & Sht 1 of 3	d) Cables required for interfacing..... Shall be in bidder's scope. e) Cables for connectivity of CEMS..... Shall be in bidder scope. & As per cable scope diagram all cables from JB/ Integral JB etc to Owner control system is in the scope of Owner.	Owner may please clarify which clause/ drawing to be followed for cabling to Owner's Control system. Owner to confirm.	Refer amended tender drawing in this regard.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
658	Section-VI, Part-A, Sub Section-III-C, Cl: 6.00.00			6 of 8		Control System	Bidder proposed to provide common PLC (hot redundant) for each Project FGD along with required number of unitized/ common RIO cabinets at CER, gypsum handling, Limestone handling system etc meeting all functional and parametric requirements of the specification. Owner may please confirm concurrence	It is clarified that binary and modulating controls of complete Flue gas desulphurization system, associated material handling systems etc. and other systems being provided under the contract shall be implemented in PLC. The PLC based Control System shall have separate process blocks for unitised system and one process block for common system including material handling system. For example in North Karanpura (3x660MW) , the PLC based control system shall have following process blocks: (i) Unit-1 FGD and associated system (ii) Unit-2 FGD and associated system (iii) Unit-3 FGD and associated system (iv) Common system including material handling systems. Refer amendment in this regard. Remote Input Output (RIO) panel, located in respective unit (s) CER, for hardwired signal exchange between FGD PLC and BOP DDCMIS of respective unit shall be provided on per unit basis.
659	Section-VI, Part-A, Sub Section-III-C, Cl: 6.01.00			6 of 8		Dual processor based PLC system with PC based OWS, programmable station and A4 size color laser printer etc on as required basis (to be decided during detail engineering)	It is understood that OWS, EWS cum OWS, printer are to be provided in line with PLC configuration diagram (0000-151-POI-A-013) and not "on as required basis". Owner may please confirm concurrence	Bidder's understanding is not correct. Bidder to refer clause 6.01.00, PART-A, Sub Section-IIIC, where in it is mentioned that Operator Work Station (OWS) shall be supplied on as required basis (to be decided during detail Engineering) for controlling and monitoring of the FGD and associated system being provided under the contract located in FGD control room. One OWS shall also be provided with capabilities of programming station of PLC and Human Machine Interface system (EWS cum OWS). However, bidder to consider minimum quantity of OWS and OWS cum EWS as follows: a) OWS (placed in FGD control room)-(N+1) where N is the total number of generating units per project under this package. b) OWS cum EWS (placed in FGD control room)-ONE (1) c) OWS (placed in central control room of each generating unit)-TWO (2). Bidder to refer amendment in this regard.

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Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.		
660	Section-VI, Part-A, Sub Section-III-C, Cl: 6.05.00			6 of 8		The minimum quantity of furniture per unit envisaged in FGD control room is as: a) Chairs- 4nos b) Printer Table- 1no c) Computer Table- 2nos - e) Locker set - 1 no The following is understood from the Tender documents: 1) Computer Table is asked in scope of supply, however no specification for computer table is provided and instead specificaion of Control desk is indicated at III C-5, which is not applicable as per scope. It is understood that computer table is to be provided as per standard practice of OEM. 2) As common control room is envisaged for each project, it is understood that the quantity of furniture indicated is common for all units of each project. 3) Provision for mounting FGD OWS in Owner's CCR (i.e.Computer table/ space in Owner's existing desk) shall be provided by Owner. Owner may please confirm concurrence to above Understanding of the Bidder.	1) It is clarified that control desk meeting specification requirements stipulated in clause 10.04.00, PART-B, Sub Section III-C5 of technical specification is in the scope of bidder. Refer amendment in this regard. As per specification clause 6.05.00, PART-A Sub section IIIC, computer table is also in the scope of bidder and the same shall be supplied as per bidder's standard and proven practice. 2) Bidder's undersatnding is not correct. It is clarified that the quantity of furniture mentioned in clause 6.05.00 a) to e) is on per unit basis. For example: In case of North Karanpura (3x660MW) project, the quantity of furniture to be supplied shall be thrice of the furniture quantity that is mentioned under clause 6.05.00 a) to e), Part-A, Sub Section III-C of the specification. Bidder to comply with the specification. 3) Bidder's understanding is correct.
661	Section-VI, Part-A, Sub Section-III-C, Cl: 6.07.00			7 of 8		Power Supply System- 24VDC and UPS Owner may please clarify the following: 1) As no specific requirement is indicated for power supply of RIO cabinets, it is proposed to extend the power supply from FGD control room to the nearby RIO cabinets. 2) Requisite Power supply feeder for Bidder's scope FGD OWS coming inside Owner's CCR shall be provided by Owner. Owner may please confirm concurrence	1) Bidder to refer clause 9.01.00, PART-A Sub Section-IIIC, wherein it is mentioned that NTPC shall provide 2 (Two) nos. of 24V DC power supply feeders per unit from employer's DCDB, for powering RIO panel located in CER. Cabling from DCDB to RIO panel (located in CER) shall be in bidder's scope of supply. 2) It is clarified that NTPC shall provide 02 nos. of UPS power feeder per unit from employer's ACDB, for powering FGD OWS located in CCR. Cabling from ACDB to FGD OWS (located in CCR) shall be in bidder's scope of supply.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
662	Section-VI, Part-A, Sub Section-III-C, Cl: 9.02.00 & Section-VI, Part-B, III-C1, Basic design Criteria, Cl: 3.05.01			8 of 8 & 3 of 4		It is also envisaged to control, operate and monitor FGD and associated system remotely from main plant CCR through ethernet link following TCP/IP standard. & Further, flue gas desulphurization system, link shall be provided for collection of data in DDCMIS (in Employer's Scope)	As separate FGD OWS is envisaged in CCR, it is understood that communication link from bidder FGD control system to Employer's DDCMIS is to be provided only for monitoring of FGD system through Owner DDCMIS, i.e. no control/ operation from Owner's DDCMIS. Owner may please confirm.	Bidder's understanding is correct. Bidder to refer clause 9.02.00, PART-A, Sub Section IIIC wherein it is mentioned that it is also envisaged to control, operate and monitor FGD and associated system remotely from main plant Central Control Room (CCR). To achieve the above the Contractor shall provide the following: 1) The FGD plant operation shall be made available through Ethernet link following TCP/IP standard. The system shall be OPC compliant. Bidder to comply with the above specification requirement. It is further clarified that to achieve the above FGD OWS shall be located in respective unit (s) CCR. Refer amended tender drawing 0000-151-POI-A-013 in this regard.
663	Section-VI, Part-A, Sub Section-VII					Mandatory Spares	Mandatory spares for Control and instrumentation are indicated under various mechanical packages (at Cl: 1.19.00, 1.21.00, 1.22.00, 1.23.00, 1.24.00) and then again at Cl: 1.25.00 and hence causing repetition of same spares at different clauses. In view of the same, it is proposed to provide mandatory spares for all supplied C&I items in line with Cl: 1.25.00 only to avoid confusion. Owner may please confirm.	Refer amendment in this regard.
664	Section-VI, Part-A, Sub Section-III-A2, Cl: 2.00.00 g)			2 of 4		Contractor shall provide microprocessor/ PLC/ GIU based control system for control and	Bidder proposes to provide relay based control system for ventilation system in line with standard and proven practice of OEM.	Bidder's proposal is not acceptable. Bidder to comply with the specification requirement.
665	Section-VI, Part-A, Sub Section-III-A6			1 to 3 of 3		General	As no requirement for control system is specified, it is proposed to provide integral control system for ZLD in line with OEM standard and proven practice. Further, separate OWS of ZLD inside FGD control room shall be provided with serial interface with FGD PLC system for monitoring of ZLD system . Owner to confirm concurrence.	Bidder's understanding is not correct. Bidder to refer clause 1.00.00 a), PART-A Sub Section IIIC wherein it is mentioned that the Contractor shall provide Independent Control & Instrumentation system for control, monitoring and operation of associated drives and auxiliaries in FGD system including Limestone grinding & handling system, Gypsum Dewatering & handling system, Zero liquid discharge system (ZLD) (if provided) and other systems being provided under the contract, in all regimes of operation in safe and most efficient manner.

CLARIFICATION No.- 01 (TECHNICAL)**FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE NORTH KARANPURA SUPER THERMAL POWER PROJECT (3X660 MW)****Bidding Document No.: CS-4410-109-2****Document No.: CS-4410-109-2-CLRF-TECH-01**

Sl. No.	ENQUIRY SPECIFICATION				SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter	Clause No.	Page No.				
666	Section-VI, Part-B, III-C1, Basic design Criteria, Cl: 3.04.00		3 of 4		In any case, Bidder shall be required to ensure the supply of spare parts for lifetime if the plant.....	With respect to control & instrumentation, the bidder shall support supply of spare parts for a period of 15 years, in view of the fast changing technology in the field of C&I. Owner may please confirm.	With reference to clause 3.04.00, Part-B, Sub Section III-C1 of technical specification, it is clarified that lifetime of the plant is envisaged as 15 years for which bidder shall ensure supply of the spare parts. Bidder to comply with the specification.
667	Section-VI, Part-B, III-C2, Measuring Instruments, Cl: 10.00.00, S.No-8 & Cl: 11.01.00, S.No-8		19 of 34 & 23 of 34		Under Common requirements for analyzer Instruments, it is specified that calibration from Remote is required.	Bidder clarifies that the Auto & Manual claibration from local is envisaged for bidder supplied analzers. Owner may please confirm.	Bidder's understanding is not correct. Specification requirement are clear. Bidder to comply with the specification requirement.
668	Section-VI, Part-B, III-C5, PLC Based Control System, Cl: 9.02.01		18 of 27		Racks for Batteries of PLC system	As no specification is provided for battery racks, It is proposed to provide battery rack in 2 step/ 2 tier configuration in line with standard practice for Ni-Cd batteries being followed in all major utilities. Owner may please confirm concurrence.	Bidder's proposal is acceptable.
669	Section-VI, Part-B, III-C5, PLC Based Control System, Cl: 16.00.00		26 & 27 of 27		Annual Maintenance Contract for PLC	As AMC for PLC is not indicated in Part-A, it is presumed that the same is not in the scope of Bidder. Owner may please confirm. However, in case AMC for PLC is to be included in his scope by the bidder, then Owner may please claify the scope of services to be provided by bidder during "hardware support" period.	Bidder's understanding is not correct. It is clarified that AMC for PLC is in the scope of Bidder. Bidder to refer amendment in this regard.
670	Section-VI, Part-E, Drawing no: 0011-109-POMI-A-001 and 001 (a)		1 of 1		Typical scheme for blower and slurry recirculation pumps	From the tender drawing, following is understood: 1. Vibration Transmitters (2 nos i.e. one in X and one in Y direction) are to be provided at drive end of HT motor and Fan/ Pump only, i.e. 4 nos. transmitters per HT drive/ motor combination. 2. Temperature Element is to be provided at drive end of motor and Fan/ Pump only. Due to space constraint only, one no. duplex element is proposed per bearing, i.e. total two nos. Duplex Temperature elements per HT drive/ motor combination. Owner may please confirm.	It is clarified that in the tender P&ID minimum quantity of field instruments to be supplied by the contractor, is indicated. However, bidder to also refer the relevant clauses of specification for the quantity of vibration transmitters, Vibration monitoring system and Temperature elements for motor and Fan/pump.
671	Section-VI, Part-E, Drawing no: 0011-109-POMI-A-001 and 001 (a)		1 of 1		P&ID for FGD- Absorber System	Requirement of Flow indicator (local indication) at absorber Inlet and outlet duct as per tender P&ID is proposed to be met with local display in electronic transmitter provided for flow measurement. Owner may please confirm concurrence.	Bidder's proposal is also acceptable.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
672	Part- B-II Elect 1 clause no 2.01.01 Technical requirement				3 of 7	Adequate number of Auxiliary transformer shall be provided to meet the demand on 11KV, 3.3 KV and 415V system under most onerous conditions, with the criteria that each 11KV/3.3KV/415V switchgear /MCC/DB shall be fed by 2x100% or 3x50%, 3x100% transformer / feeders and these shall be rated to carry the maximum load expected to be imposed.	M/s NTPC is requested to furnish the criteria for selection of 3x100% Transformer /feeder arrangement.	Bidder to refer amdt.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter		Clause No.	Page No.				
673	Drawing no 0011-109-POE-J-001/A-E Single line diagram					11 KV Switchgear	M/s NTPC is requested to confirm whether 11KV Tie Switchgear is same as 11 KV FGD Switchgear.	Bidder's query is not relevant to this project
674	Drawing no 0011-109-POE-J-001/A-E Single line diagram					Existing CHP/AHP system	Please specify the number and ratings of the existing CHP/AHP Transformers and its distance from the 11KV FGD Switchgear room.	Bidder's query is not relevant to this project
675	Part- B-II Elect 1 1.11.00 Technical requirement			2 of 7		In fire hazardous areas like gas/liquid fuel storage/handling areas lighting fixtures, switchgears shall be flame proof	The Switchgear for the Areas being referred to , are normally located in a separate Room , hence non flame proof switchgear can be proposed .M/s NTPC to confirm acceptance.	Bidder to comply specification requirement
676	Part- B-II Elect 1 clause no 2.01.01 Technical requirement			4 of 7		All ACDBs , DCDBs,Solenoid Valve DBs and MCC on travelling trippers shall be fixed module type. All 415 V Circuit breaker modules and other MCC modules shall be fully draw out type.	We understand from the Bid Clause that All ACDBs ,DCDBs,Solenoid Valve DBs shall be fixed type.M/s NTPC to confirm .	Technical specification is ample clear. Bidder to comply specification requirement
677	Part- B-II Elect 1 clause no 2.04.00 Technical requirement			4 of 7		All MV & LV circuit breakers shall be provided with Communicable Numerical Relays----.These relays shall be integrated with Employers Switchgear SCADA through Ethernet switches (to be supplied by Employer) mounted on each switchgear.	1)It is again requested to reconfirm following as per technical specifications : i. All the 11 KV/3.3KV & LT Incomers , Ties, Bus couplers , Transformer feeders shall be controlled from Switchgear SCADA and also from DDCMIS. ii. The Switchgear SCADA shall be supplied by Employer	This clause is deleted. Please refer amendment of Technical Specification(Section VI)
678	Part- B-II Elect 1 clause no 7.00.00 Technical requirement			7 of 7		Equipment through Fault withstand capabilities under worst operating conditions duly taking into account negative tolerances on transformer and maximum fault levels of source etc. shall be as follows-----.	M/s NTPC It is requested to provide the through fault with stand capabilities criteria for incoming cables to 11/0.433 KV Switchgear.	Bidder to refer Cl 7.00.00 of Chapter E1, Part- B in this regard
679	Part- B-II Elect 2 clause no 2.01.05 & 3.02.05 Technical requirement			2 & 5		The Cable vault / Cable spreader room space below the HT/LT switchgear room, control room, Unit control equipment-----. Cable Trenches shall be provided only in Switchgear/MCC rooms	It is proposed to provide cable trenches as per cl no 3.02.05 in Switchgear room. No Cable vault / Cable spreader is considered for Switchgear room.M/s NTPC to confirm acceptance.	Technical specifications are clear. Bidder to comply with the technical specifications requirements
680	Part- B-II Elect 1 clause no 7.00.09 Technical requirement			4		SIC termination kit shall be suitable for fault level of 25KA for 0.17 sec	It is requested to reconfirm the fault level for Termination Kit.	Confirmed. Bidder to comply technical specification

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
681	Part- A Elect 1 Subsection-IIIB Electrical System/Equipment clause no 1.08.00 Technical requirement			2 of 6		Contractor scope shall include laying of cable from employer board ---- on the employers nearest trestle in the FGD Area subject to availability of space & suitability. In case of non availability of space in employer trestle , contractor shall make necessary arrangement for cable tray erection & cable laying	Due to space constraint ,It is not feasible to construct a new trestle from Main Plant Area for FGD System cabling. Hence existing Trestle shall have to be utilized for cabling to FGD Switchgear from Main plant. M/s NTPC is requested to undertake the exercise to create the space in existing trestle for FGD cabling .	Bidder to comply with technical specification requirement clause no: - 1.08.00.2. However bidder may visit the project in order to get itself acquainted with existing electrical of plant
682	SUB SECTION-II-A10-PROJECT INFORMATION-BARH-I 3X660 MW			30		List of Drawings, SI No-2(Topographical Survey Drawing) & SI No-3(Equipment Layout Plan) are missing.	NTPC to submit the soft copies(Autocad drawing) of missing drawings.	The query does not pertain to North Karanpura Project.
683	SUB-SECTION-II-A8 PROJECT INFORMATION- NABINAGAR-I 3X660 MW			-		Topographical survey drawing is missing	NTPC to submit the soft copies(Autocad drawing) of topographical survey drawings.	The query does not pertain to North Karanpura Project.
684	SUB-SECTION-II-A8 PROJECT INFORMATION- NABINAGAR-I 3X660 MW_Clause No:6.00.00			9		SITE SPECIFIC DESIGN PARAMETERS: The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows: a) The basic wind speed "Vb" at ten	NTPC to furnish basic wind speed "Vb" at 10m height above the mean ground level.	The query does not pertain to North Karanpura Project.
685	SUB-SECTION-II-A8 PROJECT INFORMATION- NABINAGAR-I 3X660 MW_Clause No:7.08.00_SR-g_Item No-2			21		2) In view of the above, the following shall be adopted for all foundations and substructures,	Item description is incomplete.	The query does not pertain to North Karanpura Project.
686	SUB-SECTION-II-A3,A4,A6,A7 & A11 PROJECT INFORMATION-			-		Bore log details for following projects are missing, 1. Solapur STPP, Stage-II (2x660MW), 2. Gadawara STPP, Stage-I (2x800MW), 3.Nabinagar TPP (4X250 MW), 4. DARLIPALLI STPP, Stage-I (2X800 MW), 5. Tanda STPP, Stage-II (2x660MW)	NTPC to furnish the borelog details of missing project.	The query does not pertain to North Karanpura Project.

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Sl. No.	ENQUIRY SPECIFICATION					SPECIFICATION REQUIREMENT	COMMENTS / CLARIFICATION	NTPC CLARIFICATION
	Section / Part / Chapter			Clause No.	Page No.			
687	SECTION -VI TECHNICAL SPECIFICATION, Clause: 4.02.00			18		The scope for foul water from toilets shall include layout and laying of sewers up to the Employer's main sewer line for sewerage system together with all fittings and fixtures and inclusive of ancillary works such as connections, manholes and inspection chambers within the building and from the building to the Employer's sewer line.	NTPC to furnish the existng Sewer layout drawing.	Bidder to comply Sewage Layout drg of plant area shall be shared with successful bidder at detailed Engg. Stage.
688	SECTION -VI TECHNICAL SPECIFICATION, Clause: 4.02.00, Clause: 21.00.00, Clause: 15.00.00			29,41,32		Clause: 4.02.00 -For sewerage below ground stoneware pipes conforming to 18: 651 with concrete bedding and haunch. Clause: 21.00.00 -Sewer lines (Cast Iron), interconnected by sewer manholes (RCC) at regular intervals (not exceeding 30 meter centre to centre) shall be provided to	NTPC to confirm the type of pipe to be used for sewage disposal.	Bidder to comply to clause15.00.00 for sewage works.
689	SECTION -VI TECHNICAL SPECIFICATION, Clause: 12.00.00			30		Specification pertaing to road shoulder(shoulder width, subgrade materials used and their thickness) is missing.	NTPC to furnish the shoulder specification.	Bidder to provide 12m and 6m wide concrete roads without shoulders as per tender drg. titled"Layout Plan Of FGD System"No. 4410-999-POC-F-001
690	SECTION -VI TECHNICAL SPECIFICATION, Clause: 15.00.00			32		Sewage pump house shall be provided as per IS:4111	NTPC to furnish the sewage pump house specification.	For sewage pumping, an underground RCC sump of one day storage with submersible pumps , complete with all fittings and fixtures
691	Sec-VI Part-D ,ECC			Clause no. 28.04.00	Page no. 12	Site laboratory for Civil Work	Bidder through its civil work subcontractors will set up a temporary field quality Lab to conduct normal civil work tests at site. However, customer to allow bidder/it's subcontractors to take back those field quality lab equipment after completion of work at site. Please confirm.	Noted

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
1.	SECTION – VI, PART-B	SUB-SECTION N-III-C2 MEASURING INSTRUMENTS	18 to 30 of 30	10.00.00, 10.01.00, 10.02.00, 10.03.00, 10.04.00, 11.00.00, 11.01.00, 11.02.00, 11.03.00, 11.04.00, 11.05.00, 11.06.00, 11.07.00, 11.08.00	Clauses 10.00.00 to 10.04.00 and clauses 11.00.00 to 11.08.00	Clauses 10.00.00 to 10.04.00 and clauses 11.00.00 to 11.08.00 replaced as per attached C&I Annexure-I
2.	SECTION – VI, PART-A	SUB-SECTION N-VII, Mandatory Spares	23 of 38	Main clause 5.00.00	Clause no. 1.01.01, 1.01.02, 1.01.03, 1.01.04, 1.02.00, 1.03.00, 1.07.00	Clause no. 1.01.01, 1.01.02, 1.01.03, 1.01.04, 1.02.00, 1.03.00, 1.07.00 (Main clause 5.00.00 CONTROL AND INSTRUMENTATION) replaced as per attached C&I Annexure-II.
3.	SECTION – VI, PART-A	SUB-SECTION N-VII, Mandatory Spares	23 of 38	Main clause 5.00.00	---	New Clause no. 1.01.05, 1.11.00 added in mandatory spare main clause 5.00.00 as per attached C&I Annexure-II.

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAU SE NO.		
4.	SECTION – VI, PART-A	SUB-SECTION N-VII, Mandator y Spares	35 of 38 18 of 38	ELECTRI CAL ACTUAT ORS	ELECTRICAL ACTUATORS Mandatory spare 4.00.00 FIRE DETECTION AND PROTECTION SYSTEM	Mandatory spare of ELECTRICAL ACTUATORS replaced as per attached C&I Annexure-II . New Clause no. 7.5, 7.6 added in mandatory spare main clause 4.00.00 as per attached C&I Annexure-II
5.	SECTION – VI, PART-B	SUB-SECTION N-II-E8 ELECTRI C ACTUAT OR WITH INTEGR AL STARTE RS	1 to 5 of 5		SUB SECTION-II-E8 ELECTRIC ACTUATOR WITH INTEGRAL STARTERS	CHAPTER DELETED
6.	SECTION – VI, PART-B	SUB-SECTION N-IIIC-8 ELECTRI C ACTUAT ORS	1 to 4 of 4		SUB-SECTION-IIIC-8 ELECTRIC ACTUATORS	NEW CHAPTER ADDED as per attached C&I Annexure-III .
7.	SECTION – VI, PART-B	SUB-SECTION N-III-C2 MEASUR ING INSTRU MENTS	2 of 30	2.01.00	2.01.00 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS	Clauses 2.01.00 SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS updated as per attached C&I Annexure-IV .
8.	SECTION – VI, PART-B	SUB-SECTION N-III-C2 MEASUR ING	9 of 30	3.05.00	3.05.00 TEMPERATURE TRANSMITTER (TT)	3.05.00 TEMPERATURE TRANSMITTER (TT) updated as per attached C&I Annexure-IV .
NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2					AMENDMENT NO. CS-4410-109-2-AMDT-14	Page 2 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAU SE NO.		
		INSTRU MENTS				
9.	SECTION – VI, PART-B	SUB-SECTIO N-III-C2 MEASUR ING INSTRU MENTS	30 of 30	New clause 12.00.00	--	New clause 12.00.00 Vibration Monitoring System (VMS) added as per attached C&I Annexure-IV .
10.	SECTION – VI, PART-B	SUB-SECTIO N-III-C2 MEASUR ING INSTRU MENTS	30 of 30	New clause 13.00.00	--	NEW clause 13.00.00 FIELD INSTRUMENTS BASED ON FIELDBUS added as per attached C&I Annexure-IV .
11.	SECTION – VI, PART-B	SUB-SECTIO N-III-C9 CONTRO L DESK & PANELS	1 to 3 of 3		----	SUB-SECTION-III-C9 CONTROL DESK & PANELS NEW CHAPTER ADDED as per attached C&I Annexure-V .
12.	SECTION – VI, PART-B	SUB-SECTIO N-III-C5 PLC BASED CONTRO L SYSTEM			SUB-SECTION-III-C5 PLC BASED CONTROL SYSTEM	CHAPTER replaced with SUB-SECTION-III-C5, DDCMIS as per attached C&I Annexure-VI .

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
13.	SECTION – VI, PART-B	SUB-SECTION-III-C-10 POWER SUPPLY			---	SUB-SECTION-III-C-10 POWER SUPPLY SEPARATE CHAPTER for POWER SUPPLY ADDED as per attached C&I Annexure-VII.
14.	SECTION – VI, PART-A	SUB-SECTION-III-B	1 of 6	1.05.00	Electric actuators with integral starters along with associated accessories etc shall be supplied on as required basis for Valves / Dampers to meet the functional and the other specification requirements.	DELETED.
15.	SECTION – VI, PART-A	SUB-SECTION-III-C C&I	1 to 9		Sub Section III-C/Part-A.	Replacing existing III-C/Part-A with attached C&I Annexure-VIII.
16.	SECTION – VI, PART-E	Tender drawing C&I			Standard configuration drawing for PLC based offsite control system. Tender drawing no. 0000-151-POI-A-013.	Standard configuration drawing for control system. Tender drawing no. 0000-151-POI-A-013 updated and attached as per C&I Annexure-IX.
17.	SECTION – VI, PART-A	SUB-SECTION-III-A1, FGD	7 OF 8	10.01.00	Gypsum Dewatering system & FGD common control room & analyser room (if required) . The buildings must be complete.....	Gypsum Dewatering system & FGD common control room & containerised room (portable cabin)/analyser room for analysers. The buildings must be complete.....

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AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAU SE NO.		
18.	SECTION – VI, PART-B	SUB-SECTION-IIIIC-11 Containerised cabin (Portable room)				SUB-SECTION-IIIIC-11 CONTAINERISED ROOM (PORTABLE CABIN) SEPARATE CHAPTER ADDED as per attached C&I Annexure-X.
19.	VI/B	II-E12	4 of 30	1.01.00(s) (3)	LV Phase Terminal 3.45 KV- Busduct (Non-Segregated)	LV Phase Terminal 3.45 KV- Busduct
20.	VI/A	VII	36 of 38	-	-	List of Mandatory spares for Transformers (Annexure-E0)
21.	VI/F	DE14	-	-	-	Data sheet format for Dry type indoor transformer (Annexure-E3)
22.	VI/E				Electrical Single Line Diagram for FGD Package 4410-109-POE-J-001 rev A	Electrical Single Line Diagram for FGD Package 4410-109-POE-J-001 rev B (Annexure-E4)
23.	VI/B	II-E1	4 of 7	2.05.00		Contractor shall make necessary provisions for owners's HT switchgear control from owners DDCMIS/Contractor's FGD DDCMIS/ PLC (as decided during detailed engineering). Necessary control wiring for this purpose also shall be in contractor's scope.
24.	VI/B	II-E2	2 of 9	3.01.00 b)	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency	Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have
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AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					class-IE3, conforming to IS 12615, or IEC:60034-30.	minimum design efficiency of 95 %. Tolerance on efficiency value applicable as per IEC 60034.
25.	VI/B	II-E2	2 of 9	3.01.00 d)	Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.	Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation . Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.
26.	VI/B	II-E2	2 of 9	3.01.00 e)	-	Motors operating through variable frequency drives shall also meet the requirements mentioned in subsection for VFD.
27.	VI/B	II-E2	4 of 9	7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.	Motors rated above 1000KW shall have insulated bearings/ housing to prevent flow of shaft currents.
28.	VI/B	II-E2	7 of 9	10.02.03	The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only	The following type test reports shall be submitted for each type and rating of LT motor of above 100 KW only
29.	VI/B	II-E2	5 of 9	7.11.00	The spacing between gland plate & center of terminal stud shall be as per Table-I.	The spacing between gland plate & center of bottom terminal stud shall be as per Table-I.
30.	VI/B	II-E2	9 of 9	Table - 1	Minimum distance between centre of stud and gland plate in mm Above 125 KW-upto 200 KW 203	Minimum distance between centre of bottom terminal stud and gland plate in mm Above 125 KW-upto 200 KW 385/203 (For Single core cables only)

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AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
31.	VI/B	II-E3	5 of 11	3.06.01	A continuous 65 x 8 mm galvanised mild steel earth bar shall be provided along the entire run of each busduct.	A continuous 65 x 8 mm galvanised mild steel or aluminium earth bar shall be provided along the entire run of each busduct.
32.	VI/A	III-B	5 of 6	1.15.00	-	Variable Frequency Drive (VFD) The VFD system shall be provided for the equipment drive motors as envisaged in relevant portions of the specifications for equipment. The system shall be either Voltage Source Inverter (VSI) or Current Source Inverter (CSI) type. Complete VFD system alongwith associated equipment, HT/LT panel, HT/LT cable, Transformer etc. as applicable shall be provided. Bidder to provide Air conditioned room to house Variable Frequency Drive (VFD).
33.	VI/B	II-E18	-	-		VARIABLE FREQUENCY DRIVE (VFD) chapter added as Annexure -E2
34.	VI/B	II-E12	2 of 30	1.01.00 (n) 5 Method of neutral earthing and Vector group	REPLACE EXISTING TABLE.	ATTACHED TABLES—Annexure E1
35.	VI/B	II-E12	3 of 30	1.01.00 (p)	REPLACE EXISTING TABLE.	ATTACHED TABLES—Annexure E1

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36.	VI/B	II-E12	4 of 30	1.01.00 (r)	REPLACE EXISTING TABLE.	ATTACHED TABLES—Annexure E1
37.	VI/B	II-E12	5 of 30	1.01.00 (t)	REPLACE EXISTING TABLE.	ATTACHED TABLES—Annexure E1
38.	VI/B	II-E6	6 of 69	3.05.01	Tender drg. no 0000-211-POE –A-51-RA of cable lug attached at the end of this chapter (Drawing was missing)	Tender drg. no 0000-211-POE –A-51-RA of cable lug attached at the end of this chapter (Annexure E5)
39.	VI/B	II-E15	10 of 17	4.00.00 (19)	In the Offsite area/ buildings DC lighting shall be provided by self-contained 90 minutes duration Emergency lighting fixtures. Each shall be provided with Ni-cd battery, battery Charger & 2x10W fluorescent lamps.	DELETED
40.	VI/B	II-E4	4 of 6	2.14.04	Cables shall be armoured type if laid in CHP area or directly buried.	All Cables shall be armoured type.
41.	VI/B	II-E4	4 of 6	2.14.06	NA	Same cable sizes to be used for same type of application & rating of motor i.e if there are three pumps for one application, all three pumps motor should be provided with same cable sizes.
42.	VI/B	II-E4	5 of 6	4.00.00.c	The standard drum length for power cables shall be 1000 meters ; however for cable sizes of 1C X 630mm ² , 3C X 150mm ² and 3C X 240mm ² (sizes if applicable) standard drum length shall be 750 meters. The length per drum shall be subjected to a maximum tolerance of	The standard drum length of LT power cable with a maximum tolerance of +/- 5% may be decided by the bidder subject to condition that there shall not be any joint in cable, where application length of cable is up to & including 1000 meter for single core cable
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					+/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drums with shorter lengths	excluding 630 sq.mm size, and 750 meter for multicore cable & single core 630 sq.mm
43.	VI/B	II-E7	4 of 7	2.16.04	Cables shall be armoured type if laid in CHP area or directly buried.	All Cables shall be armoured type
44.	VI/B	II-E7	5 of 7	4.01.03	The standard length for HT power cables shall be 1000 meter for all single core cables and 750 meters for 3 core cables. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drum with shorter lengths. One drum length of each cable size can be of non standard length (not less than 250 meter) so as to match the ordered quantity. For each size, the variance of total quantity, adding all the supplied drum lengths, from the ordered quantity, shall not exceed +/-2% and the payment shall be made based on the actual cable length supplied within this limit.	The standard drum length for HT power cables with a maximum tolerance of +/- 5%, may be decided by the bidder subject to condition that there shall not be any joint in cable, where application length of cable is up to & including 1000 meter for single core cable, and 750 meter for multicore cable.
45.	VI/B	II-E6	2 of 69	2.01.01	Interplant cabling..... one route. All buried cables shall be armoured	Interplant cabling..... one route.. Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken
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						by Bidder All HT, LT and Control cables shall be armored.
46.	VI/B	II-E5	3 of 6	2.14.02	Cables shall be armoured type if laid in CHP area or directly burried	All Cables shall be armoured type.
47.	VI/B	II-E5	4 of 6	4.00.00.c	The standard length for HT power cables shall be 1000 meter. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drums with shorter lengths	The standard drum length for control cables with a maximum tolerance of +/- 5% may be decided by the bidder subject to condition that there shall not be any joint in cable, where application length of cable is up to & including 1000 meter.
48.	VI/B	II-E12	21 of 30	5.00.00	(a) The Contractor shall carry out a comprehensive..... (b) The Contractor shall carry out all type..... (c) The bidder shall indicate the charges for each of these type..... (d) The equipment checks to be carried out by the..... (e) The requirements of site tests are..... (f) The makes of all major bought out items shall be..... (g) Each transformer shall be completely assembled..... (h) The type tests shall be carried out in presence.....	(a) The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests under this contract free of cost to the Owner and submit the reports for approval. Type test report of following is also need to be

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					(i) In case the contractor has conducted such..... (j) Following components to be supplied shall be..... (k) All acceptance and routine tests as per the specification.....included in the equipment price	submitted: (a) All type test on OLTC as per IEC 60214 (wherever applicable) (b) Neutral Grounding Resistors (c) Tank Vacuum and Pressure test (b) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price. (c) Each transformer shall be completely assembled with all fittings & accessories meant for the particular transformer before offering for inspection & testing by Employer.
49.	VI/B	II E-2	4 of 9	7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled(metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.	3.3 KV motors shall be offered with dust tight phase separated double walled(metallic as well as insulated barrier) Terminal box. Contractor shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.

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50.	VI/B	II E-02	4 of 9	7.07.00	Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.	Each bearing of HT motor shall be provided with dial type thermometer and min. 2 numbers duplex platinum resistance type temperature detectors.
51.	Amendment No. 01 to technical specification (Section-VI) Sl. No. 175, Page 67				Single-flue chimney(s) shall be provided. Chimney shall be of reinforced concrete construction. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.	Configuration and height of chimney(s) shall be as specified in mechanical portion of technical specification. There shall be one flue (liner) for each unit. The centre to centre distance between the proposed chimney(s) and the existing chimney(s) in any direction shall not be less than 150 metres.
52.	VI/B	IV-D	3.14.01 Para 3	11 of 114	The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be bottom supported and shall be profiled into a circular shape to connect to the flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic fluoroelastomeric fabric expansion joint.	The flue duct outside the chimney shall be suitably connected to the flue liner inside the chimney through a transition duct. The transition duct shall be profiled into a circular shape to connect to the flue liner. The flue duct shall be so designed that no load is transferred on the chimney shell due to the duct. The interface between the flue liner and the transition ducting shall be provided with non-metallic expansion joint.

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53.	VI/B	IV-D	3.14.01 Para 4	11 of 114	The expansion joint in the flue liner shall comprise of non-metallic fluoroelastomeric material suitable to withstand a temperature of 300 Deg C , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable to withstand a temperature of 300 Deg C and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh.	The expansion joint in the flue liner shall comprise of non-metallic material suitable for wet stack operations , shall be acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable for wet stack operations and acid resistant to withstand acidic flue gas condensates arising out of flue gas parameters & operating conditions as specified elsewhere in the specification. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. Design of expansion joint shall comply EPRI guideline to avoid contact of condensate with expansion joint material and to ensure drainage of condensate.
54.	VI/B	IV-D	3.14.01 Para 5	11 of 114	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell with chequered plate floor panels and pipe handrails, shall be provided for full height of the chimney and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.	Chimney roof shall be of RCC slab over a grid of structural steel beams and provided with rainwater drainage system. An internal structural steel staircase supported from chimney shell with chequered plate floor panels and pipe handrails, shall be provided upto the platform just below roof platform and an internal cage ladder for a small height, over last staircase landing to access the chimney roof through a roof access hatch.

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55.	VI/B	IV-D	3.14.01 Para 6	11 of 114	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, mild steel wind strakes (if required) , all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects.	The other components of the chimney include liner test ports (for continuous pollution monitoring), liner hatches, grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, all finishing works, electrical power distribution boards, lighting panels, power & control cabling and wiring systems, stair and platforms lighting, socket outlet, lightning protection and grounding system, aviation obstruction lighting with photoelectric controller etc, communication system, a rack and pinion elevator and other items, though not specifically mentioned but reasonably implied and necessary to complete the job in all respects.
56.	VI/B	IV-D	3.14.02 Para 7	12 of 114	The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings. Design of all chimney components shall be based on working stress method.	The chimney and its components shall be designed to resist the most onerous forces resulting from all the possible combinations of the various loadings.

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57.	VI/B	IV-D	3.14.03 Para 1	12 of 114	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The load calculation and load combinations shall be as detailed in IS 4998 (Part 1) : 1992. The wind shield shall be analysed for cases with and without flue liner loads.	The wind shield shall be designed for vertical loading, cross wind loading, seismic loading, circumferential wind loading, thermal gradients etc. The analysis and design of wind shield shall be carried out as per IS 4998 . The wind shield shall be analysed for cases with and without flue liner loads.
58.	VI/B	IV-D	3.14.03 Para 2	12 of 114	Forces/stresses in the wind shield due to eccentricity effects of local (e.g. corbel) loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered.	Forces/stresses in the wind shield due to eccentricity effects of local loadings, insulations effects, rotation of chimney foundations, construction tolerances and moments of second order shall also be considered.
59.	VI/B	IV-D	3.14.03 Para 6	12 of 114	The stresses for the shell design shall not exceed the limits given in Cl. 7.0 of IS:4998 (PART-I) 1975 for various combinations of loads, excepting the stress in concrete for the case of dead load + wind load which shall not exceed $0.30f_{ck}$ where f_{ck} is the characteristic compressive strength of concrete.	DELETED

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60.	VI/B	IV-D	3.14.03 Para 9	13 of 114	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a sudden change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.	There shall not be any reverse (outward) slope in the inside face of chimney shell. Where there is a change in slope/ profile of the shell, the circumferential reinforcement shall be increased to twice the requirement as per the design in a circumferential band extending atleast 3m above and below such slope/profile change level.
61.	VI/B	IV-D	3.14.03 Para 14	13 of 114	The final design shall be checked & verified by 'Wind Tunnel Test' and shall be conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located in the area or in the future expansion stage of the project shall be determined along with the other topographical features of the local area through model test.	The final design shall be checked & verified by 'Wind Tunnel Test' conducted at a reputed institution. Dynamic interference effects due to additional chimney(s)/NDCTS's and other tall structures located upto distance of 20 times diameter at 2/3rd height of subject chimney , in the area or in the future expansion stage of the project, as envisaged by the owner at the time testing , shall be determined along with the other topographical features of the local area through model test.
62.	VI/B	IV-D	3.14.04 Para 5	13 of 114	Clean-out door shall be provided below the flue for the removal of ash.	DELETED

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63.	VI/B	IV-D	3.14.07 Para 5	14 of 114	The chimney foundation shall be designed for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation for any loading condition. Since chimney is a wind sensitive structure no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. No allowance shall be made in the stresses for design of foundation for wind loading. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 25 .	The chimney foundation shall be designed as per limit state method as per IS 4998 for the most critical combination of forces and moments, resulting from all possible combinations of the various loadings from the chimney system during all stages of constructions. The effect of water table shall be considered and the foundation shall be checked for overturning for minimum and maximum vertical loads. There should be no uplift under any portion of the foundation/ piles for any loading condition. Since chimney is a wind sensitive structure, no allowance shall be made in the load carrying capacity of the bearing strata / piles under any load case/combination with wind. The foundation diameter to depth ratio shall be maintained to around 10 and should preferably not exceed 12. The diameter of the reinforcing bar for the main radial and tangential reinforcement for the foundation shall not be less than 25mm. The spacing of radial steel at the outer edge of the foundation shall not be more than 250mm. Grade of concrete for foundation shall be minimum M 30 .
64.	VI/B	IV-D	3.14.08 Para 2	14 of 114	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner)	Thermal insulation (Applicable in case of Titanium / C-276 Flue Liner)

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					The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. The density of insulation shall not be less than 64 kg/cu.m for resin bonded glass wool insulation and 100 kg/cu.m for resin bonded rock wool. The coefficient of thermal conductivity of insulation shall not be more than 0.52mW/cm/oC at a mean temperature of 100°C. The insulation thickness shall be determined based on the maximum/minimum ambient temperature, surface air velocity worked out based on the draught of ventilation air in the annular space between the flue liner and chimney shell, insulation surface emissivity of 0.3 and the insulation cold face maximum temperature not exceeding 55 degree Celsius. The draught of air in the annular space shall be the natural draught created by the heating of air by the flue liner and the air being vented out through the openings in the chimney shell. The increase in the annulus air temperature due to the rising heated air shall be taken into account while calculating the insulation thickness. The insulation thickness shall not be less than 100 mm, in any case, and shall be provided in two layers with the second layer of insulation covering	The insulation shall be semi rigid, resin bonded type, in the form of slabs and shall conform to IS: 8183. Blanket type insulation shall not be used. The density of insulation shall not be less than 64 kg/cu.m for resin bonded glass wool insulation and 100 kg/cu.m for resin bonded rock wool. The coefficient of thermal conductivity of insulation shall not be more than 0.52mW/cm/oC at a mean temperature of 100°C. The insulation thickness shall not be less than 100 mm, in any case, and shall be provided in two layers with the second layer of insulation covering the joints of the first layer. The insulation shall be wrapped on the outer-most surface with galvanized wire mesh using MS galvanised pins and speed washer.

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					the joints of the first layer. The insulation shall be wrapped on the outer-most surface with galvanized wire mesh using MS galvanised pins and speed washer.	
65.	VI/B	IV-D	3.14.09 (i)	15 of 114	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) except surfaces of steel wind strakes shall be painted as specified in corrosion protection clause of this specification.	All exposed steel surfaces (including exterior surface of mild steel flue liner in case the design does not envisage provision of thermal insulation on the exterior surface of flue liner) shall be painted as specified in corrosion protection clause of this specification.
66.	VI/B	IV-D	3.14.09 (ii)	15 of 114	All exposed surfaces of steel wind strakes shall be painted with epoxy phenolic coating system having total 240 microns DFT. a) All steel surfaces shall be provided with two component epoxy primer coat (having solid by volume minimum 51% $\pm 2\%$) of minimum 70 micron DFT to be applied over blast cleaned surface conforming to Sa 2½ finish of ISO 8501-1 with surface profile 40-60 Micron. The primer coat shall be applied in shop immediately after blast cleaning by airless spray technique. b) Primer coat shall be followed with the application of Intermediate coat of epoxy phenolic coating (solid by volume minimum 63%) of minimum 100 micron DFT. This coat shall be applied in shop after an interval of minimum 24	DELETED

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					hours (from the application of primer coat) by airless spray technique. c) Intermediate coat shall be followed with the application of finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% $\pm$ 2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 Δ E) and minimum 70 micron DFT. This coat shall be applied in shop after an interval of minimum 10 hours and within six (6) months (from the completion of Intermediate coat), Colour and shade of the coat shall be as approved by the Employer.	
67.	VI/B	IV-D	3.14.09 (iii)	15 of 114	All steel parts embedded in concrete like Strake embedment assembly including bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.	All steel parts embedded in concrete like bolts, nuts, washers, pipe sleeves and insert plate shall be galvanized as per IS:4736. The minimum weight for galvanizing shall be 610 g/sq.m and shall comply with relevant IS Codes.
68.	VI/A	D-01	1 OF 282	5.03.09, PARA 7, LINE 3	The type of aviation obstruction lighting system shall be of medium intensity aviation obstruction lights having an effective intensity of 2000 to 20,000 cd depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 20000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at	The type of aviation obstruction lighting system shall be of high intensity aviation obstruction lights having an effective intensity of 4000 to 200,000 cd (minimum) depending upon back ground illuminance. Obstacle lights shall have a day time effective intensity of minimum 200000 cd. The intensity of lights shall be 20000 cd $\pm$ 25% at twilight and shall reduce automatically to a night time
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					twilight and shall reduce automatically to a night time intensity of 2000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc..	intensity of 4000 cd $\pm$ 25% through the use of photo-cell. The obstacle lights shall flash simultaneously at a rate between 20 to 60 per minute. A minimum of three levels will be provided with aviation obstruction lights and there will be four light units per level. The lowest level should not be lower than 45 meters above the ground and vertical spacing of the intermediate levels could vary between 45 and 105 meters. The intermediate lights shall be spaced as equally as possible. Aviation obstruction lighting shall be complete with lights, photo cell, controller, special cables, etc..
69.				New Clause		Bidder shall utilize the area identified for FGD purpose. The area identified for FGD purpose in GLP shall be levelled and free from obstructions like sheds, trees etc. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.
70.				New Clause		Dismantling & Removal of asbestos sheet shall be done by owner. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.

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71.	SECTION-VI/ Part-A	V SALIEN T DESIG N DATA	7.01.00 (15)	8 of 10	For areas, where A/C load is of the order of 25-60 TR, Direct Expansion (DX) type Condensing unit (with AHU) shall be provided depending on the availability of space/ layout etc. For areas, where A/C load is of the order of 15-25TR, ductable split/package d A/C shall be provided. Smaller areas which are away from the D-X type Condensing unit /central chilling units which may require air conditioning upto 15 TR rating shall be served with Hi-wall Split/Cassette air conditioner units as per requirement.	For areas like FGD control room, ZLD control room (if provided) and /or FGD cum ZLD control room (as the case may be) where load is more than 15TR ,Direct expansion (D-X) type condensing unit (with AHU) shall be provided. For other areas where air conditioning requirement is 5-15 TR ductable split/package d A/C shall be provided. If the air conditioning load is less than 5TR, then Hi-wall Split/Cassette air conditioner shall be provided.
72.	VI/B	I-M4	5.02.00(b)	Page 2 of 18	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries covered under MVW Spray System.	Linear heat sensing cable detection system Gypsum and lime conveyor of FGD system and Cable Galleries.
73.	VI/B	I-M4	5.02.00(c)	Page 2 of 18	Quartzoid bulb heat detection system Equipments protected by HVW spray system, conveyors protected by MVW spray system.	Quartzoid bulb heat detection system Equipments protected by HVW spray system.
74.	VI/B	I-M4 Fire Detect ion & Protec tion Syste m	5.15.00Notes: (3)	Page 13 of 18	Over and above, contractor may note that short term fire proof cables shall be provided for coal handling plant and inert gas protected areas. Short term fire proof cables shall be Mineral insulated copper conductor and copper sheathed type satisfying requirements of Fire resistance, safety in the industrial application areas mentioned in the specification and also, shall be approved by UL standards and certified by LPCB. The contractor	Over and above, contractor shall provide all the cables so as to complete the system.

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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
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					shall provide all the cables so as to complete the system.	
75.	VI/A	III-A3	2.00.00 (C)	2 of 5	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building, Recirculation pump & Oxidation, Blower/compressor building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans.	Miscellaneous areas: All other areas like Limestone Grinding system building, Gypsum dewatering building, Recirculation pump & Oxidation Blower/compressor building etc & all other non-air conditioned areas covered under this package shall be ventilated by a combination of supply/exhaust fans and fresh air in-take / back draft louvers. For ventilation of Battery rooms and Oil rooms, fans with flame proof motor shall be used. Further, toilets shall be provided with propeller type exhaust air fans. Note: The above list of Buildings is indicative only. Any Building under this package which are of enclosed type, shall be provided by Mechanical ventilation.
76.	VI/B	I-M4	5.05.00 (2)	4 of 18	The detection zone/loop divisions of LHSC system shall match with MVW spray zones. Conveyors where LHSC shall be installed shall be divided into no. of various zones whereas conveyor for which IR detector is installed shall be considered as one zone.	The clause stands deleted
77.	VI/B	I-M4	5.16.00 (i) c)	13 of 18	Upon detection of fire either by QB detector or LHSC detector, the spray system shall be initiated.	The clause stands deleted

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					It shall also initiate spray system for the two adjacent zones after a time delay settable at site.	
78.	VI/B	I-M4	5.05.00 (1)	4 of 18	Mounting arrangement have been indicated in tender drawing.	Mounting arrangement will be provided as per proven practice.
79.	VI/B	I-M3	4.00.00, (Air Cooled D-X type) Technical Requirement of Air Conditioning and Ventilation System	2 OF 27	Motor Rating: 10% more than the power required by the compressor at 50 deg C design ambient temperature	The referred details for Motor rating in this clause stands deleted.
80.	VI/E				LIME STONE FLOW DIAGRAM 4410-000-2-POM-002 Rev. B	LIME STONE FLOW DIAGRAM 4410-000-2-POM-002 Rev. C attached at Mechanical Annexure-IA &IB
81.	VI/E	IIIA-2	1.01.00	1 of 7	SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT (i)Two (2) no. Truck Hoppers (TH-1 &2) each having 60 Ton capacity along with apron feeders (AF-1 & AF-2) shall be provided to unload limestone from self-tipling trucks.	SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT (i)Two (2) no. Truck Hoppers (TH-1 &2) each having 90 Ton capacity along with apron feeders (AF-1 & AF-2) shall be provided to unload limestone from self-tipling trucks. Apron feeders receiving
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					Apron feeders receiving Limestone from TH-1, TH-2, shall drop coal on to conveyors 1 A/B .Each Apron feeder shall be of 150 MTPH rated capacity. The rated capacity of conveyor 1A/B shall be 150 MTPH. Alternatively two numbers bulk receiving unit along with surface feeders etc. each rated for 150 TPH capacity shall be provided The feeders shall feed to conveyor 1A/B located at ground level.	Limestone from TH-1, TH-2, shall drop coal on to conveyors 1 A/B .Each Apron feeder shall be of 150 MTPH rated capacity. The rated capacity of conveyor 1A/B shall be 150 MTPH. Alternatively two numbers bulk receiving unit along with surface feeders etc. each rated for 150 TPH capacity shall be provided. The individual feeder shall feed to conveyor 1A or 1B respectively located at ground level.
82.	VI/B	III-A2	1.01.00	2 of 7	SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT (V) Conveyor 2A/2B shall feed limestone to Stacking conveyor 3A/3B or Conveyor 5A at Junction House (JH-1). Conveyor 2B shall feed limestone to Stacking conveyor 3B or Conveyor 5B at Junction House (JH-1). (VI) Two (2) number paddle feeders (PF-1, PF-2), each of 150 MTPH rated capacity shall be installed below ground to reclaim the stored limestone and feed to underground conveyors 4A/B. Conveyor 4A/B shall drop limestone on to Conveyor 5A/B at Crusher house.	SYSTEM DESCRIPTION LIMESTONE HANDLING PLANT (v)Conveyor 2A/2B shall feed limestone to Stacking conveyor 3A/3B at Junction House (JH-1). (VII) Two (2) number paddle feeders (PF-1, PF-2), each of 150 MTPH rated capacity shall be installed below ground to reclaim the stored limestone and feed to underground conveyors 4A/B. Conveyor 4A/B shall drop limestone on to Conveyor 5A/B at Junction House (JH-2).

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					(VII)Stacking Conveyor 3A/B will drop limestone to storage hopper (One fourth (1/4 th) of total stipulated crushed limestone storage shall be considered in the hopper, if applicable, and hopper length shall be equal to stockpile length placed along the tripper centerline) provided within a shed via travelling trippers. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B.	(VII)Stacking Conveyor 3A/B will drop limestone to storage hopper (One fourth (1/4 th) of total stipulated crushed limestone storage shall be considered in the below ground hopper, and hopper length shall be equal to stockpile length placed along the tripper centerline) provided within a shed via travelling trippers or Conveyor 5A/B. One (1) number Traveling Tripper is mounted on each of the Stacking Conveyor 3A/B.
83.	VI/B	III-A2	1.01.00	2 of 7	(VIII)Conveyors 5A/B shall drop limestone in to Limestone Silos of FGD System through fixed Tripper on the first silo in the path. Alternatively diverter Plough is also acceptable in place of fixed tripper.	Add New Clause : (VIII) Conveyor 5A/B shall drop limestone on to Conveyor 6A/B at Junction House (JH-3). (IX) Conveyors 6A/B shall drop limestone in to Limestone Silos of FGD System through fixed Tripper on the first silo in the path. Alternatively diverter Plough is also acceptable in place of fixed tripper.
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84.	VI/A	III-A2	1.02.00		SYSTEM DESCRIPTION GYPSUM HANDLING PLANT (I)Dewatered Gypsum discharged from the vacuum belt filter shall be taken by Conveyor 6A/B to the storage shed. The storage shed shall be sufficient to store gypsum equivalent to gypsum generation of minimum 7 days (Generation of all three units to be considered). (II)One number of motorized travelling tripper on each of conveyor 7A/B shall drop the gypsum to the storage shed.	SYSTEM DESCRIPTION GYPSUM HANDLING PLANT (I)Dewatered Gypsum discharged from the vacuum belt filter shall be taken by Conveyor 7A/B to the storage shed. The storage shed shall be sufficient to store gypsum equivalent to gypsum generation of minimum 7 days (Generation of all three units to be considered). (II)One number of motorized travelling tripper on each of conveyor 7A/B shall drop the gypsum to the storage shed.
85.	VI/A	IIIA-2	2.01.06	4 of 7	Reclaim Conveyors 4A/B complete with tunnel, pent house, conveyor galleries along with its supporting structures, short supports, stringers, deck plate, seal plate, conveyor foundations, drive motors, drive units, pulleys, idlers, gravity take ups including guides, pits etc., internal and external belt cleaners, pull chord switches, belt sway and zero speed switches,	Reclaim Conveyors 4A/B complete with tunnel, conveyor ,supporting structures, short supports, stringers, deck plate, seal plate, conveyor foundations, drive motors, drive units, pulleys, idlers, gravity take ups including guides, pits etc., internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical etc. including all civil, structural and architectural

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					electro-hydraulic thruster brakes, all electrical etc. including all civil, structural and architectural works for tunnel, conveyor gallery, gallery supporting trestles and their associated foundations.	works for tunnel, conveyor gallery, gallery supporting trestles and their associated foundations.
86.	VI/A	IIIA-2			-----	Add New Clause Conveyors 6A/B complete with conveyor supporting structures, short supports, stringers, deck plates, conveyor foundations, drive motors, drive units, pulleys, idlers, take-ups, take-up structure, internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical, etc. including all civil, structural architectural works and their associated foundations.
87.	VI/A	IIIA-2	2.01.08	4 of 7	Junction House JH-1 complete with all civil, structural, architectural and electrical works including chutes, monorails, hoists/chain pulley blocks, hoist maintenance platforms, external staircases, dust debris chutes etc. JH-1 shall be provided with removable chequered plate covers over openings in	Junction House JH-1,JH-2,JH-3 complete with all civil, structural, architectural and electrical works including chutes, monorails, hoists/chain pulley blocks, hoist maintenance platforms, external staircases, dust debris chutes etc. JH-1,JH-2,JH-3 shall be provided with removable chequered plate covers over openings in machinery hatches for handling under ground equipment as applicable.

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					machinery hatches for handling under ground equipment.	
88.	VI/A	IIIA-2	2.01.12	4 of 7	Two (2) sets of gates each comprising of one number of rod gate and one number of actuator operated rack and pinion gate at inlet of each of the vibrating screen feeder feeding limestone to crushers complete with drive, all mechanical, electrical, structural works, etc.	Clause deleted
89.	VI/A	IIIA-2	3.01.00	7 of 7	a.Gypsum shall be conveyed from the vacuum belt filter discharge to the storage shed through conveyors 6A/B of 150 TPH rated capacity. c.Conveyors 6A/B complete with conveyor supporting structures, short supports, stringers, deck plates, conveyor foundations, drive motors, drive units, pulleys, idlers, take-ups, take-up structure, internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical, etc. including all civil, structural architectural works and their associated foundations.	a.Gypsum shall be conveyed from the vacuum belt filter discharge to the storage shed through conveyors 7A/B of 150 TPH rated capacity. c.Conveyors 7A/B complete with conveyor supporting structures, short supports, stringers, deck plates, conveyor foundations, drive motors, drive units, pulleys, idlers, take-ups, take-up structure, internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical, etc. including all civil, structural architectural works and their associated foundations. d.Two numbers (02) motorized travelling tripper on conveyors 7A/B for feeding the gypsum to the

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					d.Two numbers (02) motorized travelling tripper on conveyors 6A/B for feeding the gypsum to the storage shed. Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structures (along with structural stools, as required), cables with cable festooning arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc.	storage shed. Trippers shall be complete with all mechanical, electrical equipment, rails, chute work, rail supporting structures (along with structural stools, as required), cables with cable festooning arrangement, thruster brakes, rail clamps, electric hoist, actuator flap gates etc.
90.	VI/E				Layout of FGD area 4410-999—POM-A-001 Rev. B	Layout of FGD area 4410-999—POM-A-001 Rev. C enclosed at Mechanical Annexure-II
91.	Sl. No.-40 AMENDMENT NO. CS-4410-109-2-AMDT-08		18 of 83		The duct to Absorber inlet thickness. The duct from Absorber outlet to wet stack inlet shall be made of Carbon steel of minimum 7 mm thickness clad with minimum 2 mm thickness of Alloy C-276 / Alloy 59 or better material.	The duct to Absorber inlet thickness. The duct from Absorber outlet to wet stack inlet shall be made of Carbon steel of minimum 7mm thickness clad with 2 mm (minimum) thickness Alloy C276 / Alloy 59 / Titanium Gr-II.
92.	VI/B	I-M1	29 of 49	10.01.00	Slurry & Process Water Tanks: All the slurry tanks.....valves etc. Coarse- screen(s) at suction-side of these pumps shall be provided.	Slurry & Process Water Tanks: All the slurry tanks.....valves etc. Coarse- screen(s) at suction-side of slurry recirculation pumps shall be provided.

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93.	VI/B	I-M1	32 of 49	13.03.07	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 3mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.	All the Process water tanks (Process water Storage tanks, Clarified water tank, Emergency water storage tanks etc.) shall be designed, fabricated, erected and tested in accordance with the IS: 803, latest edition. Additional Corrosion allowance of 1.5 mm on the minimum tank shell thickness as calculated by IS: 803, latest edition shall be provided by the Contractor. Tanks shall be made from IS: 2062 quality mild steel plates of tested quality. The tanks shall be of welded construction. Interior surface of the tanks shall lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 4 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness or Epoxy lining minimum three coats of 150 micron thickness and the outside surface shall be coated with paint as approved by the Employer. The Tanks shall be provided with drain, manholes, over flow & inlet level control valves etc.
94.	VI/A	III-A1	7 of 8	10.01.00	Contractor shall provide buildings for Limestone Grinding System; Slurry re-circulating pumps & Oxidation blowers / Compressors; Gypsum Dewatering System & FGD control room & Analyser room (if required). The buildings must be complete in all respect specially facilitating the smooth operation and maintenance of associated	Contractor shall provide buildings for Limestone Grinding System, Compressors, Gypsum Dewatering System & FGD control room. Slurry re-circulating pumps & Oxidation blowers shall be located in a shed provided with roof sheeting. The buildings/structure must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of
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					equipments of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.	above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.
95.	VI/A	III-A1	4 of 8	4.01.11	All Slurry re-circulating slurry pumps & Oxidation blowers / Compressors shall be installed inside a building to be provided by the Contractor as per specifications specified elsewhere. All pumps & Oxidation blowers / Compressors shall be in straight line. The building must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc. The building shall be sufficiently ventilated.	All Slurry re-circulating slurry pumps & Oxidation blowers / Compressors shall be installed in a shed provided with roof sheeting to be provided by the Contractor as per specifications specified elsewhere. All pumps & Oxidation blowers / Compressors shall be in straight line, however, if it is not possible due to layout constraints, in such case, arrangement for handling & maintenance should be properly & optimally designed. The shed must be complete in all respect specially facilitating the smooth operation and maintenance of associated equipment's of above systems by providing adequate maintenance space, handling facilities, walkways, staircase etc.
96.	VI/B	9 of 49	4.01.02 (iv)		Margin over pressure requirement: 44% over the calculated value	Margin over pressure requirement: Bidder shall consider the margin over pressure requirement as 44% over the calculated head value excluding the static head. Margin on Static head shall be taken as 10%.For bubbling type Absorber, Bidder shall consider choking/blockage of 10% sparger tubes while calculating the head requirements of fan.

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97.	VI/B	I-M1	28 of 49	8.04.00	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized valves shall be shall be taken form the process water supply	All the slurry pumps shall be provided with motorized suction and discharge valves. In addition, flushing water lines with motorized/ pneumatic valves shall be shall be taken from the process water supply. The process water lines shall be provided with pneumatic/motorized valves as per the proven practice of the Bidder.
98.	VI/B	I-M1	24 of 49	7.04.03	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material or shall be provided with corrosion resistant liners of proven design.	The complete frame of the filter and all parts in contact with gypsum shall be made with corrosion resistant material.
99.	VI/B	I-M1	13 of 49	5.01.00(B)	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 2x 100% Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping for cooling pump discharge shall be made of Alloy 59 or C276 and nozzles shall be made of	Bubbling Type Absorber (i) In case the bidder offers an absorber with gas bubbling through the slurry, the complete gas distribution system to the slurry shall be in bidder's scope. No recirculating pump and spray header and nozzles shall be required in such case. However, 3 x 50% Gas Cooling Pumps instead of Slurry Recirculation shall be provided. The spray headers & piping which are in contact with hot flue gas shall be made of Alloy 59 or C276 and nozzles shall be made of Silicon Carbide or ceramic or equivalent

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					Silicon Carbide or ceramic or equivalent having a minimum guaranteed life of 20,000 hrs. The Cooling Pumps shall be installed inside a building. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.	having a minimum guaranteed life of 20,000 hrs. Cooling Pump discharge piping and valves outside the flue gas path shall be in line with the requirements specified for slurry recirculation pumps. The Cooling Pumps shall be installed in a shed with roof sheeting. The sparger minimum life of 5 years. Minimum 10% Sparger Tubes.
100.	VII/A	IV	1 of 3	1.02.00	Flue Gas Duct (i) Un cleaned Flue Gas : For each unit: Outlet flange (matching flanges/ expansion joint included in the Contractor's scope) in the tapping from the common Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities. In case no opening or flange connection is available in the ducts from where tapping will	Flue Gas Duct (i) Un cleaned Flue Gas For each unit: One/two tapping (depending on layout feasibility owing to space limitations and subject to Employer's approval) from the Flue Gas Duct going towards the existing Chimney. No load of duct shall be transmitted on the Employers facilities.
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					be taken, the cutting in the duct as well as flange connection shall be in the scope of the contractor.	
101.	Sl. No.-171 AMENDMENT NO. CS-4410-109-2-AMDT-08		64 of 83		The FGD system shall Steam Generator is in operation. However, provision shall be made by the contractor for facilitating operation of unit with emergency FGD bypass. This unit in operation. For this purpose. Motorized Guillotine type gates shall be provided at (i) hot gas inlet to Absorber, (ii) hot gas inlet to booster fan and (iii) outlet of booster fan. Further, Quick opening Bi-plane motorized / pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct. The same shall also be taken into account while designing the control & logics for the FGD System.	The FGD system shall Steam Generator is in operation. However, provision shall be made by the contractor for facilitating operation of unit with emergency FGD bypass. This unit in operation. For this purpose. Motorized Guillotine type gates shall be provided at (i) hot gas inlet to booster fan and (ii) outlet of booster fan. Further, Quick opening Bi-plane motorized / pneumatic damper along with 2x100% seal air fans shall be provided in the by-pass duct. The same shall also be taken into account while designing the control & logics for the FGD System.
102.	VI / A	VI	8 of 14	4.02.00 (vi)	Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system for the complete plant shall be	Waste Water The Contractor guarantees that the maximum purge flow rate to waste water treatment system shall be
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					10m ³ /hr averaged over a 24 hour period from each unit.	10m ³ /hr averaged over a 24 hour period from each unit.
103.	VI / A	III-A1	2 OF 8	2.04.00	Clean gas from the absorber in the specification. Provision shall be made for facilitating operation of unit with FGD bypass like bypass damper etc. , This shall also facilitate the online maintenance of absorber system and associated equipments. Provision shall be made for isolation of the flue gas flow through the absorber and also for bypass of the absorber, to allow maintenance of the absorber with the unit in operation.	Clean gas from the absorber in the specification. Provision shall be made for facilitating operation of unit with FGD bypass through existing stack. All modifications required including providing bypass damper is included in the scope of the Contractor. This shall also facilitate the online maintenance of absorber system and associated equipments. Provision shall be made for isolation of the flue gas flow through the absorber and also for bypass of the absorber, to allow maintenance of the absorber with the unit in operation.
104 (a)	VI/B	I-M1	13 of 49	5.01.00 A (iv)	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side.	(iv) The slurry recirculation pumps shall have motor driven knife gate valve at pump suction and discharge side. In order to optimise power consumption of FGD system at part load operation, Bidder to provide atleast one slurry recirculation pump preferably lower level with Variable Frequency Drive (VFD).
104 (b)	Sl. No.-59 AMENDMENT NO. CS-4410-109-2-AMDT-08		23 of 83	5.01.00 A (iii)	The slurry recirculation pumps shall have a minimum margin of 10% of flow and frictional head conditions. All slurry recirculation pumps including motors shall be of the same size and type.	The slurry recirculation pumps shall have a minimum margin of 10% of flow and frictional head..... conditions. All slurry recirculation pumps including motors shall be of the same size and type except for VFD driven slurry recirculation pump-motor set.

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105.	VI/B	I-M1	29 of 49	10.01.00	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness and the outside surface shall be coated with paint as approved by the Employer.....	The tanks shall be of welded construction. Interior surface of the tanks shall be lined with the following: - Wastewater tank , Filtrate tank, Secondary hydro cyclone feed tank : Vinyl ester based Flake lining of min 3 mm thickness - Slurry tanks : Replaceable chlorobutyl /bromobutyl Rubber lining of minimum 4 mm thickness The outside surface of the tanks shall be coated with paint as approved by the Employer.....
106.	VI/B	I-M1	31 of 49	12.01.00	Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve for the above purpose.	Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The contractor may provide a recirculation line with motorized isolation valve / restriction orifice made of erosion resistant material for the above purpose.
107.	VI/B	III-C7	2 of 5	2.09.00	Flanged valves shall be rated at no less than ANSI press class of 300 lbs.	Flanged valves shall be rated at no less than ANSI press class of 150 lbs.
108.	VI/B	-I-M7	15 of 24	MDL 387 388	GA Drawing & Datasheet of 12T Hoist for Ball Mill Building GA & Datasheet of 25T Hoist	GA Drawing & Datasheet of Hoist for Ball Mill Building GA & Datasheet of Hoist
109.	VI	I-M1	18 of 49	5.06.18	In case the absorber is equipped with several spray levels they shall be designed as follows: (i) The last spray level upstream the mist eliminator shall be operated	In case the absorber is equipped with several spray levels they shall be designed as follows:

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					(ii) only in counter flow. (iii) (iv)		(i) For spray type Absorber, the last spray level upstream the mist eliminator shall be operated only in counter flow. (ii) (iii) (iv)		
110.	VI	I-M1	8 of 49	4.01.01 3(iii)	Pressure at Booster Fan suction	0 mmWc	Pressure at terminal point before Booster Fan suction	0 mmWc	
111.	VI/B	I-M1	26 of 49	7.07.05	The secondary wastewater underflow shall be taken to the adequately sized filtrate tank, while the overflow shall be taken to a wastewater tank.		The secondary wastewater underflow shall be taken to the adequately sized filtrate tank while the overflow shall be taken to a wastewater tank. In case Bidder opts to provide additionally Lamella separator before the waste water tank and after the secondary hydro cyclone for removing impurities from the system, the solids concentration in waste water up to max 10% can be acceptable .However, the required moisture content in Gypsum & required Gypsum quality shall be complied.		
112.	VI/A	IV	2 of 3	1.07.00	Waste Water FGD waste water pipes shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at terminal point shall be 3.0 kg/cm2(g) , pH shall be 7.0		Waste Water FGD waste water pipes, including LHP/GHP waste water pipes, shall terminate along with isolation valve at 5 Meters near HCSD Mixing Tank , and 300 mm above FFL in HCSD Silo Area. Pressure at		
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					(approx.) and temperature shall be <50°C . Bidder shall indicate the anticipated range of chloride content in the waste water at terminal point.	terminal point shall be 3.0 kg/cm2(g) , pH shall be 7.0 (approx.) and temperature shall be 50-60°C . Bidder shall indicate the anticipated range of chloride content in the waste water at terminal point.
113.	VI/A	VII	14 of 38		Note	Add below Note:- 6. Wherever rubber part viz: coupling, V belt, flexible hose etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied. 7. Wherever nonmetallic fabric/paper filter etc have been used ,minimum quantity as specified above is to be supplied and any item which is not covered above minimum 10% or 01 no whichever is higher is to be supplied 8. Any special tool required for maintenance of any of the equipment being supplied is to be included in mandatory T&P along with the equipment.
114.	Sl. No.-93 AMENDMENT NO. CS-4410-109-2- AMDT-08		38 of 83		AUXILIARY POWER CONSUMPTION(PA)	Revised AUXILIARY POWER CONSUMPTION (PA) is enclosed at Mechanical Annexure- III

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115.					--	In case distance from Limestone Grinding system/ Gypsum Dewatering and Absorber is more than 500M, Bidder shall provide the following :- Flushing system at intermittent locations for the lime stone slurry pipeline which shall contain tank and pumps. Intermittent location distance of flushing system shall be based on their proven practice.
116.	VI/B	I:M7	1 to 24 of 24	MDL List	MDL List no. 213.Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Bhopal 214. Motor for Booster Fan - Sub QR documents of M/s Weg, Hosur 215. Motor for Booster Fan - Sub QR documents of M/s Crompton Greaves Ltd., Mandideep 433. Oxidation Blower - Sub QR documents of M/s ITO, Japan 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Thysencrupp, Germany 435.Recirculation Slurry Pump - Sub QR documents of M/s DUCHTING PUMPEN, GERMANY 436.Booster Fan - Sub QR documents of M/s Solyvent Flakt AB, Sweden 437.Slurry Pump - Sub QR documents of M/s Duchting Pumpen, Germany	MDL List no. 213.Motor for Booster Fan - Sub QR documents 214. Motor for Booster Fan - Sub QR documents 215. Motor for Booster Fan - Sub QR documents 433. Oxidation Blower - Sub QR documents 434.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 435.Recirculation Slurry Pump - Sub QR documents 436.Booster Fan - Sub QR documents 437.Slurry Pump - Sub QR documents 438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents 439.Agitators - Sub QR documents 440.Vaccume Belt Filters - Sub QR documents 441.Vaccume Belt Filters - Sub QR documents 442.Agitators - Sub QR documents 443.Not used 444.Slurry Pump - Sub QR documents 445.Slurry Pump - Sub QR documents 446.Booster Fan - Sub QR documents 447.Wet Limestone Grinding Mills
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					438.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Metso, USA 439.Agitators - Sub QR documents of M/s EKATO RMT GMBH. Germany 440.Vaccume Belt Filters - Sub QR documents of M/s Shanghai Xuhe Environmental Technology Co. Ltd., Shanghai, China 441.Vaccume Belt Filters - Sub QR documents of M/s FLSmidth, USA 442.Agitators - Sub QR documents of M/s Zhejiang Greatwall Reducer Mfg Co. Ltd. 443.Gas to Gas Heat Exchanger (GGH) - Sub QR documents 444.Slurry Pump - Sub QR documents of M/s Weir Minerals, USA 445.Slurry Pump - Sub QR documents of M/s Sam Turbo Industries Pvt. Ltd., Koimbatore 446.Booster Fan - Sub QR documents of M/s Suewon Poongryuk Machinery Co. Ltd, Korea 447.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Cemtec, Austria 448.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur	(Ball Mills) - Sub QR documents of M/s Cemtec, Austria 448.Wet Limestone Grinding Mills (Ball Mills) - Sub QR documents of M/s Christian Pfeiffer Maschinenfabrik, Austria 449. Oxidation Air Blower - Sub QR documents of m/s Siemens Turbo Machinery / HV Turbo 602. MQP for PDB of M/s pyrotech Electronics Udaipur 628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH stands deleted
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					628. MQP for foundation bolts M/s Quality Engineering Works, Kolkata 629. MQP for foundation bolts M/s Indiana Conveyors, Jejuri 671. MQP for Ball Valve (M/s Leader) -All drgs pertaining to GGH	
117.	VI/A	V	6 of 10	Notes for clause no. 6.000	Notes:-	Following note is added. Note:- 3. Available reactive value indicated at note 1 above is considering MgCO₃ as unreactive dolomitic form.
118.	VI/B	I-M1	8 of 49	4.01.00	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (excluding margin) shall be built up in booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-Nox system.	The Booster -----specified range of fuels. Additionally a pressure loss of 100 mm wcl (including margin) shall be built up in both booster fan design criteria as mentioned below to take care of pressure loss due to future installation of De-NOx system.
119.	VI/B	I-M1	18.01.00	40 of 49	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius. The specification	Thermal Insulation along with aluminum cladding shall be provided for all the equipments/surfaces having skin temperature more than 60 degree Celsius except for absorber. Further, Thermal insulation of min 70 mm shall be provided for absorber outlet flue gas duct irrespective of skin temperature. The specification

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120.	VII/A	I	10 OF 18	4.01.04	A JV / Subsidiary Company formed for for the respective equipment(s). However, in this case, the proposed JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.01.02 above by himself should have sourced / shall source such proven equipment(s) for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/	A JV / Subsidiary Company formed for for the respective equipment(s). Before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s). Further, in such a case, such the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved subvendor for a particular equipment. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for
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					Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved subvendor for a particular equipment. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only) for each equipment.	INR 10 Million (Indian Rupees ten Million only) for each equipment.
121.	VI/A	I	11 OF 18	4.01.05	In case the Bidder or the proposed sub-vendor at clause 4.01.02(c) above for the Oxidation Blowers. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's	In case the Bidder or the proposed sub-vendor at clause 4.01.02(c) above for the Oxidation Blowers. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.
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					/licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified INR 1.5 Million (Indian Rupees One and Half Million only).	
122.	Sl. No.-89 AMENDMENT NO. CS-4410-109-2-AMDT-08		35 of 83	4.01.06	(i) In case the Bidder or the clause 4.01.02(d) above for the Wet limestone Grinding mills. However, in this case, Bidder or the proposed subvendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.	In case the Bidder or the clause 4.01.02(d) above for the Wet limestone Grinding mills. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments. In addition, the Bidder along with the qualified INR 10 Million (Indian Rupees ten Million only). OR (ii)In case, the bidder or proposed sub vendor an additional on demand bank guarantee for INR 10 Million (Indian Rupees ten Million only).

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					In addition, the Bidder along with the qualified INR 1.5 Million (Indian Rupees One and Half Million only). OR (ii)In case, the bidder or proposed sub vendor an additional on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).	
123.	VI/A	I	12 OF 18	4.01.07	In case the Bidder or the clause 4.01.02(f) above for the Agitators. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.	In case the Bidder or the clause 4.01.02(f) above for the Agitators. Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.
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					In addition, the Bidder 1.5 Million (Indian Rupees One and Half Million only).	
124.	Sl. No.-86 AMENDMENT NO. CS-4410-109-2- AMDT-08		33 of 83		In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.01.02(e) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02(b) above for the Slurry Recirculation Pumps. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 660 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's	In case the Bidder or the proposed sub-vendor is a manufacturer of Pumps , the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps and slurry pumps , provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.01.02 (b) & 4.01.02 (e) above for the Slurry Recirculation Pumps and slurry pump respectively . Before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.

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					/licenser's design, manufacturing and quality control system for such equipment. In addition, the Bidder INR 1.5 Million (Indian Rupees One and Half Million only).	
125.	SECTION-VI, PART-B	I-M1	31 OF 49	12.02.00	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 3" made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same.	All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The Contractor can provide slurry pipes of size lower than 300 NB made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same. Outer surface of the pipes should be fire retardant.
126.	VI/B	III-A1	8 of 8	18.00.05	A common Nickel based alloy material storage/neutralizing tank for the both the units of storage capacity of 12 hrs of stack condensate of both the stack shall be provided. Storage tank/neutralization tank shall be complete with dosing, mixing and preparation system. After neutralization of the stack condensate collection, same shall be pumped to common drain system. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration.	Bidder should provide the condensate collection system such that the condensate collected shall be routed to absorber by gravity, bidder should ensure safe discharge to the absorber. However, in-case of the distance between absorber and wet stack is considerably far, bidder should provide the condensate collection system such that condensate shall be collected in a storage tank and pumped to absorber. Tank shall be placed at zero meter with a capacity 5 m3/hr along with associated pumping system. A common storage tank for all the units of storage capacity of minimum 5 m3/hr of stack
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					All the material in contact with the condensate shall be of suitable material for the operating duty.	condensate of all the stack shall be provided. Storage tank shall be complete with stack condensate collection be pumped to absorber. Contractor shall provide 2 X100% pumps, complete with valves, piping fittings, level control/monitoring etc. Alternatively, bidder may propose its proven system for disposal of the condensate system in its bid for Employer's consideration. All the material in contact with the condensate shall be of suitable material for the operating duty.
127.	Sl. No.-39 AMENDMENT NO. CS-4410-109-2- AMDT-08		16 of 83		Wet stack a) Wet stack sizing criteria A wet stack shall of the flue gas. The Contractor, shall take into account the entire characteristics of expected combination of fuels to be fired, for the complete load range of operation and the expected numbers of Steam Generator start-ups while designing the wet stack flue liner considering Steam Generator in operation both with & without FGD system in operation . The wet stack fuel liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of wet stack flue liner	Wet stack a) Wet stack sizing criteria A wet stack shall of the flue gas. The Contractor, shall take into account the entire characteristics of expected combination of fuels to be fired, for the complete load range of operation and the expected numbers of Steam Generator start-ups while designing the wet stack flue liner considering Steam Generator in operation with FGD system in operation . The wet stack fuel liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. The top flue liner above the roof slab shall be made of solid C276 (as per ASME SA265) / Titanium (Grade 2 as per ASME SB265) of
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SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS																																				
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.																																						
					<table><tr><td>S</td><td>Item</td><td>Design Condition</td></tr><tr><td>N</td><td></td><td></td></tr><tr><td>1.</td><td>Boiler load in MW (e)</td><td>VWO</td></tr><tr><td>2.</td><td>Gas flow at FGD inlet (m3/sec)</td><td>Design point (as given in cl. No. 3.00.00)</td></tr><tr><td>3.</td><td>Gas temperature at chimney inlet (deg. C)</td><td>To be worked out by bidder considering design point condition.</td></tr><tr><td>4</td><td>Flue gas velocity (m/sec) (Maximum)</td><td>18</td></tr></table> projecting over the wet stack roof shall be wrapped with 2mm thick Titanium/ C-276 sheet over insulation. The wet stack Titanium / C-276 sheet. (b)..... (c)	S	Item	Design Condition	N			1.	Boiler load in MW (e)	VWO	2.	Gas flow at FGD inlet (m3/sec)	Design point (as given in cl. No. 3.00.00)	3.	Gas temperature at chimney inlet (deg. C)	To be worked out by bidder considering design point condition.	4	Flue gas velocity (m/sec) (Maximum)	18	minimum 10 mm thickness. The minimum length of flue liner projecting over the chimney roof shall be at least equal to diameter of flue liner. External surface of wet stack flue liner projecting over the wet stack roof shall be wrapped with 2mm thick Titanium/ C-276 sheet over insulation. The wet stack Titanium / C-276 sheet. <table><tr><td>S</td><td>Item</td><td>Design Condition</td></tr><tr><td>N</td><td></td><td></td></tr><tr><td>1</td><td>Boiler load in MW (e)</td><td>TMCR</td></tr><tr><td>2</td><td>Gas flow at Chimney inlet (m3/sec)</td><td>To be worked out by bidder considering value indicated under</td></tr><tr><td>3</td><td>Gas temperature at chimney inlet (deg. C)</td><td>guarantee point condition(as given in cl. No. 3.00.00)</td></tr><tr><td>4</td><td>Flue gas velocity inside Chimney inlet (m/sec)</td><td>< 16.8 for Titanium / C-276 Lining < 18.3 for Borosilicate Lining</td></tr></table> (b)..... (c)	S	Item	Design Condition	N			1	Boiler load in MW (e)	TMCR	2	Gas flow at Chimney inlet (m3/sec)	To be worked out by bidder considering value indicated under	3	Gas temperature at chimney inlet (deg. C)	guarantee point condition(as given in cl. No. 3.00.00)	4	Flue gas velocity inside Chimney inlet (m/sec)	< 16.8 for Titanium / C-276 Lining < 18.3 for Borosilicate Lining
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NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2					AMENDMENT NO. CS-4410-109-2-AMDT-14	Page 50 OF 57																																				

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
128.	VI/C	GTR	38 of 82	26.01.00	Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should	Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least twelve months prior to the schedule date of start of commissioning of the 1st FGD system. The chart should
129.	VI/D	ECC	14 of 53	34.01.03	The following activities shall be carried out by the contractor, 18 month prior to schedule date of commissioning	The following activities shall be carried out by the contractor, 12 month prior to schedule date of commissioning
130.	VI/D	ECC	16 of 53	34.02.05	The Contractor shall submit the commissioning documentation, for various equipment/covered under the contract, for the approval of employer, at least 18 months before the scheduled date of commissioning of the equipment/systems.	The Contractor shall submit the commissioning documentation, for various equipment/covered under the contract, for the approval of employer, at least 12 months before the scheduled date of commissioning of the equipment/systems.
131.	VI/D	ECC	10 of 53	25.00.00	The Contractor shall have concerned. If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be resolved as per the provisions of the as specified at clause no 21.00.00 of this chapter entitled "Co-operation with other Contractors." The Contractor shall not	The Contractor shall have concerned. If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be resolved as per the provisions of the as specified at clause no 20.00.00 of this chapter entitled "Co-operation with other Contractors." The Contractor shall not

NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2	AMENDMENT NO. CS-4410-109-2-AMDT-14 	Page 51 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS																																									
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.																																											
132.				New Clause	New Clause	Bidder shall utilize the area identified for FGD purpose. The area identified for FGD purpose in GLP shall be levelled and free from obstructions like sheds, trees etc. However, site clearance like removal of bushes, vegetation etc. is in Bidder's scope.																																									
133.	VI/A	VII MANDATORY SPARES	/	Page 13 of 38	<table><tr><td>N)</td><td></td><td></td><td>ELEVATOR</td><td></td><td></td><td></td></tr><tr><td></td><td>...</td><td></td><td>.....</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td>.....</td><td>..</td><td>..</td><td></td></tr><tr><td></td><td></td><td></td><td>.....</td><td>...</td><td>..</td><td></td></tr><tr><td></td><td></td><td></td><td>.....</td><td>....</td><td>....</td><td></td></tr></table>	N)			ELEVATOR					...										..	..						...	..									<table><tr><td>N)</td><td></td><td></td><td>ELEVATOR</td><td></td><td></td></tr></table> Refer MANDATORY SPARES FOR GOODS CUM PASSENGER ELEVATOR	N)			ELEVATOR		
N)			ELEVATOR																																												
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134.	VI/A	VII MANDATORY SPARES	/	New Clause		MANDATORY SPARES FOR GOODS CUM PASSENGER ELEVATOR (One set of following spares required for each Building) <table><tr><td>1</td><td>Friction block</td><td>2 Nos.</td></tr><tr><td>2</td><td>Guide roller of each type</td><td>20% of total population or 3 Nos. of each type whichever is high</td></tr><tr><td>3</td><td>Contactors of each type</td><td>2 Nos.</td></tr><tr><td>4</td><td>Control transformer</td><td>1 No. of each type</td></tr><tr><td>5</td><td>Time device</td><td>2 Nos. of each type</td></tr><tr><td>6</td><td>Rectifiers</td><td>2 Nos. of each type</td></tr><tr><td>7</td><td>Over current relay</td><td>2 Nos. of each type</td></tr><tr><td>8</td><td>Auxiliary relays</td><td>3 Nos. of each type</td></tr></table>	1	Friction block	2 Nos.	2	Guide roller of each type	20% of total population or 3 Nos. of each type whichever is high	3	Contactors of each type	2 Nos.	4	Control transformer	1 No. of each type	5	Time device	2 Nos. of each type	6	Rectifiers	2 Nos. of each type	7	Over current relay	2 Nos. of each type	8	Auxiliary relays	3 Nos. of each type																	
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AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS			
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.					
						9	Resistor	3 Nos. of each type	
						10	Fuses of each rating	20% of the total population	
						11	Limit switches of each type	3 Nos.	
						12	Push button	3 Nos. of each type	
						13	Contact device (if applicable)	3 Nos. of each type	
						14	Brake motor	2 Nos. of each type	
						15	Transmitters	2 Nos. of each type	
						16	Switches of each type	3 Nos.	
						17	Receiver	2 Nos. of each type	
						18	Bearings of each type & size	2 Nos.	
						19	Roller of each type	3 Nos.	
						20	Worm gear spares		
							a) 'O' rings	3 Sets	
							b) Sealing ring of each type	3 Sets	
						21	Spares for brake		
							a) Fan	2 Nos. of each type	
							b) Magnetic coil	3 Nos. of each type	
							c) Brake disc	2 Sets	
							d) Brake pad	2 Sets	
						22	Bushing (for door front)	2 Sets	
						23	Pinion	2 Nos. of each type	
						24	Elevator Motor with VVVF drive	01 no of each type	
NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2						AMENDMENT NO. CS-4410-109-2-AMDT-14			Page 53 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
135.	VI/A	III-A1		18.00.07 New clause	New clause added	Single-flue or twin flue chimney(s) shall be provided. There shall be one flue (liner) for each unit. The flue gas emission point shall be minimum 150 meters above the plant grade level in case of single flue chimney & 220 meters above the plant grade level in case of twin flue chimney.
136.	VI/A	III-A1		19.00.00 New clause	New clause added	Process water & cooling water storage & pumping scheme (for 3 x 660 MW) shall be provided as per tender drawing and as detailed in relevant clauses of Section VI, Part- B, Sub-section I-M1 with its amendments, if any and as specified in specification elsewhere.
137.	VI/B	I-M1		13.01.00	Two (2) Process water Storage tanks the makeup water from terminal point. From the terminal point for process water as detailed in sub-section IV, section VI- Part B , the Contractor shall provide 2x 100% Booster Pumps of required capacity & head to feed process water to the two (2) no. of	Two (2) Process water Storage tanks the makeup water from terminal point. From the terminal point for process water as detailed in sub-section IV, section VI- Part A , the Contractor shall provide 2x 100% Booster Pumps of required capacity & head to feed process water to the two (2) no. of process water storage tank designed
NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2					AMENDMENT NO. CS-4410-109-2-AMDT-14 	Page 54 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
					process water storage tank designed to store 15 minutes of total maximum water.....control valves etc.	to store 15 minutes of total maximum water.....control valves etc.
138.	VI/A	IV	2 OF 3	1.07.01 NEW CLAUSE	New clause added	Instrument Air Contractor shall take a tap off suitably from the existing instrument Air header available along C-row at CD bay rack for meeting the instrument air requirement. The pressure available at TP will be around 6 kg/cm2(g).
139.	VI/A	IV	2 OF 3	1.07.01 NEW CLAUSE	New clause added	Service Air Contractor shall take a tap off suitably from the existing service Air header available along C-row at CD bay rack for meeting the service air requirement. The pressure available at TP will be around 6 kg/cm2(g).
NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2					AMENDMENT NO. CS-4410-109-2-AMDT-14 	Page 55 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
140 (a)	VI/B	I-M2/A10	1.3.2	71 Of 112	Humidity to be maintained at 60(+/-)5%	Humidity to be maintained at 50(+/-)5%
140 (b)	VI/B	I-M2/A-09	1.03.05	61 Of 112	The hammer crusher will be driven through Electric motor, scoop type hydraulic coupling and gear box.	The hammer crusher will be <i>driven through V-Belts</i> .
140 (c)	VI/B	I-M2/A10	Data sheet of limestone crusher, cl. No 2.6.0	63 Of 112	Drive arrangement: Electric motor, scoop type hydraulic coupling, and gearbox.	Drive arrangement: <i>V-Belts</i> .
141.	Sl. No.-82 AMENDMENT NO. CS-4410-109-2-AMDT-08		32 of 83		2x100% electric driven, single stage, integrally geared, single or dual vane centrifugal type oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.	2x100% electric driven, single stage, integrally geared, single or dual vane centrifugal type / positive displacement (Helical lobe) type with VFD drive , oxidation blowers complete with integral gearbox, lube oil system, instrumentation and accessories. The blower will be used for supplying a variable volume of air to the absorber reaction tank.
142.	Amendment No.01 to Technical specification, Sl. No.186, Document No. CS-4410-109-2-AMDT-08				For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015 for Earthquake loads.	"Deleted"

NORTH KARANPURA FLUE GAS DESULPHURISATION (FGD)SYSTEM PACKAGE BIDDING DOCUMENT NO.: CS-4410-109-2	AMENDMENT NO. CS-4410-109-2-AMDT-14 	Page 56 OF 57

AMENDMENT NO. 02 TO TECHNICAL SPECIFICATION (SECTION VI)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
143.	Amendment No.01 to Technical specification, Sl. No.181, Document No. CS-4410-109-2-AMDT-08				Annexure-VIII SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT Notes: 1. g = Acceleration due to gravity 2. For industrial structures, analysis for verification of mechanism shall be carried out as per IS:1893 (Part 4):2015. The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages	Annexure-VIII SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT Notes: 1. g = Acceleration due to gravity 2. Deleted The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages

TENDER NO: PSER:SCT:NKP-C1974:19

VOLUME -III

PRICE SCHEDULE-REV-00

FOR

Civil and Architectural works including Leveling & Grading, underground facilities like drainage, sewerage, trenches, earthing mat / grounding etc. associated with complete Flue Gas Desulphurisation System (FGD) , Lime Stone (LSS) & Gypsum Handling (GSS) System pkg for 3 x 660 MW North Karanpura STPP, Jharkhand.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)

POWER SECTOR – EASTERN REGION

PLOT NO. – 9 / 1, DJ – BLOCK,

SECTOR – II, KARUNAMOYEE,

SALT LAKE CITY,

KOLKATA – 700091.

VOLUME-III PRICE SCHEDULE, REV-0	
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.	
TENDER NO. PSER:SCT:NKP-C 1974:19	
PREAMBLE	
SL NO	DESCRIPTION
1	This preamble forms part of tender document and schedule of items. The tenderer should read this preamble carefully before filling in rates for various items. Clauses under this preamble shall be read in conjunction with various volumes of tender and other tender sections as applicable and shall have precedence over any contrary statement mentioned any where in this document.
2	The work shall be carried out strictly as per specifications, description of the items in these schedule and / or engineer's instructions. Drawings enclosed with the tender are only preliminary and for tender purposes and giving some idea of the work involved. The work is to be executed as per drawings & documents, which shall be furnished during execution.
3	Items of work provided in this schedule but not covered in this specification shall be executed strictly as per instruction of the engineer.
4	Unless specifically mentioned otherwise in the tender document, the tenderer shall quote for the finished items and shall provide for the complete cost towards power, fuel, tools, tackles, equipment, constructional plants, temporary works, labour, dismantling of all temporary piping, structures, valves, pumps, tanks & other misc. equipment, strengthening of roads/culverts/bridges etc. including arranging all clearances etc. required for carrying out different activities & tests, materials, levies, transport, layout, repairs, rectification, maintenance till handing over, supervisions, colonies, shops, establishments, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the work according to the complete tender document and this schedule.
5	The quantities of the various items mentioned in this schedule of items are approximate, based on very preliminary information and may vary to any extent or be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of work executed under any part of this contract including extra items, if any but excluding any price variation remains, within plus minus fifteen percent ($\pm 15\%$) of the awarded price as per LOI.
6	Prior written approval of BHEL shall be sought by the contractor in case quantity variation of any item crosses +50% (plus fifty percent) limit during execution, an approval to be obtained before execution of further quantity for this item.
7	In case Sealed /Paper Price Bids are opened for finalisation of the tender, for any Item Rate/BOQ based contract, possibility of variation of quantity/ addition/deletion of items can not be ruled out. Under such circumstances, after execution of work, if it is observed that standing as L-1 is changed based on actual quantity executed, the bidder shall give suitable rebate to maintain your standing as L-1. Since this aspect can be assessed at the end of execution, necessary adjustment will be effected at the end of execution in final bill. This condition shall not be applicable where the tender is finalised through Reverse Auction.
8	BHEL reserve the right to rationalize the rates, quoted by L-1 bidder against unit rate items and/ or other optional items with respect to item-wise lowest rates (amongst the participating bidders), before placement of order.
9	The rates quoted shall be inclusive of cleaning of site of any vegetation, dressing , clearing of old structures and leveling etc. including fixing of grid pillars, benchmarks etc. required for commencement of site activities. No separate payment will be made towards the same. However, if separate rate for such item is available in the rate schedule, the same shall be considered.
10	Rates shall be quoted in figures and in words in clear legible writing. No overwriting is allowed. All scoring and cancellations should be countersigned and in case of illegibility the interpretation of engineer shall be final. All entries shall be in English language.
11	All works item wise shall be measured upon completion and paid for at the rates quoted and accepted as per BHEL approved payment schedule/billing break-up.

VOLUME-III PRICE SCHEDULE, REV-0	
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.	
TENDER NO. PSER:SCT:NKP-C 1974:19	
PREAMBLE	
SL NO	DESCRIPTION
12	The tender shall be deemed to have visited site and made himself aware of all the site conditions, studied the specifications and details of work to be done within the time schedule attached and to have acquainted himself of the conditions prevailing at site.
13	No splitting of the job is envisaged. Decision of BHEL in this regard shall be final and binding to the bidders.
14	Bidders are not allowed to alter the Price Schedule format including item description, quantity etc. and the offer is liable for rejection if the bidders submit their prices in Price Schedules modified by them. BHEL reserves the right to reject the offers of bidders who submit offers in Price Formats which are modified/ altered by them. Also putting any comments instead of rates/price in the designated column of the rate schedule shall make the offer liable for rejection.
15	Bidders to note that for Civil &/Structural packages, against a particular item against a ST No. appearing in more than one schedule of the BOQ, same rate must be quoted in all schedules for that particular items with same descriptions. If by error, different rates are quoted in different schedules for same ST No. (i.e. item with same description), then the higher of the rates shall be considered for evaluation but awarding shall be done with the lower rate, if the bidder becomes L-1."
16	For Lumpsum Service Contract : The items/components indicated in the tender is indicative and may vary to any extent. No compensation shall be payable in case of any variation in the items/components listed in the bill of quantities if the executed weight remains within the variation limit. However, in case of deletion of any item or addition of new items over and above the items listed or variation of existing quantity beyond variation limit specified, adjustment (i.e. Payment or recovery as the case may be) shall be done on pro-rata basis based on the Rate per MT worked out from the quoted lump-sum Price and the total weight of components listed /indicated in price schedule plus 15% weight variation limit.
17	Engineer's decision shall be final and binding on the contractor regarding clarification of items in the schedule with respect to the other sections/volumes of the contract.
18	In case of tender for Civil and/or Structural works, if the Non-schedule items are not quoted by the bidder, it will be treated at par with rate of corresponding item of CPWD/PWD/DSR schedule as prescribed in the tender/BOQ cum Rate Schedule.
19	No interest, whatsoever, shall be payable by BHEL on the security deposit, any bank guarantee submitted or any amount due to successful bidder/contractor.
20	Size and weights of various items are mentioned in the attached BOQ cum rate/price schedule for reference purpose only & these shall not be taken into consideration for quoting/calculating amount in the rate schedule. These shall be utilised as per relevant sections of tender. Bidders shall quote for each item in the rate column, taking unit as mentioned in the quantity column. Rates shall be filled in both figures and words. Amount shall be calculated based upon these rates multiplied by the mentioned quantity for the respective items.
21	Bidder's Total price shall be considered for evaluation unless stated otherwise.
22	In case of BOP packages, if Bidder does not quote/indicate the price for freight charges against indicated rate schedule, the same shall be considered as 2% of basic price and adjusted with the total quoted price against each item keeping the total quoted price unaltered.

VOLUME-III PRICE SCHEDULE, REV-00			
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.			
TENDER NO. PSER:SCT:NKP-C1974:19			
SCH-1 : TOTAL PRICE			
SL NO	DESCRIPTION	PRICE SCHEDULE REF	TOTAL PRICE (IN INR)
1.0	TOTAL PRICE FOR CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND. AS PER TENDER SPECIFICATION.	SCH 2 - PRICE BREAK UP	IN FIGURES:- IN WORDS:-
2.0	NON-SCHEDULE ITEM For items not covered in Price Schedule , quote % above or below or at par the CPWD Schedule of rates 2018		
a)	Rate of complete item	% above / % below/ at par of CPWD Rate Schedule 2018	
b)	Rate of supply of material at site only	% above / % below/ at par of CPWD Rate Schedule 2018	
c)	Rate for execution complete excluding supply of materials.	% above / % below/ at par of CPWD Rate Schedule 2018	
NOTE			
1.0	Bidder shall quote total price at SI No. 1 above. All other amounts / rates of each item of works in respective schedules / parts will be derived based on allocated percentages. As such, any uncalled figure/ amount noted at any other place / schedule of Volume-III will not be recknoed & will stand null & void.		
2.0	Bidder to note that total price at SI No. 1 above shall be considered for evaluation & awarding. As such grand total price should be complete in all respect for the full scope defined and considering all terms and conditions.		
3.0	Bidder's quoted total price of SCH-1 at SI. No 1 above, shall be apportioned into amount of various items of works based on allocated percentages against respective item, in respective schedules / parts(Refer SCH-2, SCH-3, SCH-4, SCH-5 of VOL-III). As such, bidder shall not indicate / quote any amount / rate in these schedules / parts and any amount / rate quoted against any item shall not be taken into cognizance / account and offer may be liable for rejection.		
4.0	Based on the itemwise percentage allocations, the amount for the individual items of the Bill of Quantity shall be arrived at. The rates of individual items shall be derived from the amount against each items and its quantity after rounding off to upto 2 decimal places. However, RA bill payment shall be done after rounding off the gross amount to two decimal points. Any adjustment, if required, due to such methodology, will be effected / adjusted in final bill.		
5.0	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 SI No.3 above.		
6.0	Any item as per scope of work, if not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.		
7.0	Price format shall not be changed by bidder in any case and it may lead to cancellation of their offer.		
8.0	The quoted price shall be excluding GST including freight on FOR site basis.		
9.0	The quantity of items may vary during execution mainly due to actual requirement etc. The unit rates work out from the overall amount quoted & accepted by BHEL shall be considered and no separate unit rates shall be allowed. Unit rates shall be valid throughout the contract period.		
10.0	For payment of non schedule items, the rate shall be derived from CPWD Schedule - 2018.		

VOLUME-III PRICE SCHEDULE, REV-0		
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.		
TENDER NO. PSER:SCT:NKP-C1974:19		
SCH-2- TOTAL PRICE BREAK UP		
SL NO	DESCRIPTION	WEIGHTAGE
1.0	TOTAL PRICE OF SERVICE (SCH-3).	0.97469093
2.0	TOTAL PRICE OF SUPPLY (SCH-4).	0.00263480
3.0	TOTAL PRICE OF LEVELLING GRADING (SCH-5).	0.02267427
4.0	GRAND TOTAL	1.00000000

VOLUME-III				
PRICE SCHEDULE, REV-00				
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.				
TENDER NO. PSER:SCT:NKP-C 1974:19				
SCH-3 - SERVICE PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
100	Earth work: Earth work In excavation, backfilling and disposal including necessary men/women, materials, equipment, loading, transportation, unloading, dewatering etc as per specification, drawing and as directed by engineer- in-charge for the following:			
101	Earth work in excavation in all types of soil including ash which can be excavated by any means including setting out, levelling, dewatering (but excluding special type of dewatering viz. well point method), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 1Km, spreading/levelling of disposed materials etc all complete for following depths below ground level. [Measurement of excavation shall be paid as per clause 5.2.0 of Technical Specification, Section D, Sub-Section D1 sheet 20 Of 22]			
a	Depth from ground level but not exceeding 2 m	CUM	92719	0.02453108
b	Depth exceeding 2 m but not exceeding 4 m	CUM	53378	0.01742106
c	Depth exceeding 4 m but not exceeding 6 m	CUM	12351	0.00543486
d	Depth exceeding 6 m but not exceeding 8 m	CUM	4550	0.00264025
e	Depth exceeding 8 m but not exceeding 10 m	CUM	4000	0.00290471
f	Depth exceeding 10 m but not exceeding 15 m	CUM	2000	0.00181367
g	Depth exceeding 15 m but not exceeding 20 m	CUM	2000	0.00217206
103	Earth work in excavation in soft rock (rock without any recovery of excavated materials in the form of hard stone/boulder) including weathered rock which can be excavated by means of crow bar, pick axe, pneumatic rock breaker attachment with excavator machine etc but does not require chiselling or blasting including setting out, levelling, dewatering (wherever required), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 1 Km, spreading / levelling of disposed materials etc all complete for following depths below ground level. [Measurement of excavation shall be paid as per clause 5.2.0 of Technical Specification, Section D, Sub-Section D1 sheet 20 Of 22]			
a	Depth from ground level but not exceeding 2 m	CUM	31027	0.00973347
b	Depth exceeding 2 m but not exceeding 4 m	CUM	62215	0.02306918
c	Depth exceeding 4 m but not exceeding 6 m	CUM	47874	0.02295893
d	Depth exceeding 6 m but not exceeding 8 m	CUM	5867	0.00356409
e	Depth exceeding 8 m but not exceeding 10 m	CUM	2050	0.00149413
f	Depth exceeding 10 m but not exceeding 15 m	CUM	1000	0.00087052
g	Depth exceeding 15 m but not exceeding 20 m	CUM	1000	0.00100601
104	Earth work in excavation upto any depth below ground level in hard rock requiring blasting (but excluding controlled blasting) including wedging, line drilling, pre shearing etc as required for grading, setting out, levelling, dewatering (wherever required), dressing the sides & bottom, all lifts, necessary licenses/statutory clearances for blasting, supply, storage & handling of blasting materials, stacking/disposal of surplus excavated material within a lead upto 1 km, spreading / levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge. [Measurement of excavation shall be paid as per clause 5.2.0 of Technical Specification, Section D, Sub-Section D1 sheet 20 Of 22]			
c	Depth exceeding 4 m but not exceeding 6 m	CUM	100	0.00007998
d	Depth exceeding 6 m but not exceeding 8 m	CUM	100	0.00010137
105	Earth work in excavation in hard rock requiring controlled blasting including wedging, line drilling, pre shearing etc as required, setting out, levelling, dewatering (wherever required), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, necessary licenses/statutory clearances for blasting, supply, storage & handling of blasting materials, stacking/disposal of surplus excavated material within a lead upto 1Km, spreading / levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge for following depths below ground level. [Measurement of excavation shall be paid as per clause 5.2.0 of Technical Specification, Section D, Sub-Section D1 sheet 20 Of 22]			
b	Depth exceeding 2 m but not exceeding 4 m	CUM	500	0.00031644
c	Depth exceeding 4 m but not exceeding 6 m	CUM	2851	0.00233367
d	Depth exceeding 6 m but not exceeding 8 m	CUM	1050	0.00108812

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e	Depth exceeding 8 m but not exceeding 10 m	CUM	200	0.00024864
f	Depth exceeding 10 m but not exceeding 15 m	CUM	200	0.00029684
g	Depth exceeding 15 m but not exceeding 20 m	CUM	200	0.00034292
106	Earth work in excavation in hard rock requiring chiselling including wedging, line drilling, pre shearing etc as required for grading, setting out, levelling, dewatering (wherever required), dressing the sides & bottom, all lifts, stacking/disposal of surplus excavated material within a lead upto 1 km, spreading / levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge for following depths below ground level. [Measurement of excavation shall be paid as per clause 5.2.0 of Technical Specification, Section D, Sub-Section D1 sheet 20 Of 22]			
c	Depth exceeding 4 m but not exceeding 6 m	CUM	200	0.00042559
d	Depth exceeding 6 m but not exceeding 8 m	CUM	200	0.00053905
e	Depth exceeding 8 m but not exceeding 10 m	CUM	100	0.00032332
f	Depth exceeding 10 m but not exceeding 15 m	CUM	100	0.00038625
g	Depth exceeding 15 m but not exceeding 20 m	CUM	200	0.00089288
A107	Earthwork in Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 300 mm thickness using/with selected materials from compulsorily excavated earth available within a lead upto 1 Km and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following. [Measurement of Backfilling shall be paid as per excavation quantity after deduction for concrete etc.]			
a	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	99096	0.02095742
b	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	86576	0.02030894
Ad	Each layer compacted so as to achieve at least 80% relative density as per IS-2720 part XIV in case of sandy soils.	CUM	1000	0.00024693
A108	Earthwork in Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 300 mm thickness using/with selected earth directly from excavation within a lead upto 1Km and compacted as specified including watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following: [Measurement of Backfilling shall be paid as per excavation quantity after deduction for concrete etc.]			
a	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	17125	0.00137895
b	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	3955	0.00033649
Ad	Each layer compacted so as to achieve at least 80% relative density as per IS-2720 part XIV in case of sandy soils.	CUM	500	0.00004478
A109	Extra over ST No. 101 and 103 to A108 for carriage of material/earth for every 500m or part thereof beyond an initial lead of 1km.			
a	Carriage for stacking/ backfilling of serviceable material/ earth	CUM	39810	0.00040283
b	Carriage for disposal of serviceable/unserviceable material/ earth	CUM	60000	0.00060712
A110	Earth work in backfilling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 300 mm thickness so as to achieve required compaction with approved borrowed soil (borrowed soil to be arranged by the bidder) and compacted as specified including supplying borrowed soil, royalty/seignorage fee (if any), sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing, all lead and lifts etc all complete as per specification, drawing and as directed by the engineer for the following: [Measurement of Backfilling shall be paid as per excavation quantity after deduction for concrete etc.]			
a	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	6000	0.00433911
b	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	50236	0.03560332
A111	Supplying and filling sand upto any depth under floors, around foundations, plinths, paving, passages, etc. in layers not exceeding 300 mm thickness and compacted so as to achieve at least 80% relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical	CUM	5447	0.0061982

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
B111	Supplying and filling clean and well graded sand (conforming to IS 383 with grading zone I to III) upto any depth under floors, around foundations, plinths, paving, tank foundations, etc. in layers not exceeding 300 mm thickness and compacted so as to achieve at least 80% relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	CUM	800	0.00091033
A112	Earth work in stripping of top soil upto a maximum depth of 0.30 m below ground level so as to exclude all debris, grass, vegetation, bushes, trees having girth upto 300mm including roots and organic materials etc for leveling and grading including dressing to specified levels & grades and compacting the graded/stripped surface by manual/mechanical means, disposal of stripped materials within a lead upto 1km etc all complete as per specification, drawing and as directed by the engineer-in-charge.	SQM	25200	0.00168932
A114	Supplying and filling moorum upto any depth under floors, around foundations, plinths, paving, passages, etc. in layers not exceeding 300 mm thickness and compacted so as to achieve at least 80% relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	CUM	200	0.00018207
200	CONCRETE WORK: Providing and placing concrete work including cost of labour, materials (unless otherwise specified in BOQ/contract specification) and equipment for handling, transportation, batching, mixing, placing, vibrating and curing (excluding cost of centering, shuttering and reinforcement) with mechanised equipments like batching plant, transit mixer, concrete pump etc. complete as per drawing, specifications and as per direction of engineer in charge for the following: (CEMENT WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)			
201	Concrete of grade M7.5 (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as mass filling course, lean concrete, levelling course, mud mat under and around foundations/ floors, at any depth below finished floor level etc.	CUM	4026	0.01773624
202	Concrete of grade M10 (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors at any depth below finished floor level etc.	CUM	629	0.00277101
203	Concrete of grade M15 (1 part cement, 2 part sand, 4 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors at any depth below finished floor level etc.	CUM	72	0.00031719
204	Concrete of grade M20 (1 part cement, 1.5 part sand, 3 parts of 20 mm graded aggregate by volume) under floors, paving, plinth protection, pipe encasing etc	CUM	60	0.00024854
A204	Concrete of grade M20 (1 part cement, 1.5 part sand, 3 parts of 12 mm graded aggregate by volume) under floors, paving, plinth protection, pipe encasing etc	CUM	115	0.00046684
205	Providing and laying Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in foundations/substructure , grade slab, paving, drains, culverts, under floors etc at all level below finished floor level, any shape, position or thickness etc complete including use of plasticizer/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following.			
a	M 25 Grade	CUM	34025	0.15458543
b	M 30 Grade	CUM	575	0.00262767
c	M 35 Grade	CUM	10	0.00004596
206	Providing and laying Design Mix cement concrete of grade conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at all level above finished floor level, any shape, position or thickness etc complete including use of plasticizer/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following.			
a	M25 Grade	CUM	6085	0.02774599
b	M 30 Grade	CUM	536	0.00245758
c	M 35 Grade	CUM	10	0.00004612

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
A207	Providing and laying Design Mix cement concrete confirming to IS:456 & IS 10262-2009 for reinforced concrete works of grade mentioned below in machine foundations for TG, Gas Turbine, ID/FD/PA fans, BFP, Coal mills, Booster fans, Ball mills , etc. at all elevations below/above finished floor level except TG deck and top decks supported over vibration isolation system but including TG foundation columns with addition of suitable plasticizer conforming to IS 9103(latest) to achieve a slump more than 125mm in concrete as per manufacturer's recommendation with 20 mm nominal size graded aggregate in concrete all complete as per specification & drawing			
a	M 30 Grade	CUM	6500	0.03138944
B207	Providing and laying Design Mix cement concrete confirming to IS:456 & IS 10262-2009 for reinforced concrete works of grade mentioned below in machine foundations for Crusher deck etc. at all elevations below/above finished floor level except TG deck and top decks supported over vibration isolation system but including TG foundation columns with addition of suitable plasticizer conforming to IS 9103(latest) to achieve a slump more than 125mm in concrete as per manufacturer's recommendation with 20 mm nominal size graded aggregate in concrete all complete as per specification & drawing			
a	M 30 Grade	CUM	10	0.00004829
b	M 35 Grade	CUM	150	0.00072836
A209	Extra over St. No. 205 to B207 for controlling of temperature of fresh concrete to less than 23 degree centigrade using ice, including all related arrangements for providing, storing and mixing of ice with water, cooling of aggregates etc. All complete as per specification, drawing and instruction of engineer in charge.	CUM	700	0.00107043
A210	Extra over ST Nos. 205 to B207 for conducting UPV test for concrete at all levels including all equipments, making necessary arrangements, staging, submission of report etc. all complete as directed by engineer in charge and as per specification.	CUM	700	0.00228872
211	Providing and encasing of structural steel member with concrete using nominal aggregate size of 12.5mm down. Encased member shall be wrapped with welded wire mesh/chicken wire mesh with proper lap etc. complete as per specification for the following grades. (Payment of welded wire mesh, chicken wire mesh shall be made separately)			
Aa	M20 grade	CUM	51	0.00022468
a	M25 grade	CUM	200	0.00088108
b	M30 grade	CUM	243	0.00107184
212	Screed concrete conforming to IS 456 with coarse sand and graded hard stone aggregate 12.5mm/6 mm nominal size on the roof at any level or thickness,			
a	1:2:4 (1 part cement, 2 part sand, 4 parts of aggregate by volume)	CUM	600	0.00264325
b	1:1:2 (1 part cement, 1 part sand, 2 parts of aggregate by volume)	CUM	25	0.00011014
A213	Providing and laying Design Mix cement concrete as per IS:456 & IS 10262-2009 for reinforced concrete works using graded aggregate for Concrete in precast works like roof slabs/trench covers, fins, lintels, chajas, beams, columns, wall panels,fencing posts, facias etc.at all levels in all kinds of work including formwork/moulds, curing, rendering the top exposed surface with cement sand mortar (1:3), handling, storing, transpoting, all leads, erection without damage, setting in position with cement sand mortar (1:3), filling the gaps between adjacent precast units with M30 grade concrete or cement sand mortar (1:3) and including making of holes for bolts for fixing, welding etc.complete with graded aggregate (20/12.5/10 mm) and as per specification and drawing for following grades.			
Aa	M 20 grade	CUM	10	0.00006958
a	M 25 grade	CUM	108	0.00075145
b	M 30 grade	CUM	160	0.00111731
214	Providing and laying Design Mix cement concrete as per IS:456, IS 3370 & IS 10262-2009 for reinforced concrete works using graded aggregate for Concrete in water retaining/conveying structures including addition of suitable plastisizer cum waterproofing cement additives confirming to IS 9103 latest to achieve a slump more than 125 mm in concrete as per manufacturers recommendation and conforming to limits of permeability as per IS 2545 and specification with 20 mm nominal size graded aggregate for following grades. Watertightness is to be ensured including structural grouting if required.			
a	M 25 grade	CUM	490	0.00308026
b	M 30 grade	CUM	9290	0.05700085

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
215	Dismantling concrete work for all types of structures at all levels including stacking of servicable material to a lead of 500 m and disposal of unservicable material upto a lead of 2 km, cutting of reinforcement, labour, equipment, safety precautions etc all complete as per drawings, specification and instructions of engineer in charge.			
a	Plain cement concrete of all grades	CUM	35	0.00004144
b	Reinforced cement concrete of all grades	CUM	35	0.0000591
216	Chipping of concrete in reinforced concrete work, cutting pockets, making openings at all levels and according to shapes, disposal of waste materials upto a lead of 2 km as directed by engineer including equipment, safety precautions, making good the broken surface etc all complete as per specification, drawing, instructions of engineer in charge but excluding cutting of reinforcement .	CUM	120	0.00000607
217	Extra over and above St No 216 for cutting of reinforcement , all sizes and types including labour, equipment, return of cut reinforcement to store etc all complete as per specification, drawings and instructions of engineer in charge. Measurement shall be on the cross sectional area of reinforcement cut.	SQCM	35	0.00000022
218	Cutting Reinforced concrete with mechanised tools like Core drilling machine etc. for cutting pockets, holes, cores in slab, beam, column or foundation as per direction of engineer in charge.	CUM	35	0.0000077
219	Providing and applying curing compound (water based) of approved make where ever required as per manufacturer's specification.	SQM	100	0.00001075
300	FORMWORK: Providing, fixing and removing formwork at all elevations for all structures, as per specifications and including all labour, material, scaffoldings and centereing etc. complete as per drawing, specifications and as per direction of engineer in charge for the following:			
301	Fairface form work with good quality water proof ply wood of minimum 12mm thickness and smooth surface below finished ground floor level for foundations, footings, base of columns, walls, columns, pilasters, beams, mass concrete, trenches , drains, culverts etc.including chamfering of edges as per drawing,	SQM	88163	0.05062634
302	Fairface form work with good quality water proof ply wood of minimum 12mm thickness and smooth surface above finished ground floor level for columns, beams, suspended floors, roofs, lintels, cantilevers, staircases, landings, balconies, etc. including chamfering of edges as per drawing.for all heights as per specification, drawing and instruction of engineer in charge.	SQM	21495	0.01430071
304	Providing, fixing and removing formwork in block-outs/pockets and openings (below 0.1 sqm plan area) at all elevations including cutting, formation of all shapes and all other operations required for making the required shape and size all complete as per specification, drawing and instruction of engineer in charge			
a	Upto 150 mm depth	EACH	210	0.00006508
b	Pockets of depths more than 150mm and upto 300 mm depth	EACH	275	0.00015444
c	Pockets of depths more than 300mm and upto 600 mm depth	EACH	300	0.00031722
d	Pockets of depths more than 600mm and upto 1000 mm depth	EACH	260	0.00044429
e	Pockets of depths more than 1000mm and upto 1500 mm depth	EACH	65	0.00016344
f	Pockets of depths more than 1500mm and upto 2000 mm depth	EACH	10	0.00003335
305	Extra over item no.301 and 302 for curved form work for foundations, footings, beams, walls, trenches, domes, arches etc as per specification.			
a	Extra for Curve Shuttering for Item No. 301	SQM	3000	0.0003453
b	Extra for Curve Shuttering for Item No. 302	SQM	500	0.0000664
400	REINFORCEMENT WORK: Reinforcement work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc at all level as per specification, drawings and as directed by engineer - in - charge for the following:.			
401	Providing, straightening, cutting, bending, placing in position at all level, binding of mild steel reinforcements conforming to grade 1 of IS:432 part 1 in concrete including cost of reinforcement steel, binding wire, labour, scaffolding, transportation to & from stores etc. all complete as per specifications &	MT	3	0.00023938

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
A402	Providing, straightening, cutting, bending, placing in position at all level, binding in position of steel reinforcements of high yield strength deformed (HYSD) TMT steel bars of grade Fe-500 having minimum elongation of 14.5 % or Fe-500D conforming to IS:1786 including cost of reinforcement steel, binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer. (REINFORCEMENT STEEL WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)	MT	6000	0.06547805
A405	Providing & fixing of Rebar in existing concrete surface by inserting reinforcement bar with Epoxy based suitable bonding compound of Hilti or equivalent make (HIT-RE-500 of Hilti or equivalent make) for interconnection of new R.C. structure with existing R.C. structure. Depth of drilled hole should be suitable to develop maximum recommended strength as per approved manufacturer's recommendation. This item includes supply of all materials including bonding chemicals, T&P required to execute the work, cost of all labour, transportation of chemical, staging to reach work place etc. all complete as directed by Engineer - in - Charge. Random Pull out non destructive test as directed by engineer shall be conducted to ensure strength of bond and same is included in this item. Reinforcement bar shall be paid separately under item no. A402			
a	12mm Reinforcement bar	Nos.	5	0.00000221
500	Roof Treatment works: Roof treatment works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, curing, sampling, testing etc at all level as per specification, drawings and as directed by engineer - in - charge for the following: (CEMENT WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)			
A502	Providing and laying topping plaster with cement mortar 1:4 (1 cement : 4 sand) and thickness of 25 mm including preparation of surface, batching, mixing,	SQM	6200	0.00057246
A506	Providing and applying PU based water proofing treatment with one coat of polymerised mastic over the RCC roof to achieve smooth surface as primer with an application rate of minimum 6 sq.m per litre and two successive liquid coatings of high solids content urethane pre-polymers or equivalent material based finish coats as per relevant IS/ASTM standards (ASTM C 836 and ASTM C 898), to form an elastomeric membrane with overall dry film thickness 1.5 mm subject to minimum 500 gm/sqm/coat application rate. Item includes surface preparation, polyscrim cloth /fabric, polymerised mortar base preparation, etc all complete as per specifications and directions of engineer in charge.	SQM	7600	0.0130349
507	Providing and laying wearing course consisting of 25mm thick plain cement concrete of grade M15 (1:2:4) with graded aggregate of 12.5mm size cast in panels of maximum size 1.2mx1.2m and reinforced with 0.56 mm dia. galvanised chicken wire mesh and sealing of joints (in grooves of 6mm X 6mm) using silicon /elastomeric compound etc all complete.	SQM	6900	0.00733099
510	Providing and laying cement concrete chequered flooring tiles of 22 mm thickness and size 300x300 mm conforming to IS 13801 with 8 mm thick 1:4 cement mortar over the top most layer of roofing treatment in pathway or entire area with fine joints including sealing of joints (silicon/elastomeric sealant) and providing expansion gap in both directions including underbed (as per drawings) filled up with (silicon/elastomeric) joint sealant etc all complete. (Water proofing paid elsewhere) (including cost of cement for tiles making)	SQM	950	0.0008291
511	Providing and applying two coats of bitumen grade 85/25 as per IS 702 (@ 1.7kg/sqm) with 1% antistripping compound conforming to IS 6241 in foundation, wall, column etc on concrete surfaces exposed to soil / ash including surface preparation etc. all complete.	SQM	35691	0.00839665
A511	Providing and applying two component transparent polyamide cured epoxy sealer coating (having solid by volume minimum 40% ±2%) of minimum 50 micron DFT on concrete surfaces of water retaining structures. Surface to be coated shall be absolutely dry, clean and dust free. Sealer coat shall be followed with the application of epoxy phenolic coating (solid by volume minimum 63%) of minimum 400 micron DFT. This coat shall be applied after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique etc. all complete.	SQM	480	0.00014116
513	Providing and mixing water proofing compound conforming to IS:2645 in concrete or cement mortar all complete.	KG	1150	0.000144
A519	Providing and applying waterproofing treatment with minimum 400 micron food grade epoxy coating complying to FDA title 21, Part 175.300 for the internal concrete surfaces of water retaining structure including surface preparation etc. all complete as per specification.	SQM	30	0.00002451
A520	Providing and fixing lining on internal surfaces of sumps with replaceable chlorobutyl/bromobutyl rubber lining of minimum 5 mm thickness or with vinyl ester based flake glass lining of minimum 3 mm thickness etc. all complete as per specification.	SQM	10	0.00004047
A521	Providing and applying to surfaces of liquid carrying/retaining structures, minimum 2 coats acrylic based polymer modified cementitious composite coating system etc. all complete as per specification. The total nominal thickness of such coating shall be minimum 1.5mm.	SQM	330	0.00022464
B521	Providing and applying to external surfaces in contact with earth of liquid carrying/retaining structures, minimum 2 coats acrylic based polymer modified cementitious composite coating system mixed with fine silica/ quartz sand of 0.6mm nominal size etc. all complete as per specification. The total nominal	SQM	150	0.00010211

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
A522	Providing and fixing waterproofing treatment to be provided on sunken portion of all vertical and horizontal surfaces of depressed portions of false floor, toilets, W.C., kitchen, Pantry and the like consisting of : (i) Ist course of applying cement slurry @ 4.4 kg/sq.m mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement: 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sq.m of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sq.m) etc. all complete.	SQM	90	0.00005685
600	JOINTS AND FILLERS: Joints & fillers including all labour, material, equipment, transportation, handling etc at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
601	Supplying & installation of bitumen impregnated fibre board confirming to IS 1838 as joint filler at joints in concrete including nailing, coating of both faces with			
a	12 mm wide joints.	SQM	55	0.00003736
b	20 mm wide joints.	SQM	55	0.00004724
c	25 mm wide joints	SQM	254	0.00033264
d	50 mm wide joints	SQM	208	0.00055091
602	Supplying and installation of Dura board HD100 or its equivalent as approved by the Engineer, as filler material in joints including nailing, installation as per			
a	12 mm wide joints.	SQM	1	0.00000069
603	Providing and applying polysulphide based sealant conforming to IS:12118 in joints in concrete including cleaning of joints, raking out groove, application of primer, scaffolding etc. all complete for following size grooves:			
a	25mmX25mm	RM	584	0.00043433
b	50mmX25mm	RM	170	0.0002447
604	Supplying and filling in position hot applied bitumin sealing compound (Grade A) confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints including application of primer etc. all complete.			
a	10mm X 40mm	RM	144	0.00001038
b	12mm X 25mm	RM	274	0.00001664
c	20mmX25mm	RM	594	0.00004959
A605	Supplying and installation of 100 mm thick polystyrene board of type-1 conforming to IS: 4671 with density 20 Kg/cum from reliable manufacturers as approved by the Engineer, sandwiched between the vertical face of block foundation and brick wall including nailing, installation as per manufacturer's	SQM	2000	0.00355007
606	Providing and installing PVC joint sealing strips of minimum 3mm thickness and minimum width 100 mm at the construction, expansion and isolation joints from reputed manufacturers as a continuous diaphragm to contain the filler material and/ or to exclude passage of water or any other material into or out of the structure, without any longitudinal joint; and shall be procured and installed in largest practicable lengths having a minimum number of transverse joints with jointing procedure as per the manufacturer's recommendations including the material and tools required for jointing, testing, protection, etc all complete. The joints in rubber seals shall be vulcanised as needed.	RM	15	0.00000429
607	Providing and installing strong and tough alkathene sheet or equivalent of about 1 mm in thickness in isolation joints and shall be fixed by an approved adhesive compound on the cleaned surface of the already set concrete as per the manufacturer's recommendations, to cover it fully including the material and tools required for jointing, testing, protection, etc all complete.	SQM	10	0.00000325
608	Supplying and filling in position hot applied bitumin sealing compound (Grade B) confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints including application of primer etc. all complete.			
a	10mm X 40mm	RM	50	0.00000036
b	12mm X 25mm	RM	100	0.00000607
c	20mmX25mm	RM	50	0.00000417

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
609	Providing and sealing of joints with premium grade silicon sealant (Silpruf of GE silicons or approved equivalent) including cleaning of joints, raking out groove, joint filler tapes, application of primer, curing, scaffolding etc. all complete as per manufacturer's recommendation for following size groove:			
a	25mmX25mm	RM	10	0.00000422
b	50mmX25mm	RM	10	0.00000796
610	Providing and fixing PVC water stops in joints conforming to IS 12200 & IS 15058 all complete for the following: (Bulb or Kicker type)			
d	230 mm wide and 6 mm thick	RM	2100	0.00064545
612	Providing and applying approved fire retardant sealant in joints/openings including cleaning of joints/openings, raking out groove, application of primer,			
a	25mmX25mm	RM	10	0.00002074
b	50mmX25mm	RM	10	0.00004099
613	Providing and fixing G.I strips minimum 1.5mm thk and 150mm wide including fixing accessories etc. all complete.	Kg	60	0.00002907
614	Providing and fixing aluminium strips minimum 18 SWG thk and 300mm wide over expansion joints with minimum lap of 50mm length including brass /	Kg	60	0.00005806
615	Providing and fixing 300 mm wide Stainless steel strips over expansion joints with minimum lap of 50mm length including stainless steel screws, rawl plugs	Kg	45	0.00005493
700	MS EMBEDMENTS: Embedments including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
701	Transporting, fabricating and fixing of mild steel embedments , inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc. including welding, bolting, cutting, drilling, scaffolding, setting etc. all complete.	MT	20	0.00054019
A701	Transporting, fabricating and fixing of mild steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc. including welding, bolting, cutting, drilling, scaffolding, setting, manual Cleaning and providing with Primer Coat of Chlorinated Rubber based Zinc	MT	25	0.00076721
702	Transportation from site store, erection, installation and alignment of mild steel foundation bolt assembly conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffner plates, protective tape, pipe sleeves, templates etc.	MT	35	0.0011292
A703	Same as above items 701, A701 & 702 with BHEL supplied material free of cost including loading, transportation, unloading etc. all complete from BHEL store			
a	Mild steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc.	MT	17	0.00025884
Aa	Mild steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc. including welding, bolting, cutting, drilling, scaffolding, setting, manual Cleaning and providing with Primer Coat of Chlorinated Rubber based Zinc Phosphate Primer of Minimum 50	MT	25	0.00047262
b	Mild steel foundation bolt assembly conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffner plates, protective tape, pipe sleeves, templates etc.	MT	7	0.00011862
704	Transporting, fabricating, erecting and installing following items in concrete/brickwall for all kind of works, including setting material in concrete, layout, scaffolding, cutting, forming, grinding, drilling, bolting, welding, jointing, testing etc. all complete.			
a	MS pipes of all diameters	Kg	410	0.00004719
b	PVC pipes / conduits of all diameters	Kg	200	0.00006704
c	UPVC pipes / conduits of all diameters	Kg	200	0.00011206
d	Expansion anchor fasteners (galvanised) of HILTI make(HUD-1 Universal Fastners) or equivalent of safe tensile capacity as specified below for brick work with			
i	8mm Dia	EACH	4	0.00000012
ii	10mm Dia	EACH	4	0.00000016
iii	12mm Dia	EACH	14	0.00000067
iv	14mm Dia	EACH	4	0.00000031
e	Expansion fasteners (mechanical galvanised) of HILTI make or equivalent of safe tensile capacity as specified below for concrete work with expansion sleeve			
i	HST M8	EACH	4	0.00000063
ii	HST M10	EACH	4	0.00000093
iii	HST M12	EACH	4	0.00000133
iv	HST M16	EACH	24	0.0000156
v	HST M20	EACH	4	0.00000507
vi	HST M24	EACH	4	0.00001024
f	Chemical Expansion fasteners (galvanised)of HILTI make or equivalent of safe tensile capacity as specified below for concrete work with anchoring			
i	HAS-E5.8 M8	EACH	5	0.00000124
ii	HAS-E5.8 M10	EACH	5	0.00000151
iii	HAS-E5.8 M12	EACH	5	0.00000185
iv	HAS-E5.8 M16	EACH	5	0.000003

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
v	HAS-E5.8 M20	EACH	5	0.00000588
vi	HAS-E5.8 M24	EACH	3	0.00000541
706	Transporting, and installation of approved 25mm thick vibration damping resilient pads on/around foundation of vibrating equipment and at other locations all	SQM	6	0.00001572
707	Providing, laying and fixing rails(52kg/rm) and guide rails in concrete for transformer, rail track including cutting of rails, joining of rails, anchoring lugs etc	MT	13	0.00191365
800	GROUTING: Grouting including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, roughening surface, cleaning, ramming, curing etc. at all level , drawings and as directed by engineer - in - charge for the following: (CEMENT WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)			
801	Providing & grouting with cement slurry mix of approved ratio using pressure pump for water retaining concrete structures as per approved procedure including cost of nipples/ nozzles, cement, admixture, curing, pressure pumps, slurry agitator etc. all complete. Cost shall include fixing of nipples at maximum 500 mm centre to centre spacing, cutting of nipples after completing of grouting, making good of the nipple hole with appropriate non-shrink cement paste,	SQM	30	0.00001666
802	Providing & grouting of pocket holes, pipe sleeves under base plates, machinery, pipe supporting structures etc. with mix 1:1 (1 cement :1 sand) using	CUM	10	0.00017709
803	Providing & grouting of pocket holes, pipe sleeves and under base plate of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing etc. all complete with mix 1:1:2 (1 cement : 1 coarse sand : 2 aggregate of 6 mm down graded stonechips) using non shrink admixture as per specification, drawing and direction of engineer-in-charge. (Cost of all material and cleaning the pocket by compressed air shall be in the	CUM	25	0.00044946
804	Providing & grouting of pocket holes, pipe sleeves and under base plates of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing etc. all complete with ConbextraGP-1 or equivalent as per specification, drawing and direction of engineer-in-charge. (Cost of all material and cleaning of the pockets by compressed air shall be in the scope of the contractor).	CUM	30	0.00149356
805	Providing & grouting of pocket holes, pipe sleeves and under base plates of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing, etc. all complete with Conbextra GP-2 or equivalent as per specification, drawing and direction of engineer-in-charge.(Cost of all material and cleaning of the pockets by compressed air shall be in the scope of the contractor).	CUM	27	0.00152622
806	Providing Chemical (epoxy) injection grouting with pressure pump for water retaining concrete structures conforming to IS:6494, including fixing nozzles, cost of approved chemical, admixture, curing etc. all complete . Payment shall be made as per the consumption of chemical grout.	Kg	5	0.00000506
808	Providing Chemical Injection Grouting with Minimum, 12 mm dia (NB) threaded nozzle of suitable length over the surface and along the construction joint line in a grid pattern at a spacing not exceeding 1.5m c/c before concreting operation After the nozzles are fully set, neat cement slurry admixed with water soluble non-shrink polymer / monomer based chemical shall be injected through the net - work of nozzles with low pressure grout pumps at a pressure of about 2.0 Kg/Sqcm. Cement slurry shall be prepared by mixing cement with non-shrink polymer/monomer @ 500 gm/50 kg bag of cement and water, ensuring that Water: Cement ratio does not exceed 2 (by weight). Wetter the structure, lesser should be the water cement ratio. The property of the polymer/monomer should be such that when it is mixed with water @ 0.5% by weight of water, the viscosity of the resultant solution (water and polymer/monomer) should not be more than 1.2 centipoises. Plasticizing agent shall be added wherever required. The grouting shall be started at very low pressure and increased gradually to a required pressure. The grouting shall continue, till the hole refuses to take any further grout, even at an increased pressure. Applied pressure shall not be more than the designed strength of the concrete. After completion of grouting operation, the nozzles shall be sealed properly to the satisfaction of the Engineer	SQM	7630	0.00659096
809	Providing and applying to internal surfaces of the underground RCC structures, 1.5 mm thick acrylic based polymer modified cementitious composite coating system (2 layers) as per specification and direction of engineer in charge.	Sqm	7000	0.01031837
810	Same as above but for external surface with addition of fine silica /quartz sand of 0.6 mm nominal size to the coating mix as per specification and direction of	Sqm	7000	0.01052474
811	Providing and fixing 22G Copper water stop and 600mm wide unless specified otherwise in water retaining structuresas per relevant I.S. codes / specifications and direction of engineer in charge..	Sqm	600	0.00138379
900	DOORS & WINDOWS: Doors, windows, ventilators, louvers, roof ventilators, rolling shutters, partitions including all labour, material (unless otherwise specified in BOQ/contract specification), equipments, transportation, handling, preparation of working drawings etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:			

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SCH-3 - SERVICE PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
903	Providing, fitting and fixing solid core flush door shutter as per IS 2202 part II, 35mm thick homogenous particle board bonded with BWP type phenolformaldehyde synthetic resin, partial board core conforming to IS 3087 type I, 35x12 mm thick teakwood beading all around including preparation of working drawings. godrej or equivalent make mortice lock with handels on both sides,approved ISI mark anodised fittings like door stopper,300mm long tower bolts,16x300mm long aldrops ,125mm long handles on both sides etc. butt hinges, sliding bolt, knobs, (all fittings shall be anodised aluminium color dyed), finish synthetic paint over primer, screws etc. all complete as per drawing, specification and instruction of engineer in charge. with commercial faces and teak wood edges. (Finish painting paid separately)	SQM	2	0.00001855
A903	Providing, fitting and fixing factory made pre-laminated solid core flush door shutter as per IS 2202 part II, 35mm thick homogenous particle board bonded with BWP type phenolformaldehyde synthetic resin, partial board core conforming to IS 3087 type I, 35x12 mm thick teakwood beading all around including preparation of working drawings. godrej or equivalent make mortice lock with handels on both sides,approved ISI mark anodised fittings like door stopper,300mm long tower bolts,16x300mm long aldrops ,125mm long handles on both sides etc. butt hinges, sliding bolt, knobs, (all fittings shall be anodised aluminium color dyed), finish synthetic paint over primer, screws etc. all complete as per drawing, specification and instruction of engineer in charge. with	SQM	15	0.00015302
A904	Providing and fixing single or double steel door shutters with 45mm thk flush design shutter comprising of two outer sheets of 18 gauge steel sheets rigidly connected and reinforced inside with continuous vertical 20 gauge stiffeners, spot welded in position at not more than 150mm on centres including void filled with mineral wool (density as per specification), all fittings, Godrej or equivalent make mortice lock with handle on both sides, shop and final painting etc all complete. Side , top and bottom edges of shutters shall be reinforced by continuous pressed steel channel with minimum 18G.	SQM	165	0.00241988
A906	Providing and fixing anodized extruded aluminium doors (single or double shutter) conforming to IS:1948, IS:1949 fabricated from extruded sections of HINDALCO/JINDAL/INDAL or equivalent make having minimum 2mm wall thickness as per IS:1285, IS:733 and anodized and electro color coating of required shade as per IS 1868 (minimum anodized coating of grade AC15). fixed with rawl plugs, expansion fasteners,SS screws / fixing clips necessary filling of gaps at Junctions, at top, bottom & sides with required PVC / neoprene felt for bi-metallic protection etc. Glazing shall be clear float/toughened glass of 6mm thickness including snap fit type beading, concealed screws, fixtures, Godrej or equivalent make Mortice lock with handle on both sides, etc all complete.	Kg	800	0.0006051
907	Providing and fixing fire proof steel doors (single or double shutter) with panic devices shall be 45mm thk flush design comprising of two outer sheets of 18 gauge steel sheets rigidly connected and reinforced inside with continuous vertical 20 gauge stiffeners, spot welded in position at not more than 150mm on centers including all fittings, shop painting with approved post office/signal red color fire resistant paint and mineral wool insulation (64 kg/cum density)	SQM	17	0.0002061
908	Providing and fixing steel windows/ventilator with steel sections as per IS:1038, IS:1361 & IS:7452 latest revision including all fittings, metal beadings, hold fasts, shop and final painting ,glazing etc. all complete. (Glazing shall be paid separately)			
a	Openable type	SQM	206	0.00076994
b	fixed type	SQM	106	0.00026654
A909	Providing and fixing anodised aluminium work of INDAL, Jindal, Hindalco or other equivalent approved make for door frames, windows, ventilators, partitions, railing etc with extruded standard tubular and other sections(of minimum 2mm wall thickness) including all fittings & fixtures and accessories of approved make conforming to IS733 and IS1285, anodised and electro color dyed to required shade according to IS 1868 (minimum anodic coating of grade AC15), fixed with rawl plugs, expansion fasteners, SS screws or with fixing clips, including necessary filling of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt for bi-metalic protection etc. including preparation of working drawings, aluminium cleat angle, aluminium snap-on-beading for glazing/panelling, stair case tread nosing, with all fittings and fixtures (like tower bolts, handles, door stopper with rubber shoes, 'L' drops, stays, floor springs, hydraulic door closures etc.), CP brass/stainless steel screws, providing and fixing hstarted at very low pressure and increased gradually to a required pressure.	Kg	8247	0.00754169

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SCH-3 - SERVICE PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
A910	Providing and fixing of aluminium composite panel(ACP) of following thickness for internal encasement at all heights and elevations consisting of 3mm thick II B fire rated LDPE core mixed with mineral fibre sandwiched between 2 skins of 0.5mm thick aluminum alloy sheet making a total panel thickness of 4mm. The surface shall be finished with PVDF based coating of minimum 30 micron on the top & sides and polymer paint on reverse side. Coating shall conform to ECCA or AAMA.the surface shall be protected with self adhesive peel of masking foil. The system shall be designed to withstand a wind pressure of 200kg/Sqm and shall be fixed to the Masonry/RC walls with necessary clamps, brackets and anchor fasteners. All clamps and brackets shall be Hot dip galvanized minimum 80 microns thick and shall conform to IS: 4759-1996. The extruded aluminum section shall be anodized in approved colour with a anodic coating of minimum 20 microns. Extruded section shall be 6063 T5 or T6 alloy conforming to ASTM B221. Any other started at very low pressure and increased gradually to a required pressure. The grouting shall continue, till the hole refuses to take any further grout, even at an increased pressure. Applied pressure shall not be more than the designed strength of the concrete. After completion of grouting operation, the nozzles shall be sealed properly to the satisfaction of the Engineer, EPDM gaskets, open cell polyethylene backer rods, weather sealant, scaffolding, approach to all height, material handling, transportation, labour, T&P, preparation of working drawings etc. all complete as per drawing, specification & instructions of engineer in charge. Measurement of payment shall be outer finished area of ACP panel.			
a	4mm	SQM	50	0.00028223
911	Providing and fixing of door closers as per specification ,of approved make & quality all complete of following type :			
a	Over head hydraulic door closures as per IS 3564	EACH	22	0.00004177
b	Floor mounted Hydraulic door closers as per IS 6315	EACH	22	0.00011186
912	Providing and fixing pressed steel frames fabricated from 16 gauge M.S sheet mortised, reinforced drilled and tapped for hinges and locks bolts strikes, hold fasts adjustable floor anchors, floor tiles/weather bars ,paintings etc all complete as per specifications.	Kg	1240	0.00023369
913	Providing and fixing in position rolling shutter of hot rolled double dipped galvanised steel lath section of 18 SWG tested mild steel strips at 75mm rolling centres interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation including wire springs, top cover, primer & shop coats of approved enamel paint etc, all complete as per IS 6248 and specification of approved make of following types: The bottom lath shall be coupled to a lock plate			
a	Hand Operated	SQM	30	0.00011391
b	Mechanically Operated	SQM	130	0.00166221
c	Electrically operated	SQM	55	0.00078011
914	Providing and fixing PVC doors (25 thk double skin) of sintex or equivalent make including all fitting & fixtures as per specification, drawing and instructions of	SQM	20	0.00006279
915	Providing, fixing and fitting of glazing of first grade class in steel/aluminium/wooden frames, where ever required, cleaning after fixing including hardware,			
a	4 mm thick clear sheet glass	SQM	10	0.00001479
Aa	6 mm thick ground glass	SQM	20	0.00004275
b	4 mm thick clear float glass	SQM	10	0.00001719
c	5.5 mm thick clear float glass	SQM	10	0.00001981
Ad	6 mm thick laminated glass	SQM	20	0.00013476
Ae	3mm thick Polycarbonate sheet fire retardant and ultra violet resistant of approved make	SQM	60	0.00010364
Ah	6 mm thick clear toughened glass	SQM	765	0.00243255
i	Two nos. 6 mm thick clear toughened float glass hermetically sealed and separated by 12 mm thick air gap for thermal insulation (only single elevation area to	SQM	80	0.00038319
916	Supplying and fixing weather stripping of approved make and quality to doors as per instructions of engineer in charge and specification complete.	RM	50	0.00001417

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
917	Providing and fixing 12 mm thick BWP particle board, decorative veneer (prelaminated) on both sides , as panels in aluminium framed door shutter, fixed with necessary snap-on-beading etc. all complete (excluding aluminium works).	SQM	30	0.00006629
918	Providing and fixing steel louvered window with ISMC 100 frame all round including verticals with 18G pressed steel louvers, painting etc. all complete.	SQM	37	0.00015233
919	Providing and fixing 1 mm thk. MS sheet sliding shutters with frame and diagonal braces of 50X50X6 angle iron, 3 mm MS gusset plates at junction and corners, 25 mm dia pulley, 50X50X6 angle and T-iron guide at the top and bottom respectively including painting etc. all complete.	SQM	37	0.00019871
A923	Providing and fixing anodised aluminium grill (anodised transparent or dyed to required shade according to IS: 1868 with minimum anodic coating of grade AC 15) of approved design/pattern, with approved standard section and fixed to the existing window frame with C.P. brass/ stainless steel screws @ 200 mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved anodised aluminium standard section around the opening, all complete as per requirement and direction of Engineer-in-charge. (Only weight of grill to be measured for payment).	KG	500	0.00045724
A924	Supply, fabrication and erection of caged mild steel ladder, min. 600mm wide, including post, rung, cage hoops, fixing brackets, nuts and bolts , other accessories etc. as per drawing supplied by bidder and approved by BHEL/NTPC and specification all complete. The cage ladder will be used to climb from ground to platform/RCC roof at min. 6 m height . The ladder, rungs, posts, hoops etc. shall be galvanised at a rate of 610 gms / SqM. as per IS : 4736.The top of the ladder shall extend at least 1 M above the end of the ladder to provide protection at the top rung. Bottom of the cage shall start at a distance of at least 2 M from ground. ALL	Kg	600	0.00008718
A925	Providing and fixing steel windows/ventilator with steel sections with necessary framework for crusher house , galleries and Juntion towers as per approved drawings, The window shutters shall be provided with M.S Louvers and as per IS:1038, IS:1361 & IS:7452 latest revision, including all fittings and fixtures, metal beadings, hold fasts, shop and final painting ,glazing etc. all complete. - louver blade shall be Z shaped and made out of 18G sheets in E27 steel frames all complete as per the directions of the Engineer in charge. Quoted rate shall be all inclusive			
a.	Fixed	SQM	50	0.00026163
b	Open	SQM	500	0.00176015
A926	Extra over item A925 Providing and fixing 1.6mm thick wire as per IS 4948 and 12MM X30MM mesh for windows size including all fittings, fixtures etc all complete as per the directions of the Engineer in charge	SQM	400	0.00006535
A927	Supply, Erection & Painting of MS Monorail door (Shop fabricated) (Shutters , frame and fittings) as per drawings and specification.	SQM	200	0.0011164
1000	BRICKWORK: Brickwork masonry including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, scaffolding etc. at all levels as per specification, drawings and as directed by engineer - in - charge for the following:			
1001	Providing brick work in cement mortar 1:6 (1 part cement 6 parts coarse sand) in walls, chambers etc. in thickness varying from 230mm to 460mm at all depths, places and positions below plinth including raking out joints, curing, scaffolding etc. complete excluding plastering and painting.			
Aa	Using table moulded/machine made fly ash lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash	CUM	170	0.00137163
c	Using burnt clay bricks of class designation 7.5 of nominal dimension	CUM	10	0.00009942
Ac	Using table moulded/machine made burnt clay bricks of class designation 7.5 of nominal dimension	CUM	5	0.00005965
Ae	Using table moulded/machine made burnt clay fly ash bricks confirming to IS 13757 with crushing strength of 75 kg/cm2 and minimum percentage of fly	CUM	150	0.00186405
1002	Providing brick work in cement mortar 1:6 (1 cement 6 coarse sand) in walls, chambers etc. in thickness 230mm at all heights, places and position above plinth including raking out joints, curing, scaffolding etc complete excluding plastering and painting.			
Aa	Using table moulded/machine made fly ash lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash	CUM	780	0.00705202
c	Using burnt clay bricks of class designation 7.5 of nominal dimension	CUM	10	0.00010859
Ac	Using table moulded/machine made burnt clay bricks of class designation 7.5 of nominal dimension	CUM	100	0.00130303
Ae	Using table moulded/machine made burnt clay fly ash bricks confirming to IS 13757 with crushing strength of 75 kg/cm2 and minimum percentage of fly	CUM	750	0.01017996
A1002	Providing brick work in cement mortar 1:6 (1 cement 6 coarse sand) in walls, chambers etc. in thickness 345mm at all heights, places and position above plinth including raking out joints, curing, scaffolding etc complete excluding plastering and painting.			
Aa	Using table moulded/machine made fly ash lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash	CUM	140	0.00126575
Ac	Using table moulded/machine made burnt clay bricks of class designation 7.5 of nominal dimension	CUM	10	0.00010859
b	Using fly ash lime bricks confirming to IS 12894 with crushing strength of 50 kg/cm2	CUM	10	0.0001303

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JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.				
TENDER NO. PSER:SCT:NKP-C 1974:19				
SCH-3 - SERVICE PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
Ae	Using table moulded/machine made burnt clay fly ash bricks confirming to IS 13757 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash 25% (including cost of cement for brick making)	CUM	80	0.00108586
1003	Providing brick work in cement mortar 1:4 (1 cement 4 coarse sand) in partition walls, chambers etc. in thickness 115mm at all heights, places and position above or below plinth/graded level including providing two nos. 6 mm diameter MS bars at every third layer, raking out joints, curing, scaffolding etc			
Aa	Using table moulded/machine made fly ash lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash	SQM	170	0.00018513
c	Using burnt clay bricks of class designation 7.5 of nominal dimension	SQM	230	0.00029906
Ae	Using table moulded/machine made burnt clay fly ash bricks confirming to IS 13757 with crushing strength of 75 kg/cm2 and minimum percentage of fly	SQM	150	0.0002438
1005	Breaking of existing brick work at all levels including plastering, removing the rubbish up to a distance of 500 m including transportation, loading, unloading	CUM	15	0.00002011
1006	Providing and encasing of structural steel member with masonry work around flanges, webs etc. and filling the gap between steel and masonry by minimum 12mm thick mortar of 1:6. Encased member shall be wrapped with chicken wire mesh with 50mm lap etc. complete as per specification. (Chicken			
a	Using fly ash lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 (including cost of cement for brick making)	CUM	15	0.00012116
b	Using burnt clay bricks of class designation 7.5 kg/cm2 of nominal dimension	CUM	1	0.00001014
1007	Providing and laying 75 mm thick bed of dry brick aggregate including of excavation, disposal of surplus earth spreading of earth, ramming, watering etc. complete in all respects as directed by the engineer.	SQM	15	0.00000495
1008	Making openings in existing brick wall or partition wall including making good the broken edges/surface with cement mortar 1:6 etc. complete	CUM	8	0.00001242
1009	Supply and placing in position mild steel wire fabric of square mesh 25 mm size and wire diameter of 2 mm for encasing of steel sections in concrete including	SQM	12	0.00000291
1010	Filling existing brick wall/ partition wall opening at all level including making good the broken edges/surface with cement mortar 1:6, painting, finishing to match with existing finishing, scaffolding/supporting at all level, removal of debris upto a lead of 1 km including loading, unloading, transportation etc. all	SQM	7	0.0000091
1011	Providing and filling brick bats in soak pits all complete.	CUM	10	0.00001909
1100	DAMP PROOF COURSE: Damp proof course including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, shuttering, centering, curing etc at all level as per specification, drawings and as directed by engineer - in - charge for the following:(CEMENT WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)			
A1101	Providing Damp Proof Course of following thickness with M20 concrete (10mm and down graded aggregate) with 2% of approved admixture of water proofing compound all complete. Two layers of hot bitumen coating 85/25 grade as per IS:702 @ 1.7Kg/sqm shall be applied one before & one after the			
b	50mm thick	SQM	523	0.00023351
1200	PLASTERING: Cement mortar plaster including making grooves wherever required including all labour, material (unless otherwise specified in BOQ/contract specification), scaffolding, curing etc at all level as per specification, drawings and as directed by engineer - in - charge for the			
A1201	Providing 18mm thick plaster in two layers outside the building/boundary wall consisting first (base) layer of 12 mm thick plaster in cement sand mortar (1:6) and second (finishing) layer of 6 mm thick plaster in cement sand mortar (1:4) on walls, finished to a smooth finish including providing 3mmx3mm size	SQM	7145	0.00148211
1202	Providing 12mm thick plaster inside the building/boundary wall in cement mortar 1:6 on walls finished to a smooth finish as per specification all complete.	SQM	6715	0.00096824
A1202	Providing 12mm thick plaster on external/internal RCC surfaces including RCC parapet walls in cement mortar 1:4 finished to a smooth finish as per	SQM	2600	0.0003749
B1202	Providing 12mm thick plaster on exposed RCC walls of structures in cement mortar 1:6 on walls finished to a smooth finish as per specification all	SQM	500	0.0000721
1204	Providing 6mm thick plaster on ceiling in cement mortar 1:4 finished to a smooth all complete.	SQM	6490	0.00092759
1205	Providing 12mm thick plaster in walls, drains/culverts with a paste of neat cement @ 1kg/sqm and rubbed smooth with trowel etc. all complete.	SQM	100	0.00001214
1207	Forming groove of uniform size from 12X12 mm upto 25X15 mm in plastered surface as per approved pattern, using wooden battens nailed to the under layer, including removal of wooden battons, repair of the edges of plaster panel and finishing the groove etc. complete as per specification, drawing and the	RM	50	0.00000152
A1207	Forming groove of uniform size from 12X12 mm upto 20X15 mm in plastered surface as per approved pattern, using wooden battens nailed to the under layer, including removal of wooden battons, repair of the edges of plaster panel and finishing the groove etc. complete as per specification, drawing and the	RM	1000	0.00003036
1208	Providing and laying encasement to box type steel beams at all levels with lath plaster 50 mm nominal thickness with cement plaster (1:4) over chicken wire mesh including all labour, materials, equipment, handling, transporting, mixing, placing, leveling, curing and cleaning, finishing the exposed surfaces etc including centering and shuttering all complete as per specification, drawing and instructions of engineer in charge (chicken wire mesh to be paid separately)	SQM	10	0.00000411
A1210	Providing drip course in cement mortar (1:3) in parapet, chajjas, window/door heads, architectural facias, fins etc. all complete with all labour, tools and plants as per specification, drawing and instructions of engineer in charge.	RM	400	0.00003536
B1210	Providing drip course in cement mortar (1:4) in parapet, chajjas, window/door heads, architectural facias, fins etc. all complete with all labour, tools and plants as per specification, drawing and instructions of engineer in charge.	RM	500	0.00004199
1300	FINISHES TO CONCRETE / PLASTERED SURFACES: Finishes, painting to concrete, plastered surfaces including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, surface preparation, scaffolding etc. at all level as per specification, drawings and			
1301	Two or more coats of white wash/ colour wash as per IS 627 of approved brand and manufacture to give an even shade including a priming coat as per	SQM	1541	0.00004697

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
1303	Providing and applying two or more coats of oil bound destemper as per IS 428 of approved brand, shade and manufacture to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guideline.	SQM	636	0.00005768
1304	Two or more coats of acrylic distemper of approved brand and manufacture to give an even shade including a priming coat with distemper primer	SQM	11422	0.00105752
1305	Providing and applying two or more coats of acrylic emulsion paint as per IS 5411 of approved brand, shade and manufacture to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guideline.	SQM	2200	0.00030219
1306	Providing and applying 2 or more coats of acid/alkali resistant paint of approved brand and colour to floors, walls and ceiling including preparation of surface to receive paint, providing and applying bitumen primer confirming to IS 158 complete all as per manufacturer's recommendations and as approved	SQM	455	0.0001913
1307	Providing and applying two coats of Epoxy coating with suitable pigments of approved shade as per specification and direction of Engineer. The epoxy paint shall be a two pack material and shall be resistant to water, oil, splash, spillage & acidic environment. The epoxy paint coating shall be of minimum 150 micron	SQM	310	0.00011638
1308	Providing and applying 2 or more coats of Chlorinated Rubber paint of approved brand and colour to floors, walls and ceiling including preparation of surface to receive paint, providing and applying chlorinated rubber zinc phosphate primer confirming to IS 158 complete all as per manufacturer's recommendations and as approved by engineer, at all heights above or below grade level, inclusive of intermediate coat of Titanium dioxide / micaceous iron	SQM	150	0.00003679
1309	Two or more coats of fire resistant transparent paint (@3.5 litre per sqm per coat) as per IS 162 on all woodwork over french polish as per IS 348 or flat oil paint as per IS 137 of approved grade and manufacture to give an even shade as per specifications. French polish payment will be made seperately.	SQM	60	0.00003321
1310	Two or more coats of black anti-corrosive bitumastic painting of approved brand and manufacture to give an even shade complete.	SQM	87	0.00000875
A1312	Providing and applying 2 or more coats of water proof cement paint of approved make and color on exterior surface at all heights including material, labour, scaffolding, curing etc including primer coat complete as per specification.	SQM	1100	0.00010769
A1313	Providing and applying resin/polymer bonded granular textured finish (Two or more coats), for external applications consisting of crushed stone/quartz chips of .5 mm to 2.5 mm size and of approved natural color/shade and bonded with synthetic resins, adhesives and additives altogether in a single pack mix, applied on cured and dried plaster surface with a dry film thickness of minimum 2 mm. The final finish shall have UV resistance, fungus, bacterial resistance properties all complete with grooves filled with poly sulfide sealant of matching color and shade as per specification/drawing/approval of engineer in charge.	SQM	950	0.00150584
1314	Providing and applying resin bonded granular textured finish, for external applications shall consist of crushed stone/quartz chips of .5 mm to 2.5 mm size and of approved natural color/shade and bonded with synthetic resins, adhesives and additives altogether in a single pack mix, applied on cured and dried plaster surface with a dry film nominal thickness of 2.5 mm. The final finish shall have UV resistance, fungus, bacterial resistance properties all complete with	SQM	100	0.00017681
A1314	Providing and applying resin/polymer bonded granular textured finish, for external applications , consisting of crushed stone/quartz chips of 2.5 mm size and of approved natural color/shade and bonded with synthetic resins, adhesives and additives altogether in a single pack mix, applied on cured and dried plaster surface . The final finish shall have UV resistance, fungus, bacterial resistance properties all complete with grooves filled with poly sulfide sealant of	SQM	4800	0.00848695
A1317	Providing and applying 2 mm thick polymer based water resistant putty on walls including preparation of surface, staging, etc to achieve a smooth even surface all complete as per specification and as directed by engineer.	SQM	1200	0.00015937
1319	Providing and applying two or more coats of Acrylic based weather coat paint of approved brand and manufacture and required shade over one coat of primer after necessary cleaning/ washing, preparing the surface using coir brush/ wire brush, sand paper, including filling of cracks with putty wherever required etc. all complete to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guidelines. The final finished coating shall be fungus resistant, UV resistant, water repellant and extremely durable with color fastness as per specification.	SQM	50	0.00000706
A1319	Providing and applying two or more coats of Acrylic smooth exterior paint of approved brand and manufacture and required shade over one coat of primer after necessary cleaning/ washing, preparing the surface using coir brush/ wire brush, sand paper, including filling of cracks with putty wherever required etc. all complete to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guidelines. The final finished	SQM	600	0.00008469
1320	Providing and applying acid alkali and oil resistant high build, solvent free, self smoothing, seamless epoxy based amine cured floor finish 150 microns over	SQM	15	0.00000567
1400	FLOORING AND SKIRTING: Flooring and skirting at all level including base layer, labour, material (unless otherwise specified in BOQ/contract specification), equipments, transportation, handling, curing, polishing etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:(CEMENT WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC)			
1401	Providing and laying 50 mm thick heavy duty cement concrete in flooring with metallic hardener pigmented topping 12mm thick uniform graded treated iron particles in flooring. Under layer of 38mm thick cement concrete mix 1:2:4 (1 cement: 2 sand : 4 stone aggregates 12.5 mm well graded) and top layer of 12mm thick metallic concrete of mix 1:2 (1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges, aluminium strips etc. all complete for following (Quoted item rate shall be inclusive of providing glass joint strips):	SQM	4500	0.00249868

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
A1401	Providing and laying 50 mm thick heavy duty cement concrete in flooring with metallic hardener pigmented topping 12mm thick uniform graded treated iron paricles in flooring. Under layer of 38mm thick M20 grade cement concrete mix (with stone chips of size 12.5mm well graded) and top layer of 12mm thick metallic concrete of mix 1:2 (1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges, aluminium strips etc. all complete for following (Quoted item rate shall be inclusive of providing glass joint strips):	SQM	9543	0.00529888
B1401	Providing and laying 50 mm thick heavy duty IPS flooring with metallic hardener pigmented topping 12mm thick uniform graded treated iron paricles in flooring. Under layer of min 38mm thick M20 grade cement concrete mix(with stone chips of size 12.5mm well graded) and top layer of 12mm thick metallic concrete of mix 1:2 (1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges, aluminium strips etc. all complete for following (Quoted item rate shall be inclusive of providing glass joint strips)	SQM	3900	0.00216553
A1402	Providing and laying 25 mm thick heavy duty cement concrete in flooring with metallic hardener pigmented topping 12mm thick uniform graded treated iron paricles in skirting & dado. Under layer of 13mm thick M20 grade cement concrete mix (with stone chips of size 12.5mm well graded) and top layer of 12mm thick metallic concrete of mix 1:2 (1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges, aluminium strips etc. all complete for following (Quoted item rate shall be inclusive of providing glass joint	SQM	400	0.00016645
A1404	Providing and laying interlocking M35 Grade concrete blocks in paving with approved colour and pattern and should be laid on the subbase and bedding of sand minimum 50mm thick including 2-4mm gap sand filling as per specifications and recommendations of manufacturer.(inclusive of cost of cement for paver			
b	75mm	SQM	70	0.00007889
A1406	Providing and laying polished Kota stone 18mm thk in flooring. Under bed shall average 32mm thk of M20 concrete and brought to proper level. The kota stone slabs/tiles laid over under bed, pressed and tapped down with wooden mallet to the proper level, lifted and pressed again with thick cement slurry @4.4kg/sqm spread over the surface with fine joint finished including pigments, curing, grinding, granite polishing etc. all complete.	SQM	420	0.00073947
1408	Providing polished Kota stone 18mm to 20mm thk in skirting projecting 6mm from adjacent plaster minimum 12 mm thick cement mortar bedding of 1:3 (1 cement : 3 sand) with thick cement slurry @4.4kg/sqm spread over the surface with fine joint finished including cutting brickwall upto the required depth,	SQM	300	0.00051909
A1416	Providing and laying vitrified ceramic tiles of mirror polished variety of size 600x600 from reputed / approved manufacturer (Kajaria, Johnson, Orient or equivalent), complete including underbed of 22 mm thk M20 PCC (for flooring) and cement mortar 1:4 minimum 18mm thick underbed for flooring and 12mm thick underbed for dado/skirting with neat cement slurry @3.3Kg/sqm , 3 mm groove joint pointed neatly with 3x4mm stainless epoxy grout SP-100 of laticrete			
Ab	minimum 9.5mm thick tiles In flooring	SQM	2203	0.0033075
Ad	minimum 9.5mm thick tiles In skirting and dado upto specific height	SQM	155	0.00024036
B1416	Providing and laying cement concrete chequered flooring tiles of 22 mm thickness and size 300x300 mm conforming to IS 13801 , complete including underbed of 20 mm thk M20 PCC (for flooring) and cement mortar 1:4 minimum 8mm thick underbed for flooring in walkway or entire area jointed with neat cement slurry @4.4kg/sqm,labour,materials, etc. all complete with pigment to match the shade of the tiles including rubbing, curing, grinding and polishing all			
a	Laid on Floors	SQM	47	0.000067
b	Laid in Skirting	SQM	5	0.00000893
A1419	Providing and laying granite stone slab of 18mm thickness single piece for wash basin / sink slab /facia of black or approved colour with cutting,making	SQM	47	0.00020908
A1421	Providing and laying Heavy Duty dust pressed (grade-5) Ceramic Tiles of size 300x300mm(approved size) and 7mm thick of reputed / approved manufacturer (Kajaria, Orient, Johnson or equivalent) of approved finish, shade and colour. The tiles shall be scratch resistance of minimum 5 on Mohr's scale and shall have a bending strength of 350 Kg./sqm,with Under bed shall average 43mm thk of 1 cement : 2 sand : 4 stone aggregates by volume and brought	SQM	200	0.00038223
1422	Providing & fixing Acid / Alkali resistant (Chemical resistant) tiles confirming to IS:4457 in flooring/Dado and shall be laid over bitumastic lining of min 12mm thick (to be laid in layers of 6mm each). The tiles shall be applied with 6mm thick Potassium Silicate bedding mortar as per IS:4441, 4443 & 4832 and including preparation of surface, application of bitumen primer, curing etc. all complete for following thicknesses. The tiles should be abrasion resistant &			
a	20mm thick	SQM	100	0.00027864
b	38mm thick	SQM	100	0.00032165
A1422	Providing & fixing Acid / Alkali resistant (Chemical resistant) tiles confirming to IS:4457 in flooring/Dado and shall be laid over bitumastic lining of min 12mm thick (to be laid in layers of 6mm each). The tiles shall be applied with 6mm thick Potassium Silicate bedding mortar as per IS:4441, 4443 & 4832 and including preparation of surface, application of bitumen primer, curing, 6 mm thick pointing of joints of tiles with acid/alkali resistant epoxy/furane mortar up to a			
Aa	12mm thick	SQM	30	0.00007105
a	20mm thick	SQM	185	0.00051549
b	38mm thick	SQM	40	0.00012866

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
B1422	Providing and laying Heavy Duty dust pressed (grade-5) Ceramic Tiles (Matt Finish) of size 300x300mm(approved size) and 7mm thick of reputed / approved manufacturer (Kajaria,jhonson,Spartek or equivalent) of approved finish, shade and colour. The tiles shall be scratch resistance of minimum 5 on Mohr's scale and shall have a bending strength of 350 Kg./sqm,with Under bed shall average 43mm thk of 1 cement : 2 sand : 4 stone aggregates by volume	SQM	25	0.00004061
1423	Providing & fixing Acid / Alkali resistant (Chemical resistant) tiles conforming to IS:4457 in flooring/Dado beded and jointed with epoxy mortar all complete for following thicknesses. The tiles should be abrasion resistant & durable.			
Aa	12mm thick	SQM	20	0.00010209
a	20mm thick	SQM	20	0.00012011
b	38mm thick	SQM	20	0.0001425
1424	Providing & fixing chemical resistant (AR)(Acid / Alkali) bricks (75mm thick) conforming to IS:4860 in the floor of neutralization pit and wall of alum solution preparation tank. Surface on which lining to be applied shall be prepared in accordance with IS:2395. Bitumen primer as per IS:158 followed by 18mm thick bituminastic followed by 6mm thick potassium silicate mortar bedding shall be provided before laying AR bricks. The joints between AR bricks shall be filled with resin type of mortar conforming to IS:4832, part II, seal coat of readymade epoxy paint shall be provided on joints to cover up any porosity that may be left in mortar. End sealing shall be done with bituminastic AR bricks shall be laid with 6mm wide & 50mm deep pointing (epoxy / furnace / CNSL) & acid curing shall	SQM	25	0.0000979
A1424	Providing & fixing chemical resistant (AR)(Acid / Alkali) bricks (115mm thick) conforming to IS:4860 in the wall of neutralization pit. Surface on which lining to be applied shall be prepared in accordance with IS:2395. Bitumen primer as per IS:158 followed by 18mm thick bituminastic followed by 6mm thick potassium silicate mortar bedding shall be provided before laying AR bricks. The joints between AR bricks shall be filled with resin type of mortar conforming to IS:4832, part II, seal coat of readymade epoxy paint shall be provided on joints to cover up any porosity that may be left in mortar. End sealing shall be done	SQM	25	0.00015664
B1424 a	Providing & fixing chemical resistant (AR)(Acid / Alkali) bricks (75mm) conforming to IS:4860 in the floor/wall of neutralization pit. Surface on which lining to be applied shall be prepared in accordance with IS:2395. Bitumen primer as per IS:158 followed by 12mm thick bituminastic followed by 6mm thick potassium silicate mortar bedding shall be provided before laying AR bricks. The joints between AR bricks shall be filled with resin type of mortar conforming to IS:4832, part II, seal coat of readymade epoxy paint shall be provided on joints to cover up any porosity that may be left in mortar. End sealing shall be done with	SQM	25	0.00008811
B1424 b	Providing & fixing chemical resistant (AR)(Acid / Alkali) bricks (115mm thick) conforming to IS:4860 in the floor/wall of neutralization pit. Surface on which lining to be applied shall be prepared in accordance with IS:2395. Bitumen primer as per IS:158 followed by 12mm thick bituminastic followed by 6mm thick potassium silicate mortar bedding shall be provided before laying AR bricks. The joints between AR bricks shall be filled with resin type of mortar conforming to IS:4832, part II, seal coat of readymade epoxy paint shall be provided on joints to cover up any porosity that may be left in mortar. End sealing shall be done	SQM	25	0.00014097
1427	Providing and fixing glazed ceramic tiles of approved color and design of size 200x300mm / 300x300mm in dado of approved size, projecting 6mm uniformly from adjacent plaster or wall finish. The mix for 20mm thick underbed plaster shall consist of 1part cement and 3 parts sand by weight. fairly moist but firm, tiles shall be pressed over under bed by applying cement slurry @ 3.3kg/sqm including pigments, curing etc all complete for following thicknesses:			
b	7mm thick	SQM	110	0.0001248
A1427	Providing and fixing designer ceramic tiles(matt finish) of approved color and design of size 200x300mm in dado of approved size, projecting 6mm uniformly from adjacent plaster or wall finish. The mix for 20mm thick underbed plaster shall consist of 1part cement and 3 parts sand by weight. fairly moist but firm, tiles shall be pressed over under bed by applying cement slurry @ 3.3kg/sqm including pigments, curing etc all complete for following thicknesses:			
b	7mm thick	SQM	65	0.00007743
A1428	Providing and laying 2mm thick antistatic PVC flooring / skirting of approved shade,as per IS:3462 and laying as per IS:5318 all complete.	SQM	100	0.00011179
1429	Providing and fixing removable type flooring system consisting of fire resistant particle board of size 600X600X35 mm with 0.05 mm thick aluminium foil lining at bottom and with 2 mm thick anti static PVC topping including proprietary floor supporting system complete as per specification.	SQM	140	0.00109044
1430	Providing and fixing dividing strips in joints of cast in situ floorings at various elevations, finishing, all labour, material etc. complete as per drawing,			
a	Glass strips 40 mm wide and minimum 6 mm thick.	RM	50	0.00000392
b	Aluminium strips 40 mm wide and minimum 3 mm thick	RM	150	0.00002447
1600	FALSE CEILING: False ceiling including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, suspension system etc at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
A1602	Providing, fixing and laying light weight mineral fiber tile false ceiling of minimum thickness 15 mm and exposed surface semi-perforated with depth of perforation as 4 mm and humid resistance of 95% RH and fire performance of class 0/1 as per BS 476 with metal suspension grid system with galvanized Tees of section 24 X 38 mm for main runners of approved colour and make as per specification including 50mm thick mineral wool insulation (density48kg/cum) as per IS:8183 backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures. A.C. ducts etc. suitable M.S. channel (minimum MC 75 @ 1.2m) grid shall also beprovided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC	SQM	500	0.00082973

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A1603	Providing and fixing permanently colour coated aluminium false ceiling of approved colour and Luxalon 84 C or approved equivalent with corrosion resistant aluminium alloy panels of minimum thickness 0.5mm including 50mm thick mineral wool insulation(density 48 kg/cum) conforming to IS:8183 backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures, A.C. ducts etc all complete. Suitable M.S. channel grid with minimum MC 75 shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. (Materials for structural	SQM	228	0.00099878
A1604	Providing, fixing and laying permanently colour coated aluminium false ceiling of approved colour with stove enamel finish of approved make in LINEAR and SQUARE type with corrosion resistance aluminium alloys panels of minimum thickness 0.5mm including 50mm thick mineral wool insulation (as per IS:8183)backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements.. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures etc. Suitable M.S. channel (minimum MC 75) grid 1200 mm C/C maximum shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. The work to be complete as per specifications, drawings and direction of engineer. (Structural steel works for platform for movement is separately	SQM	150	0.00070141
A1605	Providing, fixing and laying anodised natural colour matt finished aluminium false ceiling of Jindal/Hindalco make with corrosion resistance aluminium alloys panels of minimum thickness 0.5mm including 50mm thick mineral wool (density 48kg/cum insulation (as per IS:8183) backed with 0.05 mm thick aluminium foil & 24 G x 25 mm mesh wire netting and shall be fixed to ceiling with 24 G wire ties and suitable fixing arrangements.. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures etc. Suitable M.S. channel (minimum MC 75) grid 1200 mm C/C maximum shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. The work to be complete as per specifications,	SQM	122	0.00053052
A1607	Providing and Fixing 12mm thick Calcium silicate board of HILUX or equivalent in plan or elevation with aluminium grid, metal suspension system, anchor fastener adjustable hangers etc. including two or more coats of acrylic emulsion paint of approved colour to give an even shade with smooth finish all complete as per architectural design and detail. Metal suspension system as per ASTM C-635 shall be hot dipped M.S.galvanized (grade 180 as per is :277) and nominal size of T-section shall be 24 x 38 mm or 24 x 25 mm cross runners. 24mm wide exposed flange surface shall be permanently color coated. Suspension system shall be as per manufacturer's specification.The size of tiles shall be 600 X 600 mm or seamless as per detail designation and drawing.Movement platform of structural steel shall be provided if required for the movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. (Structural steel works for	SQM	60	0.00011472
1700	RAIN WATER DOWN TAKE PIPES: Rain water down take pipes at all level including all labour, material (unless otherwise specified in BOQ/contract specification), transportation, 2 coats of approved paint over one primary coat, fixtures, accessories etc as per specification,			
1703	Providing and fixing galvanised MS down take pipes of 100 mm dia- Medium quality as per IS:1239(part-I) / IS:3589 all complete.	RM	10	0.00001232
A1704	Providing and fixing galvanised MS down take pipes conforming to IS: 1239/IS: 3589 of 150 mm dia- Medium quality as per IS:1239(part-I) all complete as per specification. (Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be less than 400 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. All rain water down comers shall be provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anticorrosive painting over a coat or primer. Downcomers shall be provided with 45 x 45 cm size Khurras having minimum thickness of 30 mm with M-15	RM	2461	0.00511738
A1711	Providing and fixing CI grills in catch pits including frame etc. all complete as per specification.	Each	45	0.00001649
1800	MISCELLANEOUS: Miscellaneous works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level unless otherwise specified as per specification, drawings and as directed by engineer - in - charge for the following:			
A1801	Providing and Filling in trenches, plinths, area paving and other underground structures with graded stone aggregate of size range 63 mm to 45 mm (complying IRC specification) in layers, 200 mm compacted thickness including breaking of stone boulders to required sizes, filling the interstices with selected sand/ moorum/non-expansive soil sand and compacting to 85 % of original volume of stone stack for all lifts etc. all complete. Payment shall be made for the	CUM	2802	0.00671602
B1801	Providing and Filling in trenches, plinths, area paving and other underground structures with graded stone aggregate of size range 63 mm to 45 mm (complying IRC specification) in layers, 400 mm compacted thickness including breaking of stone boulders to required sizes, filling the interstices with selected moorum/non-expansive soil sand and compacting to 85 % of original volume of stone stack for all lifts etc. all complete. Payment shall be made for the	CUM	1000	0.00215718
1802	Supply and laying approved quality Stone aggregate 40mm size in transformer yards.	CUM	40	0.0001494
1803	Supply and laying approved quality rounded pebbles / gravels of 40mm size in transformer yards.	CUM	170	0.00056379
1804	Providing and fixing weep holes in Retaining wall, drains, etc consisting of 100 mm dia HDPE pipe sleeves with single side covering for the pipe mouth with galvanised welded wire fabric of 20 mm sq. opening all complete.	EACH	20	0.00000402
1807	Anti termite chemical treatment of soil with Chlorpyrifos/Lindane E.C. 20% with 1% concentration conforming to IS:8944 and as per IS 6313 all complete. (Plinth area of building at ground floor only shall be measured for payment).	SQM	700	0.00018682
1808	Laying of earthing mats/rods including risers, transportation from yard stores, loading, unloading, cutting to length, welding, protective painting of joints etc. all complete. (Excavation & Back filling shall be paid separately under respective item of earth work. Earthing mats/rods shall be supplied by BHEL free of cost)	MT	5	0.00005471
1809	Construction of below ground earthing system test pits as per drawing / sketches including concreting, reinforcement, formwork, providing & fixing GI strip etc as per drawing and specification (excavation & backfilling only will be paid under applicable BOQ items).	EACH	5	0.00005385

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
1810	Construction of below ground earthing system test links as per drawing/ sketches including concreting, reinforcement, formwork, providing & fixing GI strip etc as per drawing & specification (excavation & backfilling only will be paid under applicable BOQ items.)	EACH	5	0.00004024
1811	Construction of below ground earthing system earth electrodes as per drawing and specification. (Excavation and backfilling only will be paid under applicable	EACH	5	0.0000028
1812	Construction of below ground earthing system - Earth connection and riser pig tails as per drawing and specification. (Excavation and backfilling only will be paid under applicable BOQ items& steel shall be supplied by BHEL free of cost.)	EACH	5	0.00000203
1813	Providing Earthing pit as per drawing with charcoal & salt, GI pipes, GI earth electrodes, GI wire, GI strips, brick chamber with covers including associated	EACH	5	0.00018709
1814	Construction of below ground earthing system test pits as per drawing/ sketches including brickwork, plaster, concreting, reinforcement, formwork, providing & fixing GI strips/pipes, GI wires, covers etc as per drawing & specification including associated earthwork.	EACH	5	0.00014708
1815	Providing and fixing GI rungs in concrete/brick walls having zinc coating of minimum 900 g/sqm etc. all complete.	Kg	150	0.00002144
1818	Fire proofing of steel structures with VERMICULITE cementitious coating including supply of all materials for vermiculite materials, reinforcement mesh (3mm thick wire, 50x50 size mesh) , nuts, tie wires, weldings, surface preparation, curing, staging, compatible paintings etc. all complete.	CUM	51	0.00537669
1819	Supply & fixing expanded metal steel sheet conforming to IS:412. Size of mesh shall be 10mmX40mm with strands of 2.5mm width and 1mm thickness to the structural steel for facilitating fireproofing works.	SQM	5	0.00000283
1821	Sprinkling of water by water tanker fitted with perforated GI pipe (portable tanker minimum 3000 litre capacity) for roads and miscellaneous area within plant boundary, for dust suppression and reduction of suspended material at site for day to day work, as directed by BHEL site engineer (water for this purpose shall be provided by BHEL free of cost and utilisation of machine will be in terms of Tank-hour put in actual use for water sprinkling).	TANK-HR	5	0.00000399
1822	Providing & filling Bentonite Powder (Sodium base) mixed with water in electronic earthing pit as per drawing & direction below ground level including all materials, transportation, labour, incidental etc all complete as per specification.	CUM	2	0.00004031
1823	Providing and laying cinder filling in the toilets,roads,etc complete as directed by engineer in charge.	CUM	2	0.00000373
1824	Disposal of scrap steel, scrap wood, broken packing crates, cable scrap, debris and other civil waste, electrical waste materials etc. from project site to a designated place within 5 KM range, with all manpower T & P etc. including loading and unloading as and when directed by BHEL.			
a	Steel scrap / metal scrap	MT	7	0.00000429
b	Debris & Other waste materials.	CUM	10	0.00000115
1832	Providing and fixing sliding layer of bitumen paper or craft paper over the screed layer for water retaining structures to destroy the bond between the screed and the base slab concrete of the water retaining structure etc all complete.	SQM	10	0.00000028
A1849	Providing 50mm thick premix carpet surfacing laid to slope in two layers 30mm and 20mm respectively with 12mm downgraded stone chips mixed with 80/100 grade bitumen @ 52 Kg/Cu.M including compaction etc. all complete as per specification.	SQM	669	0.00037067
A1850	Providing 50mm thick anti corrosive layer laid to required slope consisting of clean & well graded coarse sand mixed with A90 grade bitumen for softening point upto 45 degree Celcius or A65 grade bitumen for softening point above 45 degree celcius as per IS: 73 or its equivalent quality 8 to 10% by volume and	SQM	669	0.00062103
A1852	Providing 75mm thk. bitumen-aggregate mix , mix shall consist of compact crushed stone,screenings, fine gravel, clean coarse sand mixed in 80/100 hot bitumen (8 to 10% by volume) and rolled or compacted all complete as per specification.	SQM	650	0.00054021
A1852	Providing underground facilities survey using Ground Penetration Radar (GPR) etc. all complete as per specification and direction of Engineer-in-Charge.			
a	Mobilization and demobilization of equipments , manpower etc. for conducting survey work various time as per requirement of site under permission/approval of BHEL Construction Manager.	Each Time	3	0.0000664
b	Conducting survey for conduit, cable line in length wise including submission of details report to BHEL etc.	RM	500	0.0000664
c	Conducting any spot survey within a small area including submission of details report to BHEL etc.	SQM	90	0.00000558
A1853	Providing Guniting 50 mm thick in cement mortar conforming IS :9012 at all heights and levels including all cost of materials including fabricated wire mesh, 3mm diameter spaced 50mm both ways conforming IS: 1566, Anchoring the mesh to hopper surface/beam etc, labour, tools etc complete as per specifications, approved drgs and direction of Engineer-in-charge.	SQM	4000	0.00195451
2000	FENCING AND GATES: Fencing and gates including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
2001	Supplying and erecting in position 2.4 m high PVC coated gavanised chain linked fencing of minimum 8 gauge (including PVC coating) of mesh size 75mm x 75mm. The diameter of the hot dip galvanised steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge . GI barbed wire fencing of height of 600 mm confirming to IS 298 at top of chain link fencing shall be provided with 4 strands of barbed wire hot dip galvanised wire of 12G comprising of 2 ply of wires with barbs of 16G spaced at 100mm. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm	RM	300	0.00095052
A2001	Supplying and erecting in position 2.4 m high PVC coated gavanised chain linked fencing of minimum 8 gauge (including PVC coating) of mesh size 75mm x 75mm. The diameter of the hot dip galvanised steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm GI flat stretcher bar at end posts, accessories etc. all complete. (Post shall be paid	RM	920	0.00291494

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
2003	Supplying and erecting in position 2.4 m high PVC coated gavanised chain linked fencing of minimum 8 gauge (including PVC coating) of mesh size 75mm x 75mm. The diameter of the hot dip galvanised steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. Concertina of height of 600 mm at top of chain link fencing shall be provided with all accessories. Concertinal shall be from tensile serrated galvanised wire (HTSW) made with wire diameter of 2.5 mm which will be stretched to 6m and attached on two strands of galvanised HTSSW (high tensile spring steel wire) of 2.5mm dia by means of clips at 1m interval. These two HTSSW strands will be attached to the fence posts/ angles with 12 mm security fasteners. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm GI flat stretcher bar at end posts etc. all complete. (Structural post shall be separately under ST No. 2007/2008)	RM	50	0.00016873
2007	Supply and fixing of hot dip galvanised mild steel posts for fencing. Rate of zinc coating shall not be less than 710 g/m2 on steel posts.	MT	2	0.00019732
2008	Supply, fabrication and fixing of mild steel posts for fencing including painting etc all complete.	MT	20	0.0018717
2009	Supply, fabrication and installing in position and testing galvanised MS Gates out of channels, joists, angles, flats, plates, pipes, welded steel wire mesh & sheets including stiffners, bracings, fabricated hinges, MS Aldrops with locking arrangement, tempered steel pivot, guide track of MS Tee, bronze aluminium	MT	6	0.00071234
2010	Supply, fabrication and installing in position and testing MS Gates out of channels, joists, angles, flats, plates, pipes, welded steel wire mesh & sheets including stiffners, bracings, fabricated hinges, MS Aldrops with locking arrangement, tempered steel pivot, guide track of MS Tee, bronze aluminium ball bearing	MT	5	0.00056688
A2011	Two or more coats of chlorinated rubber paint (as per IS: 13467) over a sutable primer of approved quality colour and shade to give an even shade on	SQM	30	0.00000736
2100	WATER SUPPLY: Water supply work including men, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
2101	Providing and fixing in position tested heavy duty type chromium plated (CP) brass long neck bib cocks including sockets, union, nuts etc all complete -	EACH	6	0.00000897
2102	Providing and fixing in position heavy duty brass stop cock of approved quality including all specials etc all complete - 15mm nominal bore.	EACH	6	0.00000637
2103	Providing and fixing in position heavy duty brass full way valve with wheel of approved quality including all specials etc all complete for following sizes:			
a	25mm nominal bore.	EACH	27	0.0000446
b	50mm nominal bore.	EACH	27	0.00010723
2104	Providing and fixing GI pipes class B medium class conforming to IS:1239 pipes shall be concealed and painted with anticorrsvive paint, complete for internal works with GI sockets, unions, elbows, tees, nipples etc and clamps including cutting and making good the walls etc all complete for following sizes:			
a	15 mm nominal bore.	RM	85	0.00004687
b	20 mm nominal bore.	RM	45	0.00002755
c	25 mm nominal bore.	RM	47	0.00003359
d	50 mm nominal bore.	RM	7	0.00000735
2105	Providing and fixing GI pipes class B complete for external work with GI sockets, unions, elbows, tees, nipples etc including trenching & refilling, anti-			
a	15 mm nominal bore.	RM	30	0.00001423
b	20 mm nominal bore.	RM	50	0.00002675
c	25 mm nominal bore.	RM	70	0.00004462
d	50 mm nominal bore.	RM	41	0.00003988
A2106	Providing and fixing wall to wall mirror of height 450mm & 6 mm thk float glass from reputed mirror manufacturer. Mirror shall be mounted with glass adjustable revolving CP brackets with CP screws etc all complete.	EACH	15	0.00001932
A2108	Providing and fixing 20 mm diameter stainless steel towel rails (600mm X 20mm) all complete.	EACH	15	0.0000127
2110	Providing and fixing C.P. Soap holder mounted with C.P. screws etc all complete.	EACH	5	0.00000414
A2111	Providing and fixing stainless steel liquid soap holder cum dispenser. Dispenser shall be round and easily revolving with removable threaded nozzle and	EACH	11	0.00000875
2112	Providing and fixing glazed vitreous wall mounted paper holder with suitable cover cum cutter fitted with CP screws etc. sll complete.	EACH	12	0.00001003
2113	Providing and fixing chromium plated brass shower rose 100mm dia with 15 or 20 mm inlet dia all complete.	EACH	6	0.00000802
A2114	Providing & fixing in position High density polyethylene (cylindrical/vertical) molded seamless type tank of Syntex or approved equivalent including making all necessary inlet & outlet pipes, fixture, ball cocks, valves etc all complete for following capacities. GI pipes shall be paid separately under ST No. 2105.			
a	500 litres capacity	EACH	14	0.00011956
b	1000 litres capacity	EACH	10	0.00017079
c	2000 litres capacity	EACH	7	0.00023912

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SCH-3 - SERVICE PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
2115	Providing and fixing approved stainless steel sink with integrated drainboard as per IS:13983 of size 915x460x178mm with CI brackets, stainless steel chain with rubber plug 40mm, cp brass waste trap with necessary union complete including painting the fittings, cutting and making good the wall where required	EACH	2	0.00002222
A2115	Providing and fixing approved stainless steel Pantry sink as per IS: 13983 of size 610x510mm, bowl depth 200mm with drain board of at least 450 length with trap, heavy duty CP and cold mixer, including CI brackets, stainless steel chain with rubber plug, 40mm dia CP brass waste trap, with necessary union complete with painting of fittings, cutting and making good the wall where required including required notching in counter grating slab etc, complete.	EACH	2	0.00001525
2116	Providing and fixing glass shelves 600mmx127mmx4 mm with chromium plated brackets all complete.	EACH	2	0.00000225
2118	Providing Minimum 600 mm long porcelain tray etc all complete..	EACH	5	0.00000965
2119	Providing and fixing Recessed porcelain soap tray in shower area etc all complete.	EACH	5	0.0000057
2120	Providing and fixing grab bars, barrier-free access and appropriate fittings and fixtures for toilets for handicapped etc. all complete.	EACH	4	0.00001158
A2121	Providing and fixing Electric operated hand dryer with photo voltaic control including fittings, cutting and making good the wall where required etc. all	EACH	5	0.00001887
2200	SANITARY: Sanitary work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
A2201	Supply and fixing glazed vitreous china Wash Basin of approved make (with photovoltaic control) conforming to IS:2556 part 4 of oval shape with R.S. or C.I. brackets painted white, 15mm chromium plated brass hot & cold faucets with nylon washers, chromium plated brass chain with rubber plug, 32mm chromium plated brass bottle trap and waste of standard pattern, 32mm dia chromium plated brass trap unions, plastic connection pipe with chromium plated nuts,			
a	White	EACH	6	0.00011128
b	Colored	EACH	8	0.00014837
2202	Providing and fixing approved vitreous china laboratory sink of size 600x400x200mm conforming to IS:2556 (part-5) with R.S. or C.I. brackets, chromium plated brass chain with rubber plug 40mm, 40mm CP brass waste and 40mm CP brass trap with necessary union complete including painting the fittings,	EACH	3	0.00003014
2203	Providing and fixing stainless steel kitchen sink of size 610x510x200mm conforming to IS: 13983 including all fittings etc. all complete.	EACH	2	0.00002341
2204	Providing and fixing colour glazed vitreous china European type water closet conforming to IS:2556 with siphon, open front solid plastic seat and plastic cover, low level 12.5 litre PVC flushing cistern (same colour as WC) with valveless fittings, necessary C.P connections etc all complete.			
b	Wall mounted	EACH	11	0.00008589
A2206	Providing and fixing coloured glazed vitreous china flat back lipped urinals of size 440x265x355 mm with photo voltaic controlled automatic flushing system as per IS:2556 (part 6, section 1) with flush pipes, lead pipes, gratings, traps and necessary C.P. fittings, with provision of squatting urinal for ladies	EACH	12	0.00038437
2207	Supply, laying and jointing UPVC pipes of class 3 as per IS:4985 including bends, branches and all other necessary fittings, M.S holder bats/clamps, cutting and making good the walls and floors, jointing, testing etc all complete for following.			
a	75mm dia pipes	RM	70	0.00003781
b	110mm dia pipes	RM	75	0.00005521
c	160mm dia pipes	RM	115	0.0001472
d	200mm dia pipes	RM	15	0.00002216
2208	Providing, laying light duty non pressure NP3 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc all			
a	200mm dia	RM	450	0.00035175
b	300mm dia	RM	100	0.00015823
c	450mm dia	RM	140	0.00039258
d	600mm dia	RM	100	0.00035782
2209	Providing, laying light duty non pressure NP2 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc			
a	150mm dia	RM	61	0.00004622
b	250mm dia	RM	31	0.000032
2210	Providing, laying light duty non pressure NP4 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc			
a	450mm dia	RM	2	0.00000541
2211	Providing and fixing C.I Manhole heavy duty cover of size 600mmx450mm including frame from reputed manufacture etc. all complete.	EACH	1	0.00001981
2212	Providing and fixing circular heavy duty C.I. manhole cover of 600 mm dia with frame etc. all complete.	EACH	21	0.00041749
2213	Providing and fixing square mouth S.W Gully trap grade 'A' complete with CI grating, brick masonry chamber (Clay Brickwork in 1:6 mortar, 12mm plaster in 1:6 mortar & 1:2:4 Cement Concrete) and water tight CI cover with 300x300mm (inside). The weight of cover to be not less than 4.53 Kg and frame to be			
a	100x100mm P or S Type.	EACH	7	0.0000303
b	150x100mm P or S Type.	EACH	7	0.00003108
c	150x150mm P or S Type.	EACH	7	0.00003184
2214	Providing and fixing C.I. floor traps size 100 mm Inlet and 100 mm Outlet Sand Cast Iron S&S as per IS: 1729 with C.P jalli all complete.	EACH	12	0.00002717
2215	Providing and fixing 100mm heavy duty UPVC floor traps with 100 mm inlet and 100 mm outlet & C.P jalli all complete.	EACH	12	0.00002292

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ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
2216	Providing and installing approved brand single tap water cooler of 80 L cooling capacity all complete.	EACH	7	0.00056956
2217	Providing and installing approved brand single tap water cooler of 150 L cooling capacity all complete.	EACH	4	0.00058515
2218	Providing and fixing white vitreous urinal partitions of size 675x325x85mm all complete.	EACH	8	0.00003056
2219	Providing and fixing eye and face drinking water fountain (combined unit with receptacle conforming to IS: 10592) all complete as per specification.	EACH	3	0.00003056
A2220	Providing and fixing sand cast iron pipes conforming to IS:1729 for above and below ground sanitary works with water tight lead joint, fixing clamps, excavation, filling, disposal etc. all complete for the following.			
a	80mm dia pipes	RM	50	0.00008354
b	100mm dia pipes	RM	30	0.0000647
c	150mm dia pipes	RM	40	0.00013478
2221	Providing, laying spun CI pipes with conforming to IS 1536 complete for following.(Excavation,backfilling,concrete to be paid seperately)			
c	150mm dia	RM	150	0.00057771
d	200mm dia	RM	50	0.00027864
f	300mm dia	RM	15	0.00013907
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 -			
2328	Supply, fixing lightning arrester and air terminal over roof of power house building, pump house and other structures including all materials, labour, electrodes etc complete (all materials to be supplied by the contractor).	EACH	1	0.0000059
2334	Providing and fixing 20mm square MS bar balustrade with suitable MS flat with suitable anti corrosive paint and MS pipe handrails etc all complete. (MS pipe	RM	75	0.00010495
A2335	Design, Supply, fabrication and fixing of Hopper gratings made of min 200mm X 28mm thick flats in Main direction and min 100 mm X 20 mm thick flats in secondary direction including application 2 coats of Red oxide primer all complete as per specification and approved drawing	MT	120	0.01722312
2400	ROAD WORKS: Road works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation etc. as per specification drawing, relevant IRC & IS codes and as directed by the Engineer-in-charge for the following: (CEMENT WILL BE SUPPLIED BY			
2401	Preparation of sub grade by excavating earth to required depth for all types of soil/ rock, dressing to camber and consolidating the base including making good the undulation etc and disposal of surplus earth within a lead upto 1 km etc. all complete.	CUM	6000	0.00050846
2402	Supplying and filling with selected good earth of approved quality in layers not exceeding 300 mm loose thickness using borrowed soil (borrowed soil to be arranged by the bidder) and compacted so as to achieve at least 95 % maximum dry density as per IS-2720 (Part-VII) including royalty/seignorage fee (if any), sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing	CUM	3000	0.00154437
2403	Providing, stacking & laying granular morrum for shoulder including watering, compaction with road roller to required camber etc all complete.	CUM	350	0.0003847
A2404	Providing & laying granular sub base (GSB) course in layers of required thickness with crushed stone aggregates (GR-1 complying MORTH specification for road and bridge works), stone screening & blinding material including screening, sorting, spreading to template & consolidation with road roller including	CUM	1560	0.00563925
A2405	Providing & laying granular base course(WBM GRADE -III, 53-22.4MM) in layers of required thickness with stone aggregate (MORTH specification for road and bridge works), stone screening and blinding material including screening sorting, spreading to template and consolidation with road roller including carriage	CUM	4000	0.01652888
2413	Supplying and laying 400mmx150mmx350mm deep precast concrete kerb stone of grade M-20 with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:2) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where	RM	300	0.00010933
A2413	Supplying and laying 450mmx250mmx500mm deep precast concrete kerb stone of grade M-25 with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:6) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where	RM	500	0.00054646
B2413	Supplying and laying 300mmx250mmx150mm deep precast concrete kerb stone of grade M-25 with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:6) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where	RM	500	0.00018113
2414	Providing & laying edge protection on edges of black topping using brick on edge (bricks with crushing strength of 75 kg/cm2) with full brick width (230 mm) etc	RM	200	0.00003138
A2415	Supply and laying 200mm dia R.C.C NP-3 type Hume pipe in raised shoulders as rain water drains as per detailed drawing including fixing with cement mortar (1:2) in 13mm thick joints, finishing of joints with neat cement paste etc all complete.	RM	700	0.00068061
2416	Dismantling of existing road consisting of premix carpet, kerb stone/ brick on edge, bitumen macadem course, WBM, preparing subgrade to receive new WBM including camber consolidation including disposal of debris within a lead of 1 km etc all complete.	SQM	400	0.00005202
	Providing and placing concrete work in road including cost of labour, materials (unless otherwise specified in BOQ/contract specification) and equipment for handling, transportation, batching, mixing, placing, vibrating and curing (excluding cost of centering, shuttering and reinforcement) with mechanised equipments like batching plant, transit mixer, concrete pump etc. complete as per drawing, specifications and as			
2418	Concrete of grade M10 (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors at any depth below finished floor level etc.	CUM	1400	0.00619061
A2418	Providing and laying of plain cement concrete of grade M15 using 40 mm graded stone aggregate including providing and fixing formwork, compaction etc. all	CUM	425	0.00187231

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B2418	Providing and laying of plain cement concrete of grade M20 using 40 mm graded stone aggregate including providing and fixing formwork, compaction etc. all	CUM	425	0.00194219
A2419	Providing and laying cement concrete of grade M35 using 20 mm nominal size stone aggregate with approved admixture (if required), in road pavement using fully mechanized paver fitted with electronic sensors , provision for necessary joints including compaction, finishing to lines and grades, curing and providing & fixing forwork etc. all complete. (Excluding the cost of reinforcement and dowel bar)	CUM	5250	0.02901254
2420	Supplying and filling sand for preparation of read sub-base/ sub-grade in layers not exceeding 250 mm thickness and compacted so as to achieve at least 80% relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/ compaction by manual/ mechanical means, dressing, royalty (if any) etc all	CUM	200	0.00023071
2421	Providing & laying dry lean cement concrete of grade M15 with 20 mm nominal size graded stone aggregate over a prepared sub-grade including compaction,	CUM	1700	0.00748922
A2421	Providing & laying dry lean cement concrete of grade M10 (in pavement/shoulders) with 20 mm nominal size graded stone aggregate with mechanical paver over granular sub-base including compaction by vibratory roller, finishing, curing etc all complete.	CUM	2400	0.01057302
A2422	Providing and fixing in position MS dowel bar reinforcement including surface painted with bitumen and greasing, dowel end caps with cotton fills etc all complete as per specification, drawing and as directed by Engineer.	MT	7	0.00067734
B2422	Providing, straightening cutting, bending, placing in position at any level, binding in position of steel reinforcement of mild steel reinforcements including cost of binding wire, labour, scaffolding transportation to & from stores etc all complete as per specifications, drawings and as directed by Engineer.	MT	14	0.0010517
A2423	Providing & laying polythene sheet of specified thickness (min. 125 micron), above dry lean concrete sub base, before laying of concrete slab pavement.	SQM	13000	0.00105481
A2424	Providing & installation of 25 mm thk. bitumen impregnated fibre board conforming to IS 1838 at all levels as joint filler including nailing, coating of both faces with coal tar pitch/bitumin etc. all complete as per specification, drawing and as directed by engineer.	SQM	700	0.00041289
A2425	Providing and filling in position hot applied bitumen sealing compound (Grade A) of specified thick confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints, sealant primer etc all complete as per specification, drawing and as directed by Engineer.	RM	5000	0.00030356
A2426	Providing and laying debonding strip/tape , 25 mm wide & 5 mm thk. before applying sealant including cleaning etc all complete as per specification, drawing	RM	5000	0.00041532
A2427	Providing & laying 75 mm thick precast interlocking designer concrete blocks (of M35 grade concrete) of approved colour and pattern as per specification	SQM	5800	0.00448409
A2428	Providing and laying 20mm thick sand layer below and average 3 mm thick sand filler in between two concrete blocks concrete blocks including compaction etc all complete as per specification, drawing and as directed by Engineer.	SQM	3300	0.00006666
M	Miscellaneous Works-2: (Miscellaneous works including labour, material, equipment etc. all complete at any level unless otherwise specified as per specification, drawings and as directed by engineer)			
M1	Pumping out water using de-watering pumps from water logged areas as an when required for execution and to facilitate erection & commissioning including provision of delivery pipe up to 150 m etc. all complete as per site condition and instruction of engineer	KL	700	0.00012273
M2	Supply & engagement of manpower for cleaning and house keeping with all equipments, T&P etc. from various floor of power house and other buildings, boiler, ESP, mill area, etc. and stacking at designated place at 0.0 m with a lead of 100 m. as per instruction of engineer.			
M2.1	Unskilled manpower	MAN-DAY	500	0.00037313
M2.2	Semi-skilled	MAN-DAY	100	0.00008753
M3	Removal and disposal of scrap steel, scrap wood, broken packing crates, cable scrap, debris and other waste materials, slush, etc. from project site to a designated place within 5 km range, with all manpower, T&P, etc. including collection, loading and unloading as directed			
M3.1	Steel materials	MT	5	0.00000306
M3.2	Wood/cable scrap materials	CUM	25	0.00000288
M3.3	Debris & other waste materials	CUM	50	0.00000576
M3.4	Slush removal	CUM	100	0.00001151
	TOTAL			0.97469093

VOLUME-III PRICE SCHEDULE, REV-00				
JOB: CIVIL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.				
TENDER NO. PSER:SCT:NKP-C1974:19				
SCH-4-SUPPLY PART				
ST NO.	ITEM DESCRIPTION	UNIT	QUANTITY	WEIGHTAGE
700	MS EMBEDMENTS: Embedments including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge for the following:			
702S	Supply, Fabrication, transportation, delivery at site mild steel foundation bolt assembly conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffner plates, protective tape, pipe sleeves, templates etc. including welding, cutting, grinding, threading, drilling etc. all complete.	MT	35	0.00263480
	TOTAL			0.00263480

VOLUME-III PRICE SCHEDULE, REV-0				
JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.				
TENDER NO. PSER:SCT:NKP-C1974:19				
SCH-5 -LEVELING GRADING				
ST. NO	DESCRIPTION OF ITEM	UNIT	QUANTITY	WEIGHTAGE
1	Earth work in stripping of top soil upto a maximum depth of 0.30m below natural ground level so as to exclude all debris, grass, vegetation including uprooting of plants and disposal within a lead of 1km etc .	SQM	17,000	0.00113962
2	Earth work in excavation upto any depth for levelling and grading and disposal within a lead of 1km in all types of soil including ash, laterite, moorum etc all complete as per drawing, specification and as directed by the Engineer-in-Charge.	CUM	50,000	0.01062463
3	Earth work in excavation upto any depth for levelling and grading and disposal within a lead of 1km in soft rock (rock without any recovery of excavated materials in form of hard stone/boulder) including weathered rock which can be excavated by means of crow bar, pick axe, pneumatic rock breaker attachment with excavator machine etc but does not require chiselling or blasting as approved by engineer.	CUM	5,000	0.00125978
3A	Earth work in excavation upto any depth for levelling and grading and disposal within a lead of 1km in hard rock including blasting/controlled blasting and/or chiselling, wedging, line drilling, pre shearing or any other means including supply, storage, handling of blasting materials etc without damaging the existing structures and as approved by engineer.	CUM	500	0.00020996
4	Extra over ST No.1 and 103 to 3A for carriage of material/earth for every 500m or part thereof beyond an initial lead of 1km.			
a	Carriage for disposal of serviceable/unserviceable material/ earth	CUM	70,000	0.00070831
5	Earth work in filling for levelling & grading using selected excavated earth (obtained from compulsory excavation inside the project site) on prepared surface obtained by compacting with mechanical means including setting out, filling in horizontal layers not exceeding 300mm compacted thickness, spreading, sorting, breaking clods, watering, compaction with proper moisture content to achieve a minimum 95% of maximum dry density (standard Proctor density), dewatering (if required), testing, approaches, finishing to required lines, grades and slopes, levelling etc complete as per specification, drawing and as directed by the engineer.	CUM	13,000	0.00317347
6	Earth work in filling for levelling & grading using borrowed good earth (borrowed good earth to be arranged by the contractor at his own cost) on prepared surface obtained by compacting with mechanical means including setting out, filling in horizontal layers not exceeding 300mm compacted thickness, spreading, sorting, breaking clods, watering, compaction with proper moisture content to achieve a minimum 95% of maximum dry density (standard Proctor density), dewatering (if required), testing, approaches, finishing to required lines, grades and slopes, levelling etc complete as per specification, drawing and as directed by the engineer.	CUM	1,500	0.00090309

VOLUME-III PRICE SCHEDULE, REV-0				
JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS ETC. OF FGD SYSTEM PKG FOR 3X660 MW NORTH KARANPURA STPP, JHARKHAND.				
TENDER NO. PSER:SCT:NKP-C1974:19				
SCH-5 -LEVELING GRADING				
ST. NO	DESCRIPTION OF ITEM	UNIT	QUANTITY	WEIGHTAGE
7	Providing, stacking and laying 300mm thick boulder pitching with caulking and pointing with cement sand mortar (1:4) on the slopes of earth fill/cut with approved quality of rock fragments.	CUM	500	0.001511
8	Providing, stacking and laying 300mm thick hand placed rip-rap (with average weight of stone=25kg) on the slopes of earth fill/cut with approved quality of rock fragments.	CUM	500	0.00146474
9	Providing, stacking and laying 150mm thick layer of graded course aggregate in slope, which shall act like filter as per specification, drawing and instructions of engineer in charge with approved quality of rock fragments.	CUM	250	0.00098045
10	Providing, stacking and laying 150mm thick layer of graded sand in slope including screening, washing (wherever required), watering, compaction, dressing, necessary trimming if any, which shall act like filter and including all leads and lifts etc all complete as per specification, drawing and instructions of engineer in charge with approved quality and gradation of sand.	CUM	250	0.00028448
11	Providing random rubble (RR) stone masonry in foundation, super structure, boundary wall, retaining wall and embankment with cement mortar 1:6 at all elevations including all labour, material, equipment, handling, scaffolding etc. all complete. [MSR ST No. 1831]	CUM	100	0.00041474
	TOTAL			0.022674270