



भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

Ref: PSER:SCT:BRM-C1953:7493

Date: 26-03-2019

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.abcprocure.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 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:BRM-C1953:19
ii	Broad Scope of job	BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI
iii	DETAILS OF TENDER DOCUMENT	
a	Volume-IA	General conditions of contract (Supply) Not Applicable.
b	Volume-IB	General conditions of contract (Service) Applicable.
c	Volume-IC	Special conditions of contract (Supply) Not Applicable.
d	Volume-ID	Special conditions of contract (Service) Applicable.
e	Volume-IE	Forms and Procedures etc. Applicable.
f	Volume-IF	Technical Conditions of Contract (TCC) (CML, TS & DRG for PSER and ISG part) Applicable.
g	Volume-III	Price Schedule (Absolute value) – Rev-00 Applicable.
iv	ISSUE OF TENDER DOCUMENTS	This is an E-tender floated online through our E-Procurement Site https://bhel.abcprocure.com . Start date of the tender: 26-03-2019 Applicable.
v	DUE DATE & TIME OF OFFER SUBMISSION	Date: 16-04-2019, Time: 15-00 Hrs. The bidder should respond by submitting their offer online in our e-Procurement platform at https://bhel.abcprocure.com only. Offers are invited in two-parts only. Hard copy bid or bids through email/fax shall not be accepted. Applicable.
vi	OPENING OF TENDER	Date: 16-04-2019 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 working day at the same time. (2) Bidder may depute representative to witness the opening of tender. Applicable.

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vii	EMD AMOUNT	Rs. 79,30,000/-	Applicable.
viii	COST OF TENDER	Rs. 10,000/-	Applicable.
ix	LAST DATE FOR SEEKING CLARIFICATION	Date: 06-04-2019 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:-	
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	

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	attached in relevant Attachment section) <u>Note:</u> 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 this Tender 2. Cost of Tender (Demand Draft or copy of Cash Receipt as	

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	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 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:

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(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)
	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)

Sl. No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment' for corresponding Similar Packages (as in row 1)	T ₁	T ₂	T ₃	T ₄	T ₅	...	T _N	Sum (Σ) of columns (iii) to (ix) = 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
- 36 months preceding and including the cut-off month

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

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

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

III. 'Assessment of Capacity of Bidder':

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

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

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Note:

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

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

IV. Explanatory note:

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

Table-1

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

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

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

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

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

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

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

- iv). Consequent upon applying the criteria of 'Assessment of Capacity of Bidders' detailed above on all the bidders qualified against Technical and Financial Qualification criteria, if the number of qualified bidders reduces to less than four, then for further processing of the Tender, BHEL at its discretion reserves the right to also consider the bidders who are "not qualified" as per criteria of 'Assessment of Capacity of Bidders' and for this, procedure described in following three options shall be followed:
- 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 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 -
- Short hold: Evaluation shall not be applicable for this period, however Loading will be considered.
 - 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 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

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price bid (Volume-III) uploaded in E-Procurement Site <https://bhel.abcpurchase.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.
- 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:

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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) & 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	Others
Micro		
Small		
Medium		

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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 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.
- 30.0 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.
- 31.0 Annexure-B - Terms & conditions of Reverse Auction is enclosed herewith.
- 32.0 Annexure-D – Specific Clause w.r.t. BOCW Act & Cess Act is enclosed herewith.
- 33.0 Annexure-E- Statewise GST Registration nos. is enclosed herewith.
- 34.0 Duly filled & signed Annexure- CPP-GST/I to be submitted by bidders along with their techno-commercial offer.
- 35.0 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 Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Address	Phone & Email
1.	Shri D.R.S Chaudhary, IAS (Retd.)	E-1/164, Arera Colony, Bhopal 462016 (M.P.)	dilip.chaudhary@icloud.com
2.	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 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.

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- (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

- 36.0 Bidders falling under the purview of Public Procurement (preference to Make In India) order 2017 by Govt of India, vide order no P-45021/2/2017-B.E.-II, dated 15th June,2017, & all subsequent clarifications, can avail the intended benefits on submission of requisite documents as per the provisions of the order, subject to Minimum Local Content of 50%, Margin of Purchase Preference of 20% & modality of application of preference to Make In India as per aforesaid order.
- 37.0 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.

37.0 Order of Precedence

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

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

for BHARAT HEAVY ELECTRICALS LTD

Mgr (SCT)

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Agency	Contact details	
BHEL, PSER, Kolkata	Address	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700 091
	Phone no	033-2339 8229 (D)/ 8000
	FAX no	033-23211960
	E-mail	sriparna@bhel.in ; gargi@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	BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.
TENDER NO	PSER:SCT:BRM-C1953:19

SL NO.	CRITERIA
1.0 (a)	BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER OF INR 21 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. 55 CR. OR B) 2 (TWO) WORKS OF VALUE NOT LESS THAN Rs. 35 CR. EACH OR C) 3 (THREE) WORKS OF VALUE NOT LESS THAN Rs. 28 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. RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
2.2.1	AT LEAST 6300 CUM OF RCC COMPLETED WITHIN A COMMON PERIOD OF TWELVE CONSECUTIVE MONTHS IN CUMULATIVE OF TWO RUNNING / COMPLETED CONTRACTS. OR AT LEAST 4200 CUM OF RCC COMPLETED WITHIN A PERIOD OF TWELVE CONSECUTIVE MONTHS IN ONE RUNNING / COMPLETED CONTRACT.
2.2.2	AT LEAST 105 MT STRUCTURE FABRICATION WORK, COMPLETED WITHIN A COMMON PERIOD OF TWELVE CONSECUTIVE MONTHS IN CUMULATIVE OF TWO RUNNING/COMPLETED CONTRACTS. OR AT LEAST 70 MT OF STRUCTURE FABRICATION, COMPLETED WITHIN A PERIOD OF TWELVE CONSECUTIVE MONTHS IN ONE RUNNING / COMPLETED CONTRACT.
2.2.3	AT LEAST 135 MT OF STRUCTURE ERECTION WORK, COMPLETED WITHIN A COMMON PERIOD OF TWELVE CONSECUTIVE MONTHS IN CUMULATIVE OF TWO RUNNING/COMPLETED CONTRACTS. OR AT LEAST 90 MT FOR STRUCTURE ERECTION, COMPLETED WITHIN A PERIOD OF TWELVE CONSECUTIVE MONTHS IN ONE RUNNING/COMPLETED CONTRACT.

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3.0	BIDDER SHOULD HAVE VALID PAN. RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
4.0	IN CASE OF CONSORTIUM BIDDING, THE FOLLOWING POINTS SHALL BE COMPLIED. RELEVANT SUPPORTING DOCUMENT SHALL BE SUBMITTED
4.1	NO OF PARTNERS INCLUDING PRIME BIDDER SHALL NOT BE MORE THAN 2
4.2	PRIME BIDDER ALONG WITH CONSORTIUM PARTNER SHALL ENTER INTO AGREEMENT
4.3	PRIME BIDDER SHOULD COMPLY WITH CRITERIA UNDER SL NO 1.0, 2.1 & 2.2.1 or 2.2.2 or 2.2.3 ABOVE
4.4	EITHER PRIME BIDDER OR CONSORTIUM PARTNER (MAXIMUM 1 NO.) SHALL COMPLY WITH BALANCE CRITERIA.
4.5	PRIME BIDDER AND CONSORTIUM PARTNER EACH SHALL COMPLY WITH CRITERIA UNDER SL NO 3.0.
4.6	IN CASE OF CONSORTIUM BIDDING, PRIME BIDDER SHALL BE RESPONSIBLE FOR OVERALL EXECUTION OF THE CONTRACT
4.7	PRIME BIDDER SHALL COMPLY WITH ALL OTHER PRE-QUALIFYING CRITERIA FOR THE TENDER UNLESS OTHERWISE SPECIFIED
	GENERAL
A	IN CASE THE JOB IS UNDER EXECUTION / ONGOING JOB, THE VALUE OF EXECUTED PORTION OF THE JOB SHALL BE AT LEAST CORRESPOND TO THE RESPECTIVE VALUES SPECIFIED ABOVE EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
B	BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER
C	THE CONSORTIUM PARTNER SHALL SUBMIT SD EQUIVALENT TO 2% OF THE TOTAL CONTRACT VALUE IN ADDITION TO THE SD TO BE SUBMITTED BY THE PRIME BIDDER FOR THE TOTAL CONTRACT VALUE
D	BIDDER SHOULD FURNISH INFORMATION REGARDING PROJECTS IN HAND, CURRENT LITIGATION, ORDERS REGARDING EXCLUSION / EXPULSION OR BLACK LISTING.
E	AFTER SATISFACTORY FULFILLMENT OF ALL ABOVE CRITERIA, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION & PARTICIPATION AS PER NIT & ALL OTHER TERMS OF TENDER, ALONG WITH ACCEPTANCE/ APPROVAL OF BIDDER BY CUSTOMER.

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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. Time period for achievement of the 'Technical' criteria of PQR will be the last 7 years ending on the 'latest date' of Bid submission
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).

X_0 = 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	BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI	
Ref	1.0	Tender no PSER:SCT:BRM-C1953:19
	2.0	BHEL's NIT, vide reference no PSER:SCT:BRM-C1953:7493 Date: 26-03-2019
	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	BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI
TENDER NO	PSER:SCT:BRM-C1953:19

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	Undertaking regarding Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR	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.
- 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 execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'stand alone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.
- 14 The consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 0.5% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.
- 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:

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.

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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 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:

- (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.

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- (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:

"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."

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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.
 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://eaindstry.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 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:

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

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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:

- 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.

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- 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
- 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)] x 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

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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:

"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)

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Act, 1996 to contribute to the Fund at such rate per mensem as may be specified by the State government by notification in the Official Gazette. Where such beneficiary authorizes the contractor being his employer to deduct his contribution from his monthly wages and to remit the same, the contractor shall remit such contribution to the Building and other construction Workers' Welfare Board in such manner as may be directed by the Board, within the fifteen days from such deduction.

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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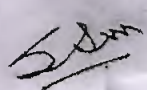
- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants 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

**BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW
BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9
BEGUSARAI, BIHAR, BARAUNI**

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.
2.3.2	<u>Service of notice on BHEL</u>

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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 financial liability of BHEL under this contract.	

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- 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 of a period of two weeks by BHEL, 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 job as per required schedule

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- 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 Sl.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:
- a) 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.
 - b) 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)
 - c) 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 work (or estimated value of services to be provided for carrying out milestone/stage payments like

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Trial Operation/PG Test, etc) as mutually agreed, shall however be reduced from the final contract value.	
2.7.9	<u>LIQUIDATED DAMAGES/PENALTY</u> 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.
2.8.6	While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate,

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

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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 carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/

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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 contractor as per specified format. Review of the programme and record of shortfall shall be done

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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
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

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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 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

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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.
- 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:**

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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) <u>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:</u> 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:

SL NO.	CATEGORY	BASE INDEX	COMPONENT ('K')		
			CIVIL PACKAGES (See Note A/B/C)	MECHANICAL PACKAGES	LABOUR ORIENTED

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			A	B**	C		PACKAGES (See Note D)
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)

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.

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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.

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

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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 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 :

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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
- 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

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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 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

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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

**BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW
BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9
BEGUSARAI, BIHAR, BARAUNI**

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.

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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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	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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	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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	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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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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	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, Supervisory Staff, etc.

	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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Chapter – VI: Material Handling, Storage & preservation

	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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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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	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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	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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	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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	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	CITATION:-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	MEMORANDUM OF UNDERSTANDING 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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	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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	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

TENDER NO: PSER:SCT:BRM-C1953:19

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FORMS & PROCEDURES

FOR

**BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW
BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9
BEGUSARAI, BIHAR, BARAUNI**

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

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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)	
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1.12	Bank Guarantee for ~~Interest Bearing Refundable~~ Advance	F-12 (Rev 00)	
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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 M ICR 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:BRM-C1953:19

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:BRM-C1953:19

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:BRM-C1953:19

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:BRM-C1953:19

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:BRM-C1953:19

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:BRM-C1953:19

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 <xxxxxxxxxxx> 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 xxxxxxxxxx, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx".

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

		Rs.	P.		I	II
					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) Rs. P.	Credit (Deductions) 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 :	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				REMARKS
							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	Rate at which	Amount recover-	Amount recovered	Balance now	Remarks
		Issued	recovery	able	upto	recovered	
			Is to be		previous		
			Made		bill		
			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:BRM-C1953:19

II MEMORANDUM OF PAYMENT												
										Rs.	P	
1	Total Value of work actually measured as per Account no I coloumn 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:BRM-C1953:19

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 **										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:BRM-C1953:19

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

IV CERTIFICATE OF THE SENIOR ENGINEER

- 1 Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and
Cretified that the measurements have been check measured to the prescribed extent by
..... (Name & designation). And by the the undersigned at site and relevent entries have been initiated in the measurement book (vide
2 pages.....)
- 3 Certified that the methods of measurement are correct
- 4 Certified that the measurements have been technically checked with reference to contract drawings, deviations etc
- 5 Certified that all the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.
- 6 Certified that all the recoverable amounts in respect of stores, tools and pallant, elwater, electricity charges etc, have been correctly made vide Annexures A
- 7 Certified that the issues of all stores as per statement atytached (whether charged to the contractor or direct to the work) have been technically checked and

Certified for payment of * Rs (Rupees.....) (Only). To be paid in
cash/by cheque in the presence of

ALLOCATION

The expenditure as under and to be included in the accounts for 19

Ledger Head	Debit (Gross Amount)		Credit (Deduction)	
	Rs.	P	Rs.	P
.....				
Total				

* Here specify the net amount payable

Signature of Senior Engineer
Date

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 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		Amount recoverable upto previous bill Rs P		Balance Now recovered Rs P		Remarks 8
				5		6		7		

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.....
ment/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 Tendered 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.

TENDER NO: PSER:SCT:BRM-C1953:19

VOLUME -IF

TECHNICAL CONDITIONS OF CONTRACT
(TCC)

FOR

**BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW
BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9
BEGUSARAI, BIHAR, BARAUNI**

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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These Special conditions shall be construed as part of tender document and shall be read along with General Conditions of Contract. In case of any conflict or inconsistency between the general and these Technical conditions, the same shall be brought out by the bidder in writing to BHEL for clarification during pre-bid discussions; failing which most stringent interpretation / clause in favour of BHEL shall be adopted and the same shall be binding to the contractor.

CLAUSE NO	DESCRIPTION
1.0	PROJECT SYNOPSIS AND GENERAL INFORMATION
	INTRODUCTION
2.0	<u>Details of proposed stage/ units</u> Project name: BARAUNI THERMAL POWER PLANT -2x250 MW EXTENSION PROJECT No of units x capacity: 2 x 250 MW. Project setting up by: Bihar State Electricity Board (NTPC) Bihar State Electricity Board, hereafter referred to as NTPC, has awarded BHEL the job for establishing two numbers of coal fired of rating 250 MW each on Engineering, Procurement and Construction (EPC) package basis The units are proposed to be set up adjoining existing plant at Barauni Thermal Power Station, Extension unit 8 &9 at district Begusarai in the state of Bihar, India. Project site is disposed at N25°23'13.5" to N N25°23'54"latitude and E 86°01'05" to 86°01'46.3" longitude, 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 the/ BHEL. APPROACH TO SITE LOCATION :Barauni Thermal Power Station, Begusarai, Bihar NEAREST RAILWAY STATION :Hathidah Railway Station (Broad Gauge) on Howrah-Patna route is about 3.5 KM away from the site. :Barauni Railway Station (Broad Gauge) on Howrah-Muzzafarpur route is about 15 KM away from the site. ROAD DISTANCES :NH-31 is adjacent to site. NEAREST AIR PORT :Patna, 110 KM away from Barauni. MODE OF TRANSPORTATION :Rail/Road DESIGN AMBIENT TEMPERATURE: 35.2 Deg.C maximum, 12.1 Deg.C minimum, DESIGN RELATIVE HUMIDITY : 98% (Maximum) AVERAGE ANNUAL RAINFALL : 1003.4 MM SEISMIC ZONE : Zone-IV as per IS-1893 Part-I (2002) WIND SPEED : 47 m/s Owner: NTPC Site visit: The bidder must visit the actual site of 2x250 MW Barauni Extension Thermal Power Project, 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	The scope of works covers Civil including bore cast –in –situ piling work, structural &

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	architectural works as per specification including supply of all materials (Other than those being supplied by BHEL), labour, tools and plants. The scope of work is indicative but not limited to the given below – • Below ground earth mating of entire plant excluding PB-1 & PB-2, CHP, AHP, Chimney, Swithyard area • CW pump house & RCC ducts • CW treatment Bldg • Effluent Treatment Plant (civil) • Hydrogen generation plant • Canteen building • DM Plant Bldg(including all civil foundation and superstructure civil) • DM tank Foundation • FOPH & All foundation, dyke etc • Fuel oil unloading area • Fuel oil pressurizing area and heating pump house • FOAM pump house • FO tank Foundation+ and Dyke • Fuel oil Tank Farm Area • PT Plant area all structure • Clarified water pump house & storage tank • Filter water tanker • Chlorination Bldg • Chemical Lab • All civil work of sewage treatment plant • All common pipe racks foundations & super structure (excluding PB-1 & PB-2 area) • Parmanent store • Administrative Building • Raw Water Reservoir • Raw Water Pump House • Time office and Security building • Workshop building • Car Parking Shed and open area • Fire Water Pump House • Fire Station Building • AHP & CHP Structure including piling work • Ash Pipe Corridor NOTE : superstructure above pump floor for CW pump house, permanent store and Clarified water pump house shall be of steel frame structure.
3.2	Any buried pipe/ cable coming in the working fronts are to be removed safely by the contractor at no extra cost to BHEL.
3.3	The work to be performed under this specification consists of providing all labour, materials, consumables, equipment, temporary works, temporary storage sheds, temporary colony for labour and staff, temporary site offices, constructional plants, 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.
3.4	The scope shall also include setting up by the bidder a testing laboratory in the field to carry out all relevant tests, Non Destructive Testing etc., complete as per Quality Plan/Customer requirements.
3.5	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

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	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.
3.6	
4.0	DEVIATIONS/CLARIFICATIONS The bidder is required to submit 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.
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
6.1	Availability of land within plant boundary is very limited and the contractor has to plan and use the existing land considering the use of land by other mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erection agencies. Contractor shall develop these areas for their site office, covered storage shed, various open yard, fabrication yard, batching plant yard etc including grass/ tree cutting, leveling, grading etc as applicable. Bidder must visit site to assess site condition, prior to quoting.
6.2	Land outside plant adjacent to boundary wall within 2KM will be provided (if available within construction period) for labour colony free of cost. Contractor will arrange temporary fencing, levelled the area according to their requirement, drinking water, sanitation, construction of temporary colony/hutment, electricity as per their requirements at their own cost.
6.3	The contractor will be responsible for handing back all lands, as handed over to him by NTPC/BHEL.
6.4	Area for fabrication, batching plant and storage area for construction material and equipment shall be provided free of cost.
7.0	WATER
7.1A	To start with the enabling job construction water may be drawn from adjacent river. Drinking water to be arranged by the contractor till borewell Water established. Construction & Drinking water will be provided to the contractor free of cost after the borewell is commissioned.
7.1B	Contractor will install and commission two/three nos borewell pumps (for construction as well as drinking water) as directed by NTPC/BHEL as per BOQ schedule rates within 45 to 60 days and day to day operation and maintenance of entire system will have to be done by the contractor at his own cost till completion of civil works. For further distribution of pipeline net work upto power block area are to be carried out by the bidder as per approved enabling work plan and the same will be paid as per BOQ schedule rate. Contractor will submit enabling work plan showing batching plant, covered cement store 65X16MX3M height, brick manufacturing area, civil construction office 400sqm alongwith toilet,septic tank, soak pits etc. two nos under ground open construction water tank(180 to 200 cum capacity), steel yard, fencing and MS gate around steel open yard, fabrication yard, hardsurfacing for fabrication yard and steel yard, drinking water spot at two places of power block, roads, open/masonry drain, tower light for general illumination, borewell points,etc. within fifteen days for approval. Contractor will construct civil laboratories, their own offices, stores, construction and drinking water net work within power block area, etc. at their own cost.
7.2	Contractor will install and commission two/three nos borewell pumps (for construction as well as drinking water) as directed by NTPC/BHEL as per BOQ schedule rates within 45 to 60 days. Day to day operation and maintenance of entire system will have to be done by the contractor at his own cost till completion of civil works.
7.3	Distribution network for drinking water system within power block area shall be done by the

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	bidder at his own cost.
7.4	Contractor should arrange on their own drinking water in their labour colony.
7.5	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.
7.6	Bidder will ensure adequate supply of construction water to meet the requirement of water during major concreting.
7.7	The availability of water (construction as well as drinking) in BARAUNI Extension project may be limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
8.0	ELECTRICITY
8.1	CONSTRUCTION POWER :- NTPC/BHEL Shall Provide Construction Power free of charge at 415V level at one point (300 M away from workplace). Contractor has to make his own distribution arrangement to draw electricity at batching plant, fabrication yard, power block area. Work area illumination: The contractor will arrange and install general illumination system during construction right from start of work. This system will include work area lighting, temporary pole, portable lighting arrangements etc. at his work spot and at his own cost. 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.
8.4A	Bidder will have to arrange sufficient illumination at their own work areas to the satisfaction of BHEL/NTPC.
8.4B	deleted
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 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.
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 unless otherwise specifically mentioned in the contract.
9.2	All consumables to be used for the job shall have to be approved by BHEL/NTPC prior to use.
9.3	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.

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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
	Contractor's 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. BHEL's authorized representative shall be given free access at all time to such quality related records etc. for inspection, review etc.
13.0	QUALITY ASSURANCE PROGRAMME
13.1	The contractor shall arrange for suitable quality assurance programme to control all activities pertaining to the scope of work, as necessary. Such programs shall be outlined by the contractor and shall be finally accepted by BHEL .A quality assurance programme of the contractor shall generally cover the following
13.2	Organization structure and qualification data for key personnel of the contractor for the management and implementation of the proposed quality assurance programme.
13.3	The procedure for source inspection, incoming raw material inspection, verification of material purchased etc.
13.4	System for maintenance of records.
13.5	General requirements – quality assurance
	All materials, components and equipments covered under the specification shall be procured, manufactured, erected, commissioned and tested, as applicable, at all stages as per comprehensive quality assurance programme. An indicative programme for inspection /test, to be carried out by the contractor, for some of the major items is given in the respective technical specification.
13.6	Field quality plan will detail out the quality practices and procedures etc to be followed by the contractor's site quality control organization, during various stages of site activities from receipt of material /equipment at site.
13.7	Casting and forgings used for construction shall be of tested quality. Details of results of chemical analysis, mechanical properties test result, as necessary, shall be furnished.
13.8	All welding shall be carried out as per procedure drawn and qualified in accordance with the requirements of ASME Section- 1X/BS4870 or other international equivalent standard acceptable to BHEL
13.9	All welders etc employed on any part of the contract at contractors' work or at site shall be qualified as per ASME Section – IX or BS 4871 or equivalent international standard approved by . Such qualification test shall be conducted in presence of BHEL.
13.10	All non-destructive examinations (NDT) shall be carried out in accordance with approved international standard .NDT operators shall be qualified as per SNT-TC-IA (of American society of non-destructive examination) Results of NDT shall be properly recorded and submitted for approval.
13.11	All the purchase specifications for the major bought out items list of which shall be drawn up by the contractor and finalized with BHEL shall be furnished to BHEL for comments and approval before placement of orders.
13.12	BHEL reserves the right to carry out quality audit and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit.
13.13	Quality audit/approval of the results of test and inspection will not prejudice the right of BHEL to reject an equipment service not giving the desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of

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	equipment/service as per specification.	
13.14	Repair/rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.	
13.15	All the latest relevant IS codes as per technical specification should be available with the contractor at site with in 45 days from the date of placement of LOI.	
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.	
14.1.1	PLANNING & MONITORING 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 subsystems/ components in the areas of engineering (wherever applicable), procurement, manufacture (wherever applicable), excavation/ concreting/construction/ erection. The network must conform to following overall project milestone schedule. However, further micro break-up of schedule based on major milestone schedule shall be drawn at site prior to start of work. Bidder should also ensure monitoring of these activities at least weekly basis to start with and on daily basis whenever required by NTPC/BHEL. The bidder has to adhere to the following project schedule for Part-1 & Part-2 of volume-III(BOQ-PRICE SCHEDULE)	
	Sl no	Major Milestone activity
		Completion of activity within months from the start of work
	1	Completion of below ground earth mating of each Structure / building area
	2	CW pump house, elect annexie and RCC ducts
	3	DM plant Bldg(including all civil foundation, Drain, superstructure) :
	5	FOPH, All foundation, dyke etc,Fuel oil unloading area,Fuel oil pressurizing area and heating pump house , FOAM pump house ,FO tank Foundation+ and Dyke and Fuel oil Tank Farm Area, Completion all RCC & Brick work, Inside plaster, Flooring, Toilet, Doors, Windows, Rolling Sutter & hand over for erection.
	6	PT Plant area all structure completion and handover for erection
	7	Clarified water pump house & storage tank, Completion all RCC & Brick work,Inside plaster,MCC Flooring, Doors, Windows, Rolling sutter alongwith MCC , PH & erection of CW Gates & hand over for water filling
	8	Chlorination Bldg Completion all RCC & brick work,inside plaster, flooring, toilet, doors,windows,Rolling sutter & hand over
	9	Administrative Building Completion all RCC & Brick work,Inside plaster, Flooring, Toilet, Doors,Windows,Rolling sutter & hand over
	10	Raw Water Reservoir & Raw Water Pump House Completion & hand over for erection
	11	CHP & AHP Structure
	11	Time office and Security building, Workshop building, Car Parking Shed and open area,Fire Water Pump House Fire Station Building Completion all RCC & Brick work,Inside plaster, Flooring, Toilet, Doors,Windows,Rolling sutter & hand over
	12	Completion of external plaster, all painting, completion of misc. structures, roads, drain, pavements etc.
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	

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	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	Deleted	
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 the 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 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	Deleted	
14.2.7	During construction contractor shall take an average thirty colour digital photograph / slides per month (not less than seven per week) of the works during progress and fifty colour digital photograph/slides of completed facilities.	
14.2.8	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 – Two Nos.
14.3.2.2	Site supervising engineer and supervisors for leveling grading, Roads & drains job.	One no Enigineer One nos supervisor
14.3.2.3	Engineer & Supervisors for quality inspection (Civil + Strl).	Two nos Engineer Two supervisors
14.3.2.4	Site supervising engineer and supervisors for piling, gound improvement work & stone col work.	Three nos ENG Three supervisor
14.3.2.5	Site supervising engineer and supervisors for civil works in power block area.	Two nos Engineers Three nos supervisors
14.3.2.6	Site supervising engineer and supervisors for Structural job(fabrication &erection).	One no. Engineers Two nos supervisors
14.3.2.7	Planning engineer (power plant erection background)	One
14.3.3	Engineer/ supervisor for other functions like store & purchase, material management, planning,	

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	fin, admn etc are to be provided as per site requirement and not considered above.	
14.3.4	In the event of non deputation of engineer/ supervisor/ draftsman by the bidder BHEL shall reserve the right to deduct Rs 45,000.00 per man-month for engineer and Rs 25,000.00 per man-month for the supervisor/ safety officer from the date of deputation as indicated as above from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement.	
14.3.5	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.	
14.3.6	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.	
14.3.7	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.	
14.3.9	The contractor should also submit network programs for the erection of various items. These networks shall show the BHEL hold points (CHP), which have to be cleared by BHEL, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of the contractor and 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 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 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.	
14.5	WORK & SAFETY REGULATIONS	
14.5.1	The contractor shall ensure the safety of all workmen, materials and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by the BHEL at site without exception.	
14.5.2	Passenger lift should have safety cage with multiple rope, i.e. with safety rope & limit switch.	
14.5.3	Safety nets with hand railings must be provided on all both inside & outside hanging platform of slip-form equipment & hanging platform from brickwork.	
14.5.4	Emergency vehicle must be provided & kept separately as stand-by.	
14.5.5	Non-conformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the contractor on each incident/each non-conformity as per details given below:	
	Safety measure	Fine (Rs)
14.5.5.1	Not wearing safety helmet at site.	Rs 50/-
14.5.5.2	Not wearing safety shoes at site.	Rs 50/-
14.5.5.3	Not wearing safety belt while working at higher elevation	Rs 100/-
14.5.5.3	Not providing lifeline of safety belt	Rs 100/-
14.5.5.4	Not using grinding goggles while doing grinding operations	Rs 50/-
14.5.5.5	Not using 24V supply for lighting in confined spaces.	Rs 500/-
14.5.5.6	Improper earthing of welding & other electrical machines.	Rs 500/-
14.5.5.7	Electrical plug not used for hand machines	Rs 100/-
14.5.5.8	Not slinging properly	Rs 200/-
14.5.5.9	Using damaged slings	Rs 200/-

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14.5.5.10	Using frayed / broken welding cables	Rs 200/-
14.5.5.11	Non removal of scarp from platforms	Rs 200/-
14.5.5.12	Lifting cylinders without cage	Rs 500/-
14.5.5.13	Gas cutting without taking proper precautions or not using sheet below	Rs 200/-
14.5.5.14	Not maintaing electrical winches properly	Rs 500/-
14.5.5.15	Shorting of fuse links by thick wire	Rs 500/-
14.5.5.16	Over speeding of vehicles within in site premise	Rs 200/-
14.5.5.17	Not having valid driving license for type of vehicle being driven	Rs 500/-
14.5.5.18	Not having valid registration for the vehicle	Rs 500/-
14.5.5.19	Not providing proper barricades/ caution boards	Rs 200/-
14.5.5.20	Not displaying SWL on the lifting equipment	Rs 200/-
14.5.5.21	Sub-contractor not attending safety meeting	Rs 1000/-
14.5.5.22	Improper ladder for climbing up	Rs 500/-
14.5.5.23	Improper scaffolding arrangement	Rs 500/-
14.5.5.24	Engaging child labour for construction work	Rs 1000/-
14.5.5.25	Using domestic LPG cylinder for gas cutting /welding operations	Rs 500/-
14.5.5.26	Not maintaining First Aid Box	Rs 500/-
14.5.6	Any other nonconformity noticed not listed above will also be fined. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected on the above will be recogniz for giving award to the employee who could avoid accidents by following safety rules. Also, the amount will be spent for improving the safety at site.	
14.5.7	The contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislation and BHEL, as he may deem necessary.	
14.5.8	The contractor will notify well in advance to BHEL of his intention to bring to the site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals, which may involve hazards. BHEL shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the contractor shall strictly adhere to and comply with such instructions. BHEL shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. BHEL shall entertain no claim due to such prohibition and BHEL shall not entertain any claim of the contractor towards additional safety provisions/conditions to be provided for/constructed as per the BHEL's instructions.	
14.5.9	Further, any such decision of the BHEL shall not, in any way, absolve the contractor of his responsibilities and in case, use of such a container or entry thereof into the site area is forbidden by the BHEL, the contractor shall use alternative methods with the approval of the BHEL without any cost implication to BHEL or extension of work schedule.	
14.5.10	Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act, 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the BHEL. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.	
14.5.11	All equipment used in construction and erection by Contractor shall meet Indian/ International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation Manual and safety instructions and as per Guidelines/ rules of BHEL in this regard.	
14.5.12	Periodical examinations and all tests for all lifting/ hoisting equipment & tackles shall be carried-out in accordance with relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated laws/ rules in force from time to time. A register of such examinations & tests shall be properly maintained by contractor and will be promptly produced as & when desired by BHEL or by the person authorized.	

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14.5.13	The contractor shall be fully responsible for the safe storage of his and his sub-contractor's radioactive sources in accordance with BARC/ DAE (Bhabha Atomic Research Center/ Department of Atomic Energy, Govt of India) rules and other applicable provisions. All precautionary measures stipulated by BARC/ DAE in connection with use, contractor would take storage and handling of such material.
14.5.14	The contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by BHEL who will also have right to examine these safety equipments to determine their suitability, reliability, acceptability and adaptability.
14.5.15	Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practices/ Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives.
14.5.16	The contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, the contractor only shall use good and standard quality of material.
14.5.17	The contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to BHEL or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by BHEL to handle such fuses, wiring or electrical equipment.
14.5.18	Before the contractor connects any electrical appliances to any plug or socket belonging to the other contractor or BHEL, he shall fulfill following.
14.5.18.1	Satisfy BHEL that the appliance is in good working condition.
14.5.18.2	Inform BHEL of the maximum current rating, voltage and phases of the appliances.
14.5.18.3	Obtain permission of BHEL detailing the sockets to which the appliances may be connected.
14.5.19	The BHEL will not grant permission to connect until he is satisfied that:
14.5.19.1	The appliance is in good condition and is fitted with suitable plug;
14.5.19.2	The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
14.5.20	No electric cable in use by contractor/ BHEL will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
14.5.21	No repair work shall be carried out on any live equipment. BHEL must declare the equipment safe and a permit to work shall be issued by BHEL before the contractor carries out any repair work. While working on electric lines/equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by contractor to electricians/ workmen/ officers.
14.5.22	The contractors shall employ necessary number of qualified, full time electricians/ electrical supervisors to maintain his temporary electrical installations.
14.5.23	The contractor shall employ trained safety officer to supervise day to day safety aspects of the equipments and workmen, who will co-ordinate with BHEL safety officer. In case of work being carried out through sub-contractors, sub-contractor's workmen/ employees will also be considered as the contractor's employees/ workmen for the above purpose.
14.5.24	The name and address of such safety officer of contractor will be promptly informed in writing to BHEL with a copy to safety officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of contract.
14.5.25	In case any accident occurs during the construction/ erection or other associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the contractor to promptly inform the same to BHEL in prescribed form and also to all the authorities envisaged under the applicable laws.
14.5.26	BHEL shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/ or property, and/ or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury/ accident and he shall comply to remove shortcomings promptly.
14.5.27	The contractor shall not be entitled for any damages/ compensation for stoppage of work due to safety reasons above and the period of such stoppage of work will not be taken as an extension

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	of time for completion of the facilities and will not be the ground for waiver of levy of penalty.
14.5.28	The contractor shall follow and comply with all safety rules of BHEL, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any inconformity between statutory requirement and Safety Rules of BHEL referred above, the later shall be binding on contractor unless the statutory provisions are more stringent.
14.5.29	In case BHEL is made to pay such compensation then the contractor is liable to reimburse BHEL such amount in addition to compensation indicated above.
14.9.30	These insurance covers have to be taken prior to start of his work at the subject project and he shall make available the Policy to BHEL site-in-charge for necessary verification before commencement of work. However, irrespective of such verification/ acceptance, the sole responsibility to maintain adequate insurance cover for his workmen, T&P, assets etc at all times during the period of contract shall lie with the contractor. Regarding the aforesaid insurance cover, the contractor shall directly deal with the Insurance Company for all matters regarding the insurance in his scope.
14.10	HEALTH SAFETY & ENVIRONMENT
14.10.1	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 up-liftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
14.10.2	Round the clock experienced paramedical personnel with first aid facility & one ambulance at site to be arranged by the bidder at his own cost. No medical facility within / near the site shall be provided by BHEL. However, BHEL shall provide one room (without furniture) for use as first aid.
14.10.3	No staff quarter shall be provided by BHEL.
14.10.4	No borrow area for earth shall be arranged / provided by BHEL.
14.10.5	All individual site erection, temporary approaches required for movement of cranes, trailers, trucks, transit mixers, dumpers, etc shall be arranged by the contractor at his own cost.
14.10.6	The contractor shall solely be responsible for the safety, quality, & quantity of material after it is handed over and issued to contractor by the 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	ISSUE OF T&P No T&P to be issued by BHEL.
17.0	DELETED
18.0	MATERIAL HANDLING (BHEL ISSUED MATERIAL)
18.1	Cement, reinforcement, earthing MS Rod, structural steel (MS plates, ISMB, ANGLE, CHANNEL, Chequered plate, Stainless Steel Plate) will be issued free of cost by BHEL for use in the work covered in this contract.
18.2	Cement & steel will be issued to the contractor from BHEL/Customer's store within the plant premises, on weighment basis. Receipt from BHEL/Customer's stores, handling / transportation to work site, unloading, safeguarding of material, reconciliation of materials etc. will be under the scope of work within his quoted rate.
18.3	Open land (free from encumbrance) shall be provided by BHEL on free of cost basis. Contractor shall maintain one centralized fenced store cum bar bending yard (Area Approx. 70mx70m). Hard surfacing of this yard and all round drain shall be carried out by the contractor at his own cost within the quoted rate. Batching plant area shall be provided within plant premises and contractor shall make use of the area for installation and operation of the Batching Plant at his own cost. The bidder shall make complete arrangement of necessary security personnel, to safeguard all such materials in his custody. Materials issued will be used only for construction of permanent work. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering.
18.4	The contractor shall construct waterproof cement store for initial period (capacity minimum 400 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.

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18.5	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.
18.6	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.
18.7	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.
18.8	The contractor shall maintain proper store account for all the BHEL issued materials and shall give three copies of once in two months computerised reconciliation statement of such account to the BHEL.
18.9	deleted
18.10	The contractor shall solely be responsible for the safety & quality of material after it is handed over and issued to contractor by BHEL.
18.11	BHEL issued materials shall not under any circumstances taken out of the project site unless otherwise permitted by BHEL.
19.0	ISSUE OF MATERIALS
19.1	ISSUE OF CEMENT
19.1.1	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.
19.1.2	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.
19.2	ISSUE OF STEEL
19.2.1	The steel shall be issued to the contractor free of cost on the following basis.
19.2.1.1	M S Structural steel (plates including cheqd plate, angle, channel, ISMB, stainless steel plate) materials – Weighment basis (unit – MT).
19.2.1.2	Reinforcement steel and earthing rod (MS round) – Weighment basis (unit – MT).
19.2.2	All the steel (structural steel, reinforcement, earthing & MS rod, stainless steel) issued by the 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: 808-1964 Beams, Channels and Angles IS: 1730-1961 Plates, Reinforcements Fe-500 confirming to IS: 1786. or grade-1 of IS:432 (part-I)
19.2.3	In case any such sectional weights are not available in the above documents, the manufacturer recommendation shall be binding.
19.2.4	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.
19.2.5	DELETED
19.3	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 the contractor from BHEL stores.
19.4	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.
19.5	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
19.6	Bidder to note that all fasteners like MS/HT/HSFG bolts/nuts, lock nuts, washers etc shall be

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	supplied by the bidder as per applicable item of BOQ-cum Rate schedule.	
19.7	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 just immediately after receipt of TG deck drawing and obtain approval from an institution of repute.	
19.8	For main civil, structural and architectural work, any reinforcement / structural item required shall be arrange by the contractor and payment will be released as per BOQ schedule rates.	
20.0	RETURN OF MATERIALS	
20.1	RETURN OF CEMENT	
20.1.1	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.	
20.2	RETURN OF STEEL INCLUDING SCRAP	
20.2.1	All surplus steel and all wastage materials will be taken back on weighment basis.	
21.2.2	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 handling and incidental charges.	
20.2.3	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 handling and transportation and incidental charge.	
20.2.4	Scrap for reinforcement steel and structural steel shall be returned separately	
21.0	CEMENT AND STEEL CONSUMPTION AND WASTAGE	
21.1	CEMENT CONSUMPTION	
21.1.1	The theoretical consumption of cement shall be based on the following.	
21.1.1.1	For design mix concrete as per approved design mix.	
21.1.1.2	For nominal mix concrete work, as per minimum cement as specified or as approved by Engineer-in-charge.	
21.1.2	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-2002 unless otherwise specified in the specifications or the drawing of contract of contract or mutually agreed by Engineer-in-charge and contractor.	
21.1.3	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).	
21.2	CEMENT WASTAGE	
21.2.1	Allowable wastage – One and half percent (+1.5%) of theoretical consumption of cement unless specified otherwise in the technical specification.	
21.2.2	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 effected at penal rates.	
21.2.3	Sl no	Basis of issue & penal recovery
	C-1	Theoretical consumption (without considering any wastage or loss).
	C-2	Actual consumption being Limited to plus one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.
	C-3	Actual consumption beyond one and half percent (+1.5%) of above (C-1).
21.3	REINFORCEMENT STEEL & EARTHING MS ROUND CONSUMPTION	
21.3.1	The theoretical consumption of various diameter 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.	

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21.3.2	Actual consumption = Issue – Surplus.	
21.3.3	Surplus = Un-tampered and unused quantity of steel returned by the contractor to BHEL store along-with relevant documents.	
21.3.4	Wastage = Actual consumption – Theoretical consumption.	
21.4	REINFORCEMENT STEEL & EARTHING MS ROUND WASTAGE	
21.4.1	Allowable wastage: (+3%) of the theoretical consumption shall be considered as allowable wastage.	
21.4.2	Wastage and scrap shall be as per actual weightment basis.	
21.4.3	Sl no	Basis of issue & penal recovery
	R-1	Theoretical consumption (without considering wastage and scrap or loss)
	R-2	Wastage limited to plus four percent (+3%) of aforesaid theoretical consumption (R-1) towards allowable wastage.
	R-3	Wastage beyond four percent (+3%) of the theoretical consumption above (R-1).
21.5	STRUCTURAL STEEL MATERIALS CONSUMPTION	
21.5.1	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.	
21.5.2	Actual consumption = Issue – Surplus.	
21.5.3	Surplus = Untempered, unused, uncut quantity of steel returned by the contractor to BHEL store.	
21.5.4	Wastage = Actual consumption – Theoretical consumption.	
21.6	STRUCTURAL STEEL WASTAGE	
21.6.1	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).	
21.6.2	Sl no	Basis of issue & penal recovery
	S-1	Theoretical consumption (without considering any wastage, scrap or loss) as per specification & drg.
	S-2	Wastage limited to plus four percent (+4%) of the aforesaid theoretical consumption (S-1) towards allowable wastage.
	S-3	Wastage beyond four percent (4%) of the aforesaid theoretical consumption (S-1).
21.7	All wastage reinforcement, MS round (for earthing), structural steel shall be returned to BHEL.	
22.0	RECONCILIATION OF BHEL ISSUED MATERIALS	
22.1	The contractor shall submit a reconciliation statement of cement and steel issued to him with each RA bill.	
22.2	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 material are available with contractor's custody at site.	
22.3	At the time of submission of bills by the contractor, 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.	
22.4	The approved drawings/ bar bending schedules are to be considered for the purpose of reconciliation of materials.	
23.0	DELETED	
24.0	RECOVERY OF MATERIAL	
24.1	If wastage exceeds the specified limit, the recovery of excess wastage shall be made from monthly RA bill at the penal rate stipulated below.	

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24.2	PENAL RATE OF MATERIALS	
	Item	Penal rate (Rs)
24.2.1	Cement (OPC/ PPC/PSC).	6,500/- per MT.
24.2.2	Reinforcement steel and earthing rod etc.	58,000/- per MT.
24.2.3	Stainless Steel Plate / Liner	6,00,000/- per MT
	Structural steel and hand railing materials.	65,000/- per MT.
25.0	CONSTRUCTION OF TEMPORARY OFFICE, STORES ETC	
30.1	The contractor shall arrange at his own cost cleaning and grass removing of area allotted, construction of his temporary office/stores, cement godown, fabrication yards 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.	
30.2	BHEL contemplates to provide fabrication yard more that one places within plant premises. However; during execution, based on actual site conditions, requirement and layout and approaches, the above may change suitably.	
26.0	TOOLS & PLANTS (TO BE PROVIDED BY CONTRACTOR)	
26.1	Tentative list of T&P to be deployed by contractor for successful completion of work is detailed below. This supersedes corresponding Annexure of Volume-1E	
26.2	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) measuring (calibrated) instruments & handing equipments 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 requirements. However, contractor shall submit deployment plan of all T&P along with tender bid.	
26.3	In the event of any failure of the part of the contractor and as a result progress of work suffered, 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. 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.	
26.4	Following Major T&Ps to be arranged by contractor within the time as indicated against each T&P.	
	Major T&P items	Mobilisation time (from LOI date)
26.4.1	Two nos. crawler/tyre mounted cranes 40/45 T capacity	1 st Within 60 days, Balance as per requirement
26.4.2	DELETED	
26.4.3	2 Nos. hydraulic excavator / Poclain	1 st Within 25 days, Balance as per requirement
26.4.4	Two Nos. 20/25 T capacity crawler crane	1 st Within 45 days, Balance as per requirement
26.4.5	4 nos. hydra (10/ 12 T cap)	1 st & 2 nd within 30 days. Balance as per requirement
26.4.6	Two Nos. All cut drill machine	Within 100 days.
26.4.7	DELETED	
26.4.8	DELETED	
26.4.9	DELETED	
26.4.10	40 nos. welding rectifier	Within 150 days.
26.4.11	1 no. trailer – 15T	Within 100 days.
26.4.12	2 no. power driven HSFG bolt tightening m/c	As per requirement
26.4.13	1 no. portable automatic concrete batching plant with printing facility (Output 30 cum/ hr)	To be commissioned Within 45 days.
26.4.14	1 no. automatic concrete batching plant with printing facility (30 Cum/Hr) – to be commissioned at site.	As per requirement
26.4.15	4 nos. transit mixer (4.5/5/6 M3 capacity)	As per requirement
26.4.16	2 nos. concrete pump (20 cum/ hr min capacity & lift 70M)	As per requirement
26.4.17	One mobile concrete boom placer atleast 41mt height lifting	Within 45 days.

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	capacity.	
26.4.18	2 nos. self priming dewatering pump 5 HP (diesel/ electric)	Within 20 days.
26.4.19	Two nos. 10 HP submersible mono-block electric pump (KOS-1040+ of Kirloskar or equivalent),	Within 60 days.
26.4.20	2 nos. self priming dewatering pump 2 HP (diesel/ electric)	Within 30 days.
26.4.21	One no. 5 HP sludge/sump/slurry electric pump.	Within 30 days.
26.4.22	2 nos. curing pump – 1.5 /2 HP (pump for curing at heights)	Within 60 days.
26.4.23	1 no. dozer.	Within 25 days.
26.4.24	Deleted	
26.4.25	Two nos Cast in situ Hydraulic piling rig with all accessories	As per requirement
26.4.26	Ply shuttering board (4500 sqm) including propping with steel tubular sections/ ACROW pipes	Within 60 days.
26.4.27	Ply shuttering board (4500 sqm) including propping with steel tubular sections/ ACROW pipes	Within 120 days.
26.4.28	8 nos. dumper	3 nos. Within 20 days. Balance within 30 days
26.4.29	2 nos. reinforcement bending machine	Within 30 days.
26.4.30	2 nos. reinforcement cutting machine	Within 30 days.
26.4.31	40,000 RM MS scaffolding pipe/cup-lock system	As per site requirement
26.4.32	04 nos. power driven earth rammer	Within 60 days.
26.4.33	1 no. vibromax (earth compacter)	Within 45 days.
26.4.34	1 no. compression testing machine (200 T cap)	Within 45 days.
26.4.35	Civil laboratory equipments as per list attached in ANNEX `A` with temporary building (20 M x 8 M).	Within 55 days.
26.4.36	4 nos. electric winch with building hoist	Within 220 days.
26.4.37	Power winch – 3T - 4 nos for structural erection	Within 150 days
26.4.38	Power winch – 5T - 2 nos for structural erection	Within 150 days
26.4.39	1 no total station with adequate arrangement for operators.	Within 15 days.
26.4.40	1 no theodolite 1 second accuracy	Within 15 days.
26.4.41	2 nos auto level & staff	Within 15 days.
26.4.42	DELETED	
26.4.43	125 nos concrete cube moulds	Within 15 days.
26.4.44	DELETED	
26.4.45	Adequate no. of small trucks 2T/5T for movement within site	As per requirement.
26.4.46	One nos drinking water tank – 5000 lit.	Within 30 days.
26.4.47	1 nos truck mounted water tank (minimum 5000 lit) capacity with sprinkler arrangement.	Within 30 days.
26.4.48	1 no ultra-sonography testing machine for structural work.	Within 75 days.
26.4.49	1 no radiography source.	Within 100 days.
26.4.50	scaffolding materials / structural steel (approx 90 T).	Within 160 days.
26.4.51	DELETED	
26.4.52	deleted	
26.4.53	Portable fire extinguishers as below: Soda acid – 20 sets. Dry chemical powder – 20 sets CO2 – 15 sets. Water & sand bucket (4 buckets in one stand) – 10 sets. Fire hose with nozzle (50 M length) – 12 sets.	Within 90 days
26.4.54	1 no concrete cutting power tools (DD2E of HILTI/ BOSCH make).	As per site requirement
26.4.55	1 no concrete coring machine for drilling in concrete upto 150 mm dia alongwith diamond bits.	As per site requirement
26.5	T&P shown in the above mentioned list are minimum requirement. Mobilisation period shown above for major T&Ps have to be adhered and no change will be permitted without written approval of NTPC/BHEL. Further requirement will be reviewed time to time at site and vendors will provide additional T&P/ equipments to ensure completion of entire work within schedule time without any financial implication to BHEL. However payment for deployment of 150T, 250T capacity cranes and water tanker with sprinkler arrangement (under sl no 26.4.41,	

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	26.4.52 and 26.4.47) only shall be made as per BOQ schedule rates. All other T&Ps shall be provided by the contractor without any extra cost to NTPC/BHEL. Vendor will give advance intimation & certification regarding capacity etc prior to dispatch of heavy equipments.
26.6	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.
27.0	CIVIL LABORATORY AT SITE
27.1.0	Contractor shall establish and maintain civil laboratory at site with equipments as listed attached in ANNEX `A`
27.1.1	Compressive strength of cement, concrete cubes, bricks etc.
27.1.2	Water absorption test of bricks.
27.1.3	Earth compaction test (proctor density/ dry density and optimum moisture content, etc).
27.1.4	Conducting of test for setting time and compressive strength of cement.
27.1.5	Sieve analysis of fine aggregates and coarse aggregates.
27.1.6	Bulking test of fine aggregates.
27.1.7	Sieve analysis, moisture content, specific gravity and crushing strength of coarse aggregates.
27.1.8	Rapid moisture meter
27.1.9	Other than above mentioned test, any testing required to be carried out at site as per Quality Plan and technical specification have to be arranged by contractor for all the works at his own cost.
27.2.0	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 one no. chemist to be deployed as necessary.
28.0	CONSTRUCTION SCHEDULE
28.1	Entire work shall be carried out in accordance with the construction schedule within the stipulated completion period. Within 30 days of LOI, the contractor shall discuss with BHEL site engineer & furnish the (L-3) construction schedule based on milestones as per clause 14.1.1 for approval.
28.2	Contractor will establish mix design within 40 days from the date of LOI.
28.3	Mix design for all concreting may be carried out either at site or from a reputed institute; contractor has to ensure adding of admixture and minimizing of cement content in line with IS 456.
29.0	COMPLETION PERIOD
	The entire work under this scope shall be successfully completed in all respect within 20 (twenty) months from date of start of work, as certified by Construction Manager, BHEL.
	Mobilisation period - 15 days from date of LOI.
30.0	LIQUIDATED DAMAGE
30.1	Intermediate Milestones
30.1.1	In case delay in achieving the Milestone as mentioned in Serial No. 3 of CL. No. 14.1.1 above, is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.
30.1.2	In case delay in achieving the Milestone as mentioned in Serial No. 11 of CL. No. 14.1.1 above, is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld.
30.1.3	Amount already withheld, if any against slippage of Serial No. 3 of CL. No. 14.1.1 above, shall be released only if there is no delay attributable to contractor in achievement of Milestone as mentioned in Serial No. 11 of CL. No. 14.1.1 above.
30.1.4	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.
30.1.5	Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.
30.1.6	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.
30.2	Overall Completion
30.2.1	If the contractor fails to maintain the required progress of work which results in delay in the completion

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	of the works 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 ceiling specified below. 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, Supplementary / Additional Items and PVC.
30.2.2	If Completion of work goes beyond specified contract period of 20(Twenty) months from date of start of work, as certified by Construction Manager, BHEL, LD will be imposed with maximum LD amount shall be 10 % of total contract value.
30.2.3	BHEL shall deduct the amount of such compensation from any money due or which may become due to the contractor and/or recover such compensation from the bank guarantees / security deposit of the contractor. To be entitled to impose such compensation, BHEL will not be required to prove that he has incurred such amount as actual damage.
30.2.4	BHEL reserve the right to cancel the order/ contract or a portion thereof at the risk & cost of the contractor and the contractor shall be liable to BHEL for any excess costs thereof.
Note:-	*Executable Contract value- Value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.
31.0	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. The decision of BHEL in this regard shall be final and binding on the contractor.
32.0	GUARANTEE
32.1	Even though the work will be carried out under supervision of BHEL, the contractor will be responsible for the quality of workmanship, quality of materials/ items and design for which the contractor is responsible.
32.2	The contractor shall guarantee the work executed under the scope of the contract for a period of 12 (twelve) months from the date of start of guarantee period as certified by the Engineer (ie on completion of total work under scope and/ or taking over by BHEL) and shall rectify free of cost all defects due to faulty supply or work done. In case the contractor fails to repair/ replace the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs/ replace such defective works at contractor's risk and cost without prejudice to any other rights and recover the same from security deposit/ other dues.
33.0	METHOD OF MEASUREMENT
	IS 1200 in conjunction of IS code 3385 shall be adopted. In case the item of measurement is not available in the IS 1200, the standard procedure adopted in CPWD 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.
34.0	DELETED
35.0	OVER RUN CHARGES
	Not applicable
36.0	REVISION ON ACCEPTED CONTRACT RATE
	No revision of rates shall be applicable in the event the completion period is extended for any reason whatsoever.
37.0	PRICE VARIATION CLAUSE (SUPPLY OF CEMENT & STEEL BY BHEL)
37.1	PVC shall be applicable as per relevant clause of GCC.
38.0	SECURITY DEPOSIT & PERFORMANCE BOND
38.1	Security deposit shall be as per relevant clause of GCC.
38.2	Performance bond is not applicable for this tender.
39.0	CONTRACT PRICE
39.1	The bidder shall quote their rates strictly in accordance with prescribed rate schedule of Volume-III.
39.2	The quantities of the various items mentioned in the BOQ cum rate schedules of items of 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 the 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.
40.0	TAXES AND DUTIES

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40.1	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.
40.2	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.
40.3	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.
40.4	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.
40.5	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.
40.6	TDS under GST shall be deducted at applicable rates on gross invoice value from the running bills (RA bills).
40.7	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 – Refer attached GSTN code table of BHEL. 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.
40.8	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.
40.9	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.
40.10	In case of raising any Supplementary Tax Invoice (Debit / Credit Note), successful bidder shall issue the same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
40.11	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.
40.12	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.
40.13	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.
40.14	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.
40.15	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.
40.16	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.
41.0	INTERIM PAYMENTS
41.1	For all items of work as per Volume-III, Price Schedule, interim payment shall be limited to 95% of the gross value of interim bill on item rate basis which will be prepared and submitted by the contractor on the basis of measurement sheet duly checked and signed by BHEL and NTPC

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	Engineers. All admissible recoveries/adjustments etc. shall be made from the interim payable amount. The balance 5% shall be payable along with final bill.
41.2	Out of above mentioned 95% of gross bill value, 0.5% shall be paid after ratification by BHEL engineer on compliance of house keeping, work area illumination by bidder. Also 0.1% of above mentioned 95% gross bill value shall be paid after certification by BHEL engineer on compliance of HSE activities at site.
41.3	Contractor's RA bill, complete & correct in all respects, certified by BHEL/NTPC engineer, shall be paid within 30 days of date receipt of bill.
41.4	Deleted
41.5	NTPC/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. BHEL reserve the right to release payment through electronic mode, for which bidder shall comply with requisite formalities
41.6	Such payment as above shall be effected only on certification by BHEL against completion of each stage.
41.7	No bills including RA bills will be paid to individual consortium partners in case of consortium arrangement.
42.0	METHOD OF MEASUREMENT
	IS 1200 in conjunction of IS code 3385 shall be adopted. In case the item of measurement is not available in the IS 1200, the standard procedure adopted in CPWD 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.
43.0	EXTRA/ ADDITIONAL ITEMS OF WORK
	If any extra or additional items, which are not incorporated in the BOQ schedule/ CPWD DSR 2007, have to be executed by the contractor, the rate of such extra or additional work shall be as per the following. First, the rate of such items shall be derived by a duly constituted committee, if possible, from the available rates, agreed upon in the rate schedule of this contract. The rates have to be mutually agreed upon on the basis of prevailing market rates for which all documentary evidences, as required by BHEL shall have to be produced by the contractor. Decision of BHEL in such cases shall be final and binding on the contractor.
44.0	DESIGN OFFICE AND FABRICATION DRAWING
44.1	Based on design drawings of structures , to be issued to the contractor from time to time by BHEL, contractor will prepare & submit within 15 days of receipt, 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. 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. It is preferred that the contractor have establishment / liason office at Delhi /Noida with a co-ordinator for better co-ordination with BHEL-PEM.
44.3	Contractor shall submit progress report pertaining to fabrication drawing, by 7 th of each month, drawing-wise, section-wise cumulative Bill of Materials for which Engineering drawing has been issued to them and status of fabrication drawing.
45.0	FABRICATION / GALVANISING
45.1	All the fabrication of structural steel items (except nuts/bolts) shall be done in fabrication yard inside project premises. Bidders to note that all fasteners like MS/HT/HSFG bolts, nuts, lock nuts, washers etc. shall be supplied by bidder as per technical specification/ drawings and BOQ items.
45.2	Bidder, at his own cost, shall supply electrodes required for fabrication, erection of structural steel as per specification and approval of BHEL.

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45.3	However, in case of exigency as considered fit by BHEL, BHEL may permit the contractor to get some specific portion of fabrication / Galvanizing work done at qualified shop (s) out side the project premises. For steel to be issued to the contractor for such purpose, 50% of the value of such steel as worked out as per BHEL's procurement rates shall be furnished by the contractor in the form of BG. Such BG shall be returned depending on the receipt of fabricated / Galvanized steel back to site.
46.0	OTHER TERMS
46.1	While bidder's scope include deplyment of all resources, like T&P, materials, consumables, manpower including supervision etc for proper completion of the subject job and no sub-contracting for execution of the job is allowed by BHEL, depending on project's requirement and on prior acceptance of BHEL, bidder may associate agencies for deployment of skilled/ unskileld manpower only for site execution. Bidder should arrange all resources, like T&P, materials, consumables, supervision etc directly for the subject job.
46.2	All other term & conditions of this specification, not mentioned above shall be governed by the pertinent provisions of GCC.

ANNEXURE-A
LIST OF EQUIPMENTS FOR CIVIL SITE LABORATORY

CONCRETE TESTING EQUIPMENT				
SL NO.	NAME OF TEST	NAME OF EQUIPMENT	SIZE OF EQIPMENT	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 appratus 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	

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9	Concrete Compressive test	Digital Compressive Testing Machine with 2000 KN capacity.	2000KN capacity	IS 2505
10	Cement mortar cube casting	Mortar 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 TG Raft major concreting 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 mortar cube vibrating	Motorised vibration machine for cement testing	Standard	IS 4031
15	Coarse aggregate 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 aggregate 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	Sieve Shaker	Motorised Sieve shaker	Mfg. Catalogue	
18	Silt content check	Sand silt content beaker	Standard	
19	Ultrasonic pulse velocity test	UPV apparatus for concrete	Standard	

	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

	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 &	02 nos each required	

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		150° C		
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	Sptula	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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STANDARD TECHNICAL SPECIFICATIONS
FOR
GENERAL CIVIL WORKS

CONTENTS:

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2.0	Plastering
3.0	Flooring
4.0	Painting
5.0	Steel Doors, Windows, Ventilators and Rolling Shutters
6.0	Aluminium Doors, Windows and Ventilators
7.0	Glazing
8.0	False Ceiling
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1.0 **BRICK MASONRY**

1.01 **General**

The Contractor shall furnish all labour, materials and equipment required for the construction for all brick masonry work required for the construction as per drawings. The bricks shall be clay bricks or fly ash bricks as specified on the drawings and directed by Engineer.

1.02 **Materials**

1.02.1 **Clay Bricks**

Locally available best quality bricks conforming to IS: 1077 shall be used. The bricks shall be of uniform colour, strength and size with minimum crushing strength of 50 kg/cm². The bricks shall have smooth surfaces with corners straight; they shall not be twisted or chipped; when broken they shall reveal a fine, uniform, non-vitreous grain; they shall emit ringing sound when tapped with a hammer; they shall absorb water on immersion (not more than one-sixth of its original weight after soaking for 15 minutes) and dry sufficiently quickly. The bricks shall not show any sign of efflorescence after soaking and drying in shade. If the bricks show any sort of efflorescence the Contractor shall do the necessary treatment at his own cost to the satisfaction of the Engineer.

All bricks shall be subjected to inspection and approval and representative samples shall be submitted before ordering out. The bricks supplied shall conform to approved samples and may be subjected to tests as required by the engineer. Any lot of bricks found not up to the specification, must be removed from the site immediately at contractors cost. Representative samples of bricks to be used shall be submitted to the Engineer and his approval taken before bulk purchase.

The samples shall be kept sealed with the Engineer for future reference and comparison. All bricks supplied shall confirm to these

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approved samples in all respects. Bricks shall be carefully and systematically stacked at locations as directed in an approved manner. Each stack shall contain equal number of bricks preferably not more than 3,000.

1.02.2 Fly Ash Bricks

Fly Ash Brick work shall be conform to the requirement of IS: 13757. The bricks shall be regular in shape with sharp and square sides and edges and parallel faced. They shall be sound, hard of uniform composition and fully satisfy the requirements of IS: 13757. They shall not absorb water more than 20% of their own dry weight when soaked in water. Minimum crushing strength should be as per I.S. but in no case less than 75 Kg/cm².

1.02.3 Water

Water shall be clean and free from deleterious matter such as oil, acid, alkali, salt and vegetable growth. Quality of water shall be same as under for cement concrete work. The water used for preparing the mortar shall be clean and free from deleterious matter and in accordance with IS specifications.

1.02.4 Cement

Cement shall conform to IS: 269, IS: 455 or IS: 1489. Cement shall be stored in weather proof sheds on dry platform and protected from rain and moisture. Cement, which has set or partially set, shall not be used.

1.02.5 Sand

Sand shall conform to IS: 2116. Grade of sand when tested as per IS: 2386 shall met the requirements of IS: 2116. Sand shall be clean and free from dirt, clay or other impurities.

1.02.6 Mortar

The mortar shall conform the requirements of I.S. 1925 and be prepared by mixing cement and sand in a mixer and the proportion as specified. Mortar shall be prepared and used as per IS: 2250. Only cement sand mortar shall be used. Unless otherwise specified on drawings / given in other sections of the specifications the mortar for brickwork except for half brick or lower thickness walls shall be 1 part cement and 6 parts sand by volume. Mortar for half brick and lower

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thickness brick walls shall be 1 part cement and 4 parts sand by volume.

The unit of measurement for cement shall be a bag of cement weighing 50 Kg. And this shall be taken as 0.035 cu.m. Other ingredients in specified proportion shall be measured in boxes of suitable size. Sand shall be measured on the basis of its dry volume. In case of damp sand, is quantity shall be increased suitably to allow for bulkage.

Cement and Sand shall be mixed dry thoroughly on clean approved platform and water shall then be added to obtain a mortar of the consistency of a stiff paste, care being taken to add just sufficient water for the purpose.

Mortar shall be used as soon as possible after mixing and within 2 hours after the cement is mixed wet. Mortar unused for more than 2 hours shall be rejected and removed from the site of work.

1.03 **Brick Work**

1.03.1 **Soaking of Bricks**

Bricks required for masonry in cement mortar, shall be wetted to saturation point by prolonged immersion, but never by spraying. The cessation of bubbles, when the bricks are immersed in water, shall be an indication of thorough soaking of bricks. The soaked bricks shall be kept on wooden plank to avoid earth being smeared on them.

1.03.2 **Laying**

Brick work shall be laid with best skill and the greatest care and diligence, each brick shall be pressed on the layer of the specified mortar, so that this spreads all around it and fill the joints which shall never be more than 10mm nor less than 5mm wide. Mortar ingredients shall be of proper grain size to permit joints within these limits. The thickness of joints shall not in general exceed 6mm. All joints on face shall be raked to minimum 10 mm depth using raking tool while the mortar is still green to provide bond for plaster or pointing. Where plaster or pointing. Where plaster or pointing is not provided, the joints shall be struck flush and finished immediately.

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The whole the brick work shall be built in English Bond unless otherwise directed. No four brick courses shall rise more than 25mm above the same laid-dry. No brick bats shall be used except where required as closures. The bricks shall be thoroughly bedded on cement mortar during each layer. After every third course reinforcing steel consisting of 2 nos. of 6mm dia mild steel bars shall be provided and these shall be anchored to the structural steel as directed by the Engineer. However, the reinforcement steel shall be separately paid for at the issue rates.

The work will be done in a proper manner in the first instance only and no grouting shall be resorted to. String courses cornices and moldings shall not generally be provided unless as shown on the drawings or as directed by the Engineer. The architectural features and treatment if required as per the drawing or as may be finalized before execution and such items whether in large or small quantities and any shape and size, shall have to be provided by the contractor at the rates in relevant items of the bill of quantities. The Contractor shall not be eligible to claim any extra rate on this account. The brick work must be laid true to lines and level with horizontal courses and vertical perpendicular faces and corners etc.

Masonry in contact with RCC columns should be joined with either chicken meshed or dowel bars to avoid appearances of cracks. Masonry in contact with structural steel including beams and columns shall be properly anchored to the steelwork as per standard practice.

The brick work shall be protected from the effect of sun and rain and curing shall be done for a period of 7 days.

The contractor shall erect necessary scaffolding and planking for efficient execution of work at all levels.

At the end of the construction, the contractor shall ensure proper plugging of all openings made for supporting the scaffoldings.

1.03.3 **Non-Load bearing Walls**

Non-load bearing walls (dividing walls) shall be built of choice bricks, for both header and stretcher courses. No broken bricks or bricks with chipped corners will be accepted.

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- 1.03.4 **Curing**
Green work shall be protected from rain by suitable covering. Brick work in cement mortar shall be kept constantly moist on all the faces for a minimum period of ten (10) days. The top of masonry work shall be left flooded at the close of the day.

- 1.04 **Measurements**
(Applicable for “Item Rate” contracts only)
Masonry work in general shall be geometrically measured by volume. The volume of the walls shall be reduced for all voids, hollows, recesses and openings of net area more than half a square metre, without accounting for flares, that is, discounting only the volume obtained multiplying the net span of the opening in rough by the thickness of the walls or the depth of the recess; assuming that the volume of flares and splays shall cover the higher skill required in their construction. The provision, during construction of recess and holes for passage of pipes as designed and previously arranged and ordered, shall not entitle the Contractor to any compensation. The plinth level shall be taken as 0.00 level of the respective building. Half brick wall shall be measured in Square Meters.

All the measurements are to be done as per IS: 1200 (relevant parts) for the items not covered above.

2.0 **PLASTERING**

2.01 **General**

The Contractor shall furnish all labour, materials and equipment required for plastering all the walls and ceilings required for the Civil Works for the complete construction of the Power Station as per drawings. All walls and ceiling shall be plaster finished on all visible sides.

2.02 **Materials**

- 2.02.1 Cement and water used for this work shall be as given in the specification for concrete and Allied works.

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2.02.2 Sand for plaster shall have the characteristics specified in IS: 1542.

The sand shall not contain any harmful impurities, as specified in Clause 3.3 of IS: 2116. The maximum quantities of clay, fine silt, fine dust and organic impurities in sand shall not exceed the following limits:

A.	Clay, fine silt and Fine dust (determined In accordance with IS: 383 Appendix-C and also IS: 2386 (Part-II)	:	Not more than three (3) percent by weight
B.	Organic impurities (determined In accordance with IS: 2386 (Part-II)	:	Below that indicated by comparison with Stan- dard Solution specified In Clause 6.2.2 of IS: 2386 (Part-II)

2.03 Plastering Work

2.03.1 Plastering shall be done with 1:4 cement plaster to the following finished plaster thickness : 6mm and 12mm thick on interior surfaces and 18 mm for outside surfaces. Plaster shall be applied only when walls are perfectly dry. Jutting or recessed edges shall have sharp or suitably rounded corners, as specified by the Engineer. Plaster of all kinds, either smooth or rough finished, shall never show cracks, faulty, alignment either in horizontal or vertical planes, detachment from walls, blisters or other faults and shall have a uniform and perfectly smooth appearance. However, the new plaster shall not be trowel led to a glazed surface since white wash would not adhere to it.

2.03.2 Any faulty plastering shall in any event be removed and replaced at the Contractor's expense at the sole discretion of the Engineer.

2.03.3 The joints of brick work and masonry shall be raked out 10 mm deep with mortar still green to form key for the cement plaster and surfaces to be plastered, if not sufficiently rough, shall be thoroughly picked and roughened to provide a good bond for the plaster. The rates for plastering shall be inclusive of preparing the surface as above.

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- 2.03.4 Cement and sand shall be mixed dry and then just enough water added to form an easily workable paste. In no case shall mortar which has been allowed to stand more than twenty (20) minutes after mixing, be used.
- 2.03.5 The surface of brick work, stone, concrete and other structures to be plastered shall be thoroughly cleaned from dust, dirt, oil, salt and bituminous spots, wetted, as directed before the application of the rendering coat.
- 2.03.6 All scaffolding log holes shall be properly filled in advance of plastering as scaffolding is being taken down.
- 2.03.7 For any increase in plaster thickness due to irregularities in brick work face, Contractor will not be entitled for any extra payment.
- 2.03.8 Proper precaution shall be taken to see that each coat of plaster is cured for a maximum period of seven (7) days by an approved method. Curing shall be done as soon as the applied plaster has hardened enough so as not to be damaged. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period can therefore be watched.
- 2.03.9 The Contractor shall take every precaution, right from the commencement of plaster work to prevent any defects that may appear on the surface of the plasters, and shall be responsible to make good any portion of the work which in the opinion of the Engineer requires removal and/or re-doing.
- 2.03.10 the uneven face plastering 20 mm thick shall be applied in two layers. The first coat 12 mm thick with the second coat 8 mm thick applied after the under coat has sufficient set but not dried and in any case within 48 hours. The plaster of under coat when brought to a true surface with a wooden straight edge, the surface shall be left rough and furrowed 2 mm deep with a scratching tool diagonally both ways to form key for the finishing coat. Facade plastering 25 mm thick shall be done in three coats with the first two coats as above and the third rough textured coat 5 mm thick of cement and black marble chips (2-3 mm size) in 1:1.5 ratios.

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2.03.11 plastering of the ceiling shall be done before wall plastering. Wall plastering shall be done from the ceiling downwards.

2.03.12 In suspending work at the end of the day the plaster shall be left, cut clean to line both horizontally and vertically, when recommencing the plastering the edge of the old work shall be scraped cleaned and wetted with lime putty before plaster is applied to adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of wall and not near than 15 cm to any corners or arises. Horizontal joints in plaster work shall not occur on parapet tops and copings, as these invariably lead to leakage. No portion of the surface shall be left out initially to be patched up later on.

2.03.13 if directed by the Engineer the Contractor shall use approved water proofing admixture made by reputed manufacturer in the mortar for plaster work. The quantity to be used etc. shall be in accordance with the manufacturer's instructions subject however to the approval of the Engineer. These admixtures shall not contain calcium chloride unless specifically allowed by the Engineer and shall conform to IS: 2645. Payment shall be made for actual quantity of such admixtures used unless it is already covered in the rates for the work concerned.

2.04 **Measurement**
(Applicable for "Item Rate" contracts only)

2.04.1 Plastering on walls and ceilings shall be measured by their actual finished surface, without taking into account jutting parts, etc. No special allowance or extra price shall be computed for these parts, or for corners and angles. Prices are intended either for plane or curved surfaces. Provisions of transition grooved moldings between walls and ceiling or between walls, with radius not larger than 150 mm is also included in the price, keeping in mind that plaster work shall be measured also in this case as having sharp corners.

2.04.2 All area openings, doors, windows, fan openings etc. shall be deducted while paying for plastering work. The rate quoted for plaster viz. the rate indicated in Section - E, duly increased/decreased as the case may be, by the percentage increase/decrease quoted by the tendered and shall include finishing at bottom after completion of floors.

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2.04.3 Plastering shall be measured by their actual finished surface in square metres.

3.0 FLOORING

3.01 General

The type of flooring required for the various areas shall be as indicated on the construction drawings and or as per the finishing schedule drawing and shall be provided as detailed herein:

Materials of any type and kind shall be perfect in every respect. The individual elements shall fit perfectly together and be fixed to the underlying floor without the slightly unevenness at joints; they may be of different shapes and colors and be laid as directed. Floor shall penetrate about 15 mm into the wall plaster, finished and clean, without stains and performed to best workmanship. The Contractor is fully responsible for damage resulting from abusive treatment and shall at his own expense rebuild the portions damaged. Flooring directly exposed to rain shall be cast rough/grooved to make them non-slippery. The Contractor shall submit samples of the materials to be used to Engineer for approval.

3.02 Grade Slab

3.02.1 The existing earth fill shall be thoroughly compacted so that there are no loose pockets left. Extra layers of earth shall be deposited to make good the settlement due to compaction of the existing fill. Each consolidated layer shall have a thickness not exceeding 200 mm and shall be consolidated to minimum 95% Proctor density at optimum moisture content. The final surface shall be evenly dressed to the specified level.

3.02.2 The bed on which the floor paving is to be laid shall be properly prepared. The sub-grade shall be cleaned of all dirt and other foreign matter. The slope desired in the floor shall be provided in the sub-grade. The ground shall be well consolidated before and after laying the sub-grade so that no settlement whatsoever takes place at a later stage. The subgrade shall be thoroughly wetted with water before laying the floor. The floor paving shall be laid in panels of uniform size in squares or rectangles not exceeding 6 square metres in area but no side shall be longer than 2.5 metres.

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- 3.02.3 The floor paving shall be of 150 mm thick M 20 grade reinforced cement concrete and shall have 300 kg of cement per each actual cubic metre of finished vibrated concrete with sand and crushed graded stone of size not exceeding 20 mm.
- 3.02.4 Glass strips 40 mm wide and 3 mm thick shall be placed between the panels as directed and if considered necessary by the Engineer. The work shall be carried out in alternate panels in the first instance so that the two (2) panels have one corner- point common. At least four (4) days shall elapse before commencing
- 3.02.5 Of intermediate bays. The top surfaces shall be finished to a smooth and even plane using extra cement. While being placed, the concrete shall be vigorously sliced and spread with suitable tools to prevent formation of voids or honey – comb pockets. The concrete shall be brought to specified levels by means of a heavy straight edge resting on the side forms and drawn ahead with a smooth motion, in combination with a series of lifts and drops alternating with small lateral shifts. When concreting the remaining alternate bays, care shall be taken to ensure that the edges of previously laid bays are not broken by careless or hard tamping. Immediately after laying the concrete, the surface shall be inspected for high or low spots and any needed correction shall be made up by adding or removing concret.
- 3.02.6 The surface shall be then finished as ordered and cured. The junctions of floors and walls, floor and dado or skirting shall be rounded off as directed without any extra payment. Any inequalities in the bed of the floor shall have to be made good by the Contractor at his own cost by providing the concrete required to provide a truly plane surface. Payment will be made only for the thickness specified. Reinforcing steel shall be paid for separately.
- 3.03 **Cement Floor (IPS Flooring)**
- 3.03.1 The cement topping shall consist of one (1) part Portland Cement, one (1) part fine aggregate and two (2) parts of coarse aggregate, proportioned by volume, with the addition of not more than eighteen (18) litres of water per bag of cement unless otherwise approved by the Engineer. The coarse aggregates shall be graded from 3 mm to 12 mm maximum size. The fine and coarse aggregates shall be free

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from injurious quantities of clay, loam, vegetable matter or any ingredients that may affect their bonding qualities.

- 3.03.2 Cement topping shall be applied in average thickness of 40 mm after all heavy construction work has been completed and all machinery, equipment units and piping have been installed.
- 3.03.3 All surfaces in areas to receive cement topping shall be broom cleaned and be free from loose particles; any grease, paint, oil spot, asphalt and/or tar shall be removed; any projections such as nails, bolts or screws shall be cut off flush with the concrete slab. Any laitance of scum shall be removed by the use of stiff bristle brushes.
- 3.03.4 Immediately prior to placing the cement topping, the base slab shall be thoroughly moistened and brush coated with a neat cement grout, to provide a mechanical bond for the surface application. The cement topping shall be placed immediately following the applied neat cement brush coat. After screeding the topping to the established grades, the surface shall be compacted by tamping and rolling, then floated with a wooden float or power floating machine.
- 3.03.5 After the topping has partially set the surface shall be steel trowelled to a smooth and even finish, free from tool marks. A final steel trowelling shall be given until the surfaces have set to a hard and uniform finish.
- 3.03.6 The top surface shall be provided with dust preventive coating as per manufacturer's specification of some approved make viz. FOSROC-lithurine or equivalent, approved by the Engineer-in-Charge.
- 3.03.7 Provisions for expansion joints shall be made through the entire depth of the topping at all intersections with vertical surfaces and at not more than three (3) metres intervals across the floor surface. The expansion joints shall be formed by placing 20 mm thick wooden strips and after the curing period the wooden strips shall be removed and all joints shall be filled with bitumen, asphalt or equivalent material (curing shall be done by covering with wet sacks for two (2) days and then by ponding 50 mm water for seven (7) days).

3.04 Heavy Duty Floor

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3.04.1 Heavy duty patent stone with ironies 50mm thick or approved equal artificial stone concrete floor with hardener shall be provided for heavy equipment areas as shown on drawings or as directed by the Engineer.

3.04.2 The topping shall, if possible, be placed on the base slab before the latter has taken its final set. When this is not possible, the base slab shall be thoroughly brushed with stiff brooms, wetted for twelve (12) hours and allowed to dry before the cement concrete floor topping is laid. Surplus water shall be mopped up and a cement grout brushed well into the surface immediately before laying the screened bed to a level 12 mm below the finishing level.

3.04.3 The cement floor shall consist of a mix of one part cement, one part sand and two parts crushed aggregate 10 mm size, as specified above, but with a slump less than 25 mm. This shall be mixed, placed, thoroughly tamped with a grill hammer and floated and screened to receive the 12 mm thick hard topping. Hard topping shall be applied while the screened bed is still wet. This shall consist of one part of a cement-ironite mixture to two parts by bulk of well-graded approved crushed granite of maximum 6/12 mm size. The cement ironite shall consist of well mixed dry mixture containing one part ironite to four parts cement by weight. Water shall be added after mixing the aggregate, placing, tamping, floating and trowelling being done in accordance with manufacturer's recommendations. Care shall be taken not to over trowel until the initial set has taken place.

3.05 Terrazo Tile Floors

3.05.1 Terrazo tiles shall be hydraulically pressed, of approved tint, pattern and size. Each tile shall be printed legibly and permanently on the back with manufacturer's trade name and ISI certification mark. The tiles shall conform to IS: 1237. Face of tile shall be free from pin holes and any other such defects. The Contractor shall submit samples of the tiles for the approval of the Engineer. The tile shall be cured for a minimum period of fourteen (14) days at the shop before it being delivered to the site. The tiles shall be polished at site after being laid.

3.05.2 The underbed for horizontal surfaces shall be 20mm thick in 1:3 Cement: Sand mortar, mixed with ample water to form a stiff workable mass.

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3.05.3 The tiles shall be kept wet for atleast ten (10) minutes just before laying. The under bed mortar shall be evenly spread and brought to proper grade. Before the under-bed mortar is set, cement slurry at the rate of 4.4 Kg of cement per square metre shall be applied over it. The tiles shall be immediately placed over it and pressed by wooden mallet till it reaches the desired level. The floor shall be kept moist for seven (7) days. The joints between the tiles shall be uniform and as thin as possible but not more than 1.5 mm.

3.05.4 The day after the tiles are laid all joints shall be carefully cleaned and grouted with coloured cement to match with the tint of tiles. About a week after lying of tiles each tile shall be tapped with a wooden mallet to find out if it gives a hollow sound. All such tiles and tiles broken shall be removed and replaced by new tiles till the tiles are fixed to proper line and level and polished. After the joints have developed sufficient strength, the floors shall then be properly polished to a highly glossy finish with polishing machine. After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 Gms per square metre sprinkled with water and rubbed hard with a pad of woolen rags. The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean. If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet.

3.06 **Marble Slab / Kota Stone / Marble Tile Floors**

3.06.1 The marble stone slab/tiles shall be of grade IST quality and of approved colour and size. The thickness of marble slab/tiles shall be 25mm thick Marble Stone / Tiles shall be provided in dado work wherever required.

3.06.2 The underbed for horizontal surfaces shall be 20mm thick in 1:3 Cement: Sand mortar, mixed with sample water to form a stiff workable mass.
The backing for vertical surfaces in dado shall be 12mm thick in 1:2 cement: sand mortar, mixed with angle water to form a stiff workable mass.

3.06.3 The marble slabs/tiles shall be kept wet for atleast fifteen (15) minutes just before laying. The water absorption capacity of marble stone

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slab/tiles shall not be more than 5 percent by weight. The under bed mortar shall be evenly spread and brought to proper grade. Before the under bed mortar is set, cement slurry at the rate of 4.4kg of cement per square metre shall be applied over it. The marble slabs/tiles shall be immediately placed over it and pressed by wooden mallet till it reaches the desired level. The floor shall be kept moist for seven (7) days. The joints between the tiles shall be uniform and as thin as possible but not more than 1.0mm.

- 3.06.4 The day after the tiles are laid all joints shall be carefully cleaned and grouted with coloured cement to match with the tint of marble slabs/tiles. About a week after lying of tiles each tile shall be tapped with a wooden mallet to find out if it gives a hollow sound. All such tiles and tiles broken shall be removed and replaced by new tiles till the tiles are fixed to proper line and level and polished. After the joints have developed sufficient strength, the floors shall then be properly polished to a highly glossy finish with polishing machine. The floor shall be rubbed with carborandum stone and water and then with final carborandum stone and emery powder. The surface shall then be finally smoothening down with pumic stone. After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 Gms. per square metre sprinkled with water and rubbed hard with a pad of woollen rags or felt. The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean. If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet.

3.07 **PVC Flooring**

PVC tiles flooring shall be carried out using PVC antistatic floor tiles "WONDERFLOOR" or equivalent tiles approved by the Engineer-in-Charge and conforming to IS: 3462 and BS: 2050. The tiles shall be 600x600mm in size and 2mm thick in approved colour. The tiles shall be laid using approved rubber base adhesive 'Fericol' or equivalent over cement concrete finished floor which shall be prepared with smooth surface without any pot holes, dust or dirt. While laying PVC tiles the joint shall be properly matched without any space between the tiles and tiles shall be rolled with light wooden roller weighing about 5 kg for proper adhesion to the floor surface.

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3.08 **Ceramic Tiles/Glazed Tiles**

The earthenware tiles shall be of Kajaria / Nitco / Johnson make or equivalent approved by the Engineer-in-charge covered with glaze of approved size, colour and design. The tiles shall be flat and true to shape. They shall be uniform in colour, free from any flaws like cracks, chips etc. The edges and the underside of the tiles shall be free from any glaze and shall have proper indentations for proper bond. All precautions and workmanship while doing the work shall be enumerated above.

3.09 **Acid Proof Tiles**

3.09.1 Acid proofing work shall be carried out using Coromandel Prodorite Product (acid proof tiles) or approved equivalent. Over the finished R.C.C. surface apply one coat of the bituminous acid resistant paint "PRODORLAC SPL" with 230 x 115 x 38 mm thick acid resistant tiles laid over it. The tiles shall be bedded and jointed in 6 mm thick cement PRODOR SWK; the joints should be 3 mm wide.

3.10 **Curing**

Curing shall be done by covering with wet sacking for two (2) days and then by ponding with 50 mm water for seven (7) days.

3.11 **Dado**

Tiles from factory should be practically fully polished. The back of such tiles at the time of fixing to the mortar backing shall be covered with a thin layer of neat cement paste and the tile shall then be jointly tapped against the wall with a wooden mallet. This shall be done from the bottom of the surface upwards. The joint shall be as close as possible and the work shall be truly vertical and flush. After the work is set, polishing shall be done so that the surface attains a high glossy finish.

3.12 **Measurement**

(Applicable for "Item Rate" contracts only)

3.12.1 **Floors**

Floors of any kind shall be estimated on the basis of the surface area appearing between the plastered walls of the room. The keying of the floors under the plaster is therefore not included. Dado shall be paid for the surface area up to floor level. Measurement of flooring work and dado shall be in square metres to two decimal places and shall be

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measured by their actual surface, whatever shape or position the walls may have; skirting shall be measured in linear metres. The cost of laying shall include providing of adequate bedding/backing, filling of joints with specified mortar, all special transition pieces, groove moulds, corners all as per specification and drawings. The prices shall include cleaning and finishing of floors.

3.12.2 **Tile Facings**

Tile facings shall be measured by their actual surface, whatsoever shape or position the walls to be coated may have. The prices quoted shall include all special transition pieces, grooved moulds, corners etc.

4.0 **PAINTING**

4.01 **Scope**

The Contractor shall provide all labour, material and equipment necessary to paint, white wash, colour wash, dry distemper, plastic emulsion paint, all the items in general, including those not covered by this technical specifications. Steel doors, windows, steel rolling shutters, gangways, stairways, railing, grating, rain water pipes etc. shall be painted with synthetic enamel paint over the primer paint.

4.02 **Type of Painting**

The type of painting required for the various areas shall be generally as shown in the drawings.

4.03 **White Washing**

4.03.1 White wash shall be prepared with rich lime perfectly white, slaked by immersion.

4.03.2 The lime shall be thoroughly slaked on the spot, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for a period of twenty-four (24) hours and then shall be screened through a clean coarse cloth. 40 grams of gum dissolved in hot water, shall be added to each ten (10) litres of the cream. The approximate quantity of water to be added in making the cream will be 5 litres of water to one kg of lime. Indigo up to 3 gm per kg of lime, dissolved in water, shall then be added and wash stirred well. Water shall then be

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added at the rate of about 5 litre per kg. of lime to produce a milky solution. The surfaces specified to be white washed shall be thoroughly dried and cleaned. The white wash shall be applied by moonj brushes to the specified number of coats.

4.03.3 Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the Engineer, before subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on. The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

4.03.4 Doors, windows, floors, etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Splashings and droppings, if any, shall be removed by the Contractor at his own cost and surfaces cleaned. Damages if any to fittings and fixtures shall be recoverable from the Contractor.

4.03.5 Colour wash may be applied instead of white wash by adding approved colouring agent as approved by the Engineer.

4.04 **Colour Wash**

The mineral colours not affected by lime, shall be added to white wash. Indigo shall then not be added. No colour wash shall be done until a sample of the colour wash of the required tint or shade has been got approved from the Engineer-in- Charge. The colour shall be of even tint or shade over the whole surface. If it is blotchy or badly applied, it shall be redone by the contractor. For new work the priming coat shall be white wash with lime or with whiting as specified in the description of the item. Two or more coats shall be applied on the entire surface till it represents a smooth and uniform finish. Before taking a room in hand sufficient colour wash shall be prepared to cover all the walls and to a uniform tint. Work in a room shall be started sufficiently early in the day to ensure the room being finished before the evening. The instructions laid down for white washing shall also apply here. Protective measures shall be as described in white washing.

4.05 **Dry Distemper**

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- 4.05.01 Dry distemper of required colour conforming to IS:427 and of approved brand and manufacture shall be used. The primer shall be cement primer or distemper primer. The shade shall be got approved from Engineer incharge. The distemper, as required, shall be stirred slowly and mixed with clean water, preferably warm, using 0.6 litres of water per Kg of distemper or as specified by the manufacturer. Distemper shall not be mixed in larger quantities than is actually required for one days work. The treatment shall consist of a priming coat of whiting followed by the application of two or more coats of distemper till the surface shows an even colour.

4.06 Oil Bound Washable Distemper

- 4.06.1 Oil Bound distemper of approved brand and manufacture shall be used. The shade shall be got approved from the Engineer before application of the distemper. The distemper shall be well stirred before and during use to maintain an even consistency. Distemper shall not be mixed in larger quantity than each actually required for one day.
- 4.06.2 Before new work is distempered, the surfaces shall be thoroughly brushed free from mortar droppings and other foreign matter and sand papered smooth. New plaster surfaces shall be allowed to dry for atleast six (6) months before applying distemper. The oil bound distemper shall be applied after the surface is primed with an alkali resistant primer and followed by two coats of approved oil bound distemper all as per manufacturer's specification. In the case of oil work, all loose pieces and scales shall be removed by sand papering. The surface shall be cleaned of all grease, dirt etc. Pitting in plaster shall be made good with plaster of paris mixed with pigment of relevant colour of the distemper to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of the distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is applied. The next coat of oil bound distemper on completed surface shall be applied after the first coat has set for atleast 24 hours.
- 4.06.3 After the primer coat has dried the surface shall be lightly sand papered to make it smooth for receiving the next coat of distemper, taking care not to rub out the priming coat. The entire surface shall be coated with

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the mixture uniformly with proper distemper brushes (ordinary white wash brushes shall not be allowed) in horizontal strokes followed immediately by vertical ones which together shall constitute one coat. The subsequent coats shall be applied only after the previous coat has dried. The finished surface shall be even and uniform and shall show no brush marks. Enough distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room, which cannot be completed the same day. After each day's work, the brushes shall be washed in hot water and hung down to dry. Old brushes which are dirty or caked with distemper shall not be used. The dry distemper should be applied in dry weather only.

4.07 **Plastic Emulsion Painting**

4.07.1 Plastic emulsion paint of approved brand and manufacture shall be used. The primer where used as on new in accordance to the manufacturer's requirements shall be of the same manufacture as plastic emulsion paint and shall be brought by the Contractor in sealed tins in sufficient quantities at a time to suffice for a fortnight's work and the same shall be kept for in the joint custody of the Contractor and the Engineer. The empty tins shall not be removed from the site of work, till this item of work has been completed and passed by the Engineer. Only sufficient quantity of paint required for the day's work shall be prepared for new work. The surface shall be thoroughly cleaned of dust, old white or colour wash if any by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water on the entire surface including filling up the undulation and sand papering the same after it is dry. The primer coat shall be applied with a brush on the clean dry and smooth surface, horizontal strokes shall be given first and vertical stroke shall be applied immediately after. This entire operation will constitute one (1) coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for atleast forty eight (48) hours, before plastic emulsion paint is applied.

4.07.2 After the primer coat has dried the surface shall be lightly sand papered to make it smooth for receiving the paint, taking care not to rub

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out the priming coat. All loose particles shall be dusted off after rubbing. One (1) coat of paint properly diluted with thinner (water or other liquid as stipulated by the manufacturer) shall be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one (1) coat. The subsequent coats shall be applied in the same way. Two (2) or more coats of paint shall be applied over the primer coat to obtain an even shade. A time interval of at least twenty four (24) hours shall be allowed between consecutive coats to permit the proper drying of the preceding coat. Fifteen (15) centimetres double bristled distemper brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work. Plastic emulsion paint is not recommended to be applied within six (6) months of the completion of wall plaster. Protective measures shall be as described for white washing.

4.08 **Water-proof Cement Paint**

- 4.08.1 Water-proof cement paint shall be of approved brand and manufacture and shall be applied on the surface to be treated in accordance with the manufacturer's specifications if so directed by Engineer. However, for guidance of Contractor the following specifications are given. The surface shall be thoroughly cleaned of all mortar dropping, dirt, dust, grease and any other foreign matter by brushing and washing. The surface shall be thoroughly wetted with clean water before the waterproof cement paint is applied.
- 4.08.2 Water-proof cement paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish. Water proof cement paint shall be mixed as per the manufacturer's instructions.
- 4.08.3 For new work, the surface shall be treated with three (3) coats of waterproof cement paint to get a uniform shade. For old work, the treatment will be with one or more coats as found necessary to get a uniform shade. Water cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound, varnishes, paints etc. It shall not be applied on gypsum, wood and metal surfaces.

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4.09 Acid Resistant Painting

- 4.09.1 Acid resistant paint of approved brand and manufacture shall be used. The primer where used as on new in accordance to the manufacturer's requirements shall be of the same manufacture as acid resistant paint and shall be brought by the Contractor in sealed tins in sufficient quantities at a time to suffice for a fortnight's work and the same shall be kept for in the joint custody of the Contractor and the Engineer. The empty tins shall not be removed from the site of work, till this item of work has been completed and passed by the Engineer. Only sufficient quantity of paint required for the day's work shall be prepared for new work. The surface shall be thoroughly cleaned of dust, old white or colour wash if any by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty made of plaster of Paris mixed with water on the entire surface including filling up the undulation and sand papering the same after it is dry. The primer coat shall be applied with a brush on the clean dry and smooth surface, horizontal strokes shall be given first and vertical stroke shall be applied immediately after. This entire operation will constitute one (1) coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for atleast forty eight (48) hours, before acid resistant paint is applied.
- 4.09.2 After the primer coat has dried the surface shall be lightly sand papered to make it smooth for receiving the paint, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. One (1) coat of paint properly diluted with thinner (water or other liquid as stipulated by the manufacturer) shall be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one (1) coat. The subsequent coats shall be applied in the same way. Two (2) or more coats of paint shall be applied over the primer coat to obtain an even shade. A time interval of at least twenty four (24) hours shall be allowed between consecutive coats to permit the proper drying of the preceding coat. Fifteen (15) centimetres double bristled distemper brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be

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used on the work. Protective measures shall be as described for white washing.

4.10 **Chlorinated Rubber Based Paint**

4.10.1 Chlorinated rubber is the product obtained from the reaction of chlorine with rubber. The product contains an average chlorine content of about 65 %.

4.10.2 Chlorinated rubber shall be formulated with resins (for adhesion and gloss), plasticisers, (for flexibility and toughness), pigments (for colour) stabilisers and solvents (for fluidity). This shall meet the general requirements of IS:13467 and BS:5493.

4.11 **Preparation Of Surface**

Before starting the work the contractor shall obtain the approval of the Engineer regarding the soundness and readiness of the surface to be painted on.

4.11.1 **Masonry, Concrete and Plastered Surfaces**

Surface shall be free from all oil, grease, efflorescence, mildew, loose paint or other foreign and loose materials. Masonry cracks shall be cleaned out and patch filled with mortar similar to the original surface and uniformly textured. Where this type of resurfacing may lead to the finishing paint being different in shade from the original surfaces, the resurfaced area shall be treated with minimum one coat of cement primer which should be continued to the surrounding area for a distance of minimum 100mm.

Surface with mildew, efflorescence shall be treated as below

a) **Mildew**

All mildewed surfaces shall be treated with an approved fungicide such as ammonia cal wash consisting of 7 gm of copper carbonate dissolved in 80 ml liquid ammonia and diluted to 1 litre with water or 2.5 per cent magnesium silico-fluoride solution and allowed to dry thoroughly before paint is applied.

b) **Efflorescence**

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All efflorescence shall be removed by scrubbing the affected surface with a solution of muriatic acid in water (1:6 to 1:8) and washed fully with clear water and allowed to dry thoroughly.

- 4.11.2 All metal Surfaces shall be absolutely clean, dry and free from wax, grease or dried soap films. All steel and iron surfaces in addition shall be free from rust. All galvanized iron surfaces shall be pre-treated with a compatible primer according to the manufacturer's direction. Any abrasion in shop coat shall be touched up with the same quality of paint as the original coat.

4.11.3 **Application**

The method of application shall be as recommended by the manufacturer. In case of selection of special shades and colour (not available in standard shades) the Contractor shall mix different shades and prepare test panels of minimum size 1 metre square as per instruction of the Engineer and obtain his approval prior to application of finishing paints.

Proper tools and implements shall be used. Scaffoldings if used shall be independent of the surface to be painted to avoid shade differences of the freshly repaired anchor holes. Painting shall be done by skilled laborers in a workman like manner. All materials shall be evenly applied, so as to be free of sags, runs, crawls or other defects. All coats shall be of proper consistency. In case of application by brush, no brush marks shall be visible. The brushes shall be clean and in good condition before application of paint.

All priming undercoats for painting shall be applied by brush only and rollers, spray equipments etc. shall not be used.

No work shall be done under conditions that are unsuitable for production of good results. No painting shall be done when plastering is in progress or is drying. Application of paint which seals of surface to moisture shall be done after the moisture on and below the surface has dried out.

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All coats shall be thoroughly dry before being sand papered or before the succeeding coat is applied. Coats of painting as specified are intended to cover surfaces perfectly.

In case the surface is not covered properly by applying the specified number of coats, further coats shall be applied by the Contractor when so directed by the Engineer, without any extra cost to Owner. All primers and undercoats shall be tinted to approximate the colour of the finishing coats. Finished coats shall be of exact colour and shade and as per approved samples and finish shall be uniform in colour and texture. All parts of mouldings and ornaments shall be left clean and true to finish.

4.12 **General**

4.12.1 All painting shall be performed, generally, in accordance with the detailed descriptions. In the selection of colors, agreement shall be made with the Engineer. All painting/finishing material (other than whitewash, colour wash etc.) shall be obtained ready mixed in sealed containers from approved manufacturers; these shall be of best quality, of approved make and having Engineer's approval.

4.12.2 Generally, iron and steel work etc. Would have received its primary shop coat before delivered to site. No painting work shall be started, unless specimens and colors are submitted in advance to the Engineer for approval. Such approval of paint specimens by the Engineer does not relieve the Contractor of his full and entire liability as to the life and quality of paints. No products prepared in the field by the workmen shall be used, except for those not available in the market; in this case, however, the paints shall be prepared with the greatest care and best methods known in a sufficiently good quantity to assure uniform coloring; they shall be of a density and body such as to cover perfectly the surfaces to which they are to be applied. The Engineer may, while work is in progress, take samples for the products employed in the different operations, in order to have them analyzed and tested as deemed fit, all at the Contractor's expense.

4.12.3 The Contractor shall be responsible for evident or hidden faults which may become apparent even after work is finished, up to the time of final inspection and acceptance. The Contractor shall take into

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account the conditions of the surfaces to be painted (for example ageing of plasters, etc.) and adapt the preparation thereto, using any special operations which in practice may have proved necessary and which have been approved by the Engineer. All reconditioning or extra work which the Engineer may deem necessary for the removal of defects shall be at the Contractor's expenses.

- 4.12.4 All paints shall be of the best type used for that particular purpose, possessing the highest wear resistance, and shall be submitted for approval to the Engineer, who is entitled to demand such tests as he may deem fit. The Contractor shall give notice to the Engineer of each stage of painting that is to be performed, and obtain approval for each in special register prepared for the purpose. Painted surfaces shall appear absolutely even and free from any trace of brush marks and a good finish is required for those having pumice treatment.

- 4.13 **Measurement**
(Applicable for "Item Rate" contracts only)
All painting white washing, dry distempering, oil bound distempering, plastic emulsion painting, acid proof painting or Snowcem painting, etc. on walls, ceilings or synthetic enamel painting of steel structures, doors and windows frames etc. shall be measured as per relevant part of IS:1200 or C.P.W.D. Specification.

5.00 **STEEL DOORS, WINDOWS, VENTILATORS AND ROLLING SHUTTERS**

5.01 **Scope**

The contractor shall furnish all labour, material and equipment required for supply, transportation and fixing in position all the doors, windows and rolling steel shutters required for the civil works as per drawings.

5.02 **Doors, Windows & Ventilators**

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All windows and door frames of any kind and size shall be made of standard steel shapes and be of the tight closing type; double contact, stiffened windows shall be partly hinged and partly fixed.

Hinges windows shall be actuated by means of special easy to adjust and operate devices, smoothly operating, all the doors shall be of standard construction, with shape and size of openings as indicated in the drawings. All standard steel doors, windows and ventilators or approved best quality shall conform to IS:1038, IS:1361 and IS:4351 unless other-wise stated.

All fittings shall be superior chrome plated quality or anodized aluminum as required. The Contractor shall submit samples of all fittings and provide only the selected/approved fittings.

Each door shall be provided with :

- One (1) superior quality rim lock or mortice lock with handles on both sides and two (2) 150 mm Tower Bolts to close the door from inside.
- One (1) approved brass door closer
- Necessary lugs for fixing

Each window shall be provided with :

- Peg-stay arms
- Handles
- Tower Bolts

Each ventilator shall be provided with :

- Bronze cup pivots and spring catch closure.

All steel doors, windows and ventilators shall be given a coating with Red oxide primer. This shall be touched up during installation as necessary. The colour coating shall match the painting schedule.

Doors shall be completely or partly sheeted with 16 gauge metal sheet.. Doors of toilets, wash rooms, etc. shall be fully sheeted with the bottom

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portion constructed as a louvered ventilator. Kick plates shall be provided. Two (2) keys shall be provided for each door and in addition a master and sub-master keys shall be provided, as required.

Door Frames

Frames shall be reinforced for door closers. They shall be mortised, reinforced, drilled and tapped for hinges, lock and bolt strikes. Flush butt welding to form a solid fused joint, so that all frames are square and flat shall be sued with sections cut to required length and mitred. Rubber door silencers shall be furnished for the striking jamb. Loose "T" Masonry anchors shall be provided. Frames shall finish flush with floor and adjustable floor anchors shall be supplied. Frames shall be brought to site with floor ties / weather bars installed in place.

Double Plate Flush Door Shutters

Door shutters shall be 45mm thick, completely flush design and shall comprise of two sheets of 18G steel sheets, rigidly connected and reinforced inside with continuous vertical 20G stiffeners, spot welded in position at not more that 150mm on centres. Both edges of doors shall be joined and reinforced full height by steel channels placed immediately inside and welded to the door faces. Top and bottom of doors shall be reinforced horizontally by steel channels running full width of door. Doors shall not have more than 2.5mm clearance at jambs and head shall have proper level on lock stiles and rails to operate without binding and shall be reinforced at corners to prevent sagging or twisting. Pairs or double doors shall have meeting stile edges beveled or rebated.

Doors shall be mortised, reinforced, drilled and tapped in shop for hinges, locks and bolts. They shall also be reinforced for closer, push plates and other surface hardware where necessary. Any drilling and tapping required for surface hardware shall be done at site. Wherever required, provision shall be made for fixing glazing, vision panels, louvers etc. Glazing mouldings shall be of 18G mild steel or extruded aluminium sections with profiles shown in drawings and suitable for fixing 6mm glass. Louver blades shall be V or Z shaped and made out of 16G sheets.

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Pressed Steel Louvers

The louvre blade shall be 'Z' shaped and made of 18 gauge sheets in EZ 7 steel frames. The frame shall be of ISMC-100 unless shown otherwise on approved drawings.

5.02.1 Installation

After the masonry work has been constructed the Contractor shall install the doors, windows and ventilators frames in line and plumb and shall firmly anchor these to the masonry with approved metal anchors. The Contractor shall ensure that variations in building dimensions (contractions, expansion etc.) will not cause the doors, windows or ventilators to jam or not close properly. Work not properly anchored or out of plumb shall be rectified to the Engineer's satisfaction. After all Civil works under this and other sections have been completed, the Contractor shall carefully inspect all doors, windows and ventilators and make necessary adjustments to ensure efficient operation.

5.03 Rolling Shutters

5.03.1 The rolling steel shutters shall be as per IS:6248, of an approved design and make. The dimensions shall be as shown on the drawings. Wicket gates shall be provided, where required.

5.03.2 In case of hand operated pull and push type rolling shutters of sizes larger than 10 sq.m. in area and in case of very large gear operated and/or as directed by the Engineer, rolling shutters shall be provided with ball bearings for smooth and efficient operation and with the provision of wicket gate and ventilator where necessary. In case of large rolling shutters and depending upon local wind conditions, the rolling shutters should be provided with special locking type of wider channel guides or it shall be provided with central movable channel supports to take up the design wind pressures in the area.

5.03.3 Power Operated Rolling Shutter:

These shall be operable from a push button station conveniently located besides the door or as shown on drawings. One emergency

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and chain.crank operation shall also be provided for use in case of power failure or failure of electric system. Where called for in schedule, externally mounted shutters shall be operated by control mechanism located inside the building.

5.04.01 **Installation**

The shutter shall be erected complete with all necessary hardware, operation mechanisms, equipment, wiring and materials to suit the sizes of the openings. All electrical works shall be in accordance with the Indian Electricity Regulations.

5.04.02 **Tests**

After the equipment has been installed, tests shall be made by the Contractor in the presence of the Engineer to ensure efficient operation of the equipment. These tests shall be repeated after all Civil works have been completed and the Contractor shall make necessary checks and adjustment to ensure efficient operation.

5.05 **Measurement**

(Applicable for "Item Rate" contracts only)

Steel doors, windows and ventilators including fixtures shall be computed by square metres. Rolling steel shutters shall be computed by Square metres.

6.0 **ALUMINIUM DOORS, WINDOWS AND VENTILATORS**

6.01 **Scope**

The Contractor shall furnish all labour, material and equipment required for supply, transportation and fixing in position, all anodized aluminium doors, windows, ventilators, excluding glass required for the construction as per drawings.

6.02 **Doors**

The doors shall be built from extruded anodized aluminium sections. The panels shall be of anodized aluminium sheet of not less than 18 gauge thickness, unless otherwise specified. The finished work shall be plumb, in line and free from corrugation, depression or wavy

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appearance and any defects rectified. Field connections of all works may be made with concealed screws or approved type of fasteners or may be welded as approved by the Engineer. Fabrication Drawings - Before starting fabrication of all metal doors, windows etc. the Contractor shall submit detailed fabrication drawings to Engineer for approval. Only after approval of drawings, the fabrication work shall be started. All fittings and fixtures shall be of matching shade inline with overall finishes.

Workmanship - Workmanship shall be of best quality, free from any flaws and defects. Approval of the Engineer shall be taken for the samples of each type of work after submitting the same, before starting the bulk manufacture.

Transporting - Packing, despatching, loading and unloading from wagons/trucks shall be done by the Contractor with all care to ensure safe arrival of materials at site in undamaged condition.

6.03 **Anodized Aluminium Louvers**

Aluminium louvers shall be of an approved design, horizontal or vertical type, designed to resist a wind pressure of 250 kg. per square metre. The louvers shall be of atleast 18 SWG anodized aluminium. Extruded anodized aluminium sections shall be used for supports as required and operating devices shall be of anodized aluminium of matching shades. Approved bi-metallic corrosion protection paint shall be used where required.

6.04 **Measurement**

(Applicable for "Item Rate" contracts only)

Alluminium doors, windows, ventilators, and louvers shall be computed by square metres.

7.0 **GLAZING**

7.01 **Scope**

The Contractor shall furnish all labour, material and equipment required for supply, transportation and fixing in position, all types and

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sizes of glasses required for the civil works for the complete construction as per drawings.

In general wherever applicable and unless otherwise noted, work shall conform to IS:1081 (latest) 'Fixing and Glazing' (steel and aluminium) doors, windows and ventilators.

7.02

Glazing Work

Glazing for doors, windows and ventilators (both steel and anodized aluminium) shall be of 5.5 mm thick plate glass conforming to IS:2835 flattened sheets or 6 mm thick wire reinforced glass panels of superior approved quality. Wired glass shall be rolled glass with centrally embedded 24 G wire mesh of Georgian type. This may be of clear or coloured glass, as required by Engineer and shall conform to IS:5437.

The glass shall be brought to site in the original packing from the manufacturer and cut to size at site. The cut edges shall be straight and free from chips, spall or any other damages.

All glass panes or panels shall be free from flaws, specks, bubbles and wavy surface and shall have a uniform refractive index. All panels shall have properly squared corners and straight edges. Any defective or damaged glass shall be rejected forthwith. Putty shall be fresh and ready mix of superior aproved quality conforming to IS:400 (latest).

Glass panes shall be securely fixed in position by means of putty (as per IS:419), mastic paint and glazing clips. Rebates or grooves shall be oiled and cleaned before glazing. Glazing shall be commenced only after all other work in the respective portion has been completed, all glazing shall be thoroughly cleaned with turpentine to remove any stains of paint smears, spots and other blemishes. Bolts, nuts and beds as required shall be provided alongwith glazing clips. All fasteners, clips, clamps etc. shall be anodised aluminium / epoxy coated steel / double dipped glavanized matching the overall shades and finish.

Neoprene gaskets with snap-fit glazing, where required, shall be fixed as per manufacturer's instruction and shall fit firmly against the glass to give a leak proof installation.

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All glass shall be thoroughly cleaned before placing in positions. Each glass pane shall be held in place by special glazing clips of approved type. As specified in relevant IS Codes, four glazing clips shall be provided per glass pane, except for large panes where six or more clips shall be used as per Engineer's instructions. All holes that may be necessary for holding the clips, glazing beads and all other attachments shall be drilled by the Contractor.

Glass pane shall be set without springing, and shall be bedded in putty and back putted, except where mouldings or gaskets are specified. Putty, mastic cement etc. shall be smoothly finished to a true even line. Obscure and figured glass shall be set with smooth side out.

After completion of glazing work, the Contractor shall remove all dirt, stains, putty etc. clean the glass panes and leave the work in perfectly acceptable condition. All broken, cracked or damaged glass shall be replaced by new ones at the Contractor's own cost.

7.03 **Acceptance Criteria**

All installations shall be free from cracked, broken or damaged glass. Edges of large panes of thicker glass and heat absorbing glass shall be inspected carefully for chipped, cracked or unground edges. Glazing shall be carefully done to avoid direct contact with metal frames.

All glass shall be embedded in mastic or fixed by neoprene gaskets to give a leak-proof installation.

At completion, the panes shall be free from dirt, stains, excess putty etc. and to complete satisfaction of the Engineer.

7.04 **Measurement**

(Applicable for "Item Rate" contracts only)

Glazing shall be computed by square metres of glass areas inclusive of the area occupied by putty/beading.

8.0 **FALSE CEILING**

8.01 **Scope**

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The work under this sub-section shall include the supply and installation of suspended ceiling together with the suspension system as shown on drawings or specified in schedule of items with all materials, labour and equipment. The work shall also include providing of openings in the ceiling for lighting, air-conditioning diffusers, etc. as shown on drawings or as instructed by the Engineer.

8.02

Installation

Suspension System

Suspension system shall consist of grid supporting the ceiling panels intermediate runner supports for the grid if any, and hangers wall angles etc. required to suspend the grid or the runners from structural walls, slabs and beams or trusses.

All members of the suspension system shall be of sufficient strength and rigidity to carry the ceiling board or sheets in a true and level plane without exceeding a deflection of $1/500^{\text{th}}$ of their span. All joints in ceiling panels shall run straight and cross joint shall be at perfect right angle. Angle moulds shall be securely fixed to walls. All drillings of structural concrete or welding to steel for installation of the suspension system shall be included in the rate. All M.S. section, wherever used for supports etc. shall be given one coat of synthetic enamel paint over a coat of red lead primer of two coats of aluminium paints. All wood supports shall be painted with two coats of approved wood preservative before erection.

8.03

Pre-laminated Particle Board False Ceiling

Aluminum grid ceiling system shall consist of anodised Tee-section (runners) spaced at 600mm centers.

Angle cleats or other suitable fixing device shall be fixed to the structural beam or slab above for fixing of hanger. Runners shall be hung by MS rod with a provision of leveling arrangement at a spacing of 1200 C/C. Extra hangers shall be provided at light fixtures that are supported from the ceiling system.

The cross tees shall intersect main tees in pattern shown on drawings and positively locked together with intersection clips. All

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perimeter areas shall have angle mouldings fixed to vertical walls surfaces and end tees shall rest on the mouldings unless otherwise shown on drawings.

40mm thick Resin bonded fiberglass wool of Density 60kg/m³ faced with WMP-10 with edges covered with the same and having Fiberglass Tissue provided on the upper faced in size 600x600mm shall be placed on the grid.

8.04 **Pre-coated False Ceiling Panels**

a) **Ceiling Panels**

84 mm wide x 16mm deep plain roll formed panels out of 0.5 mm thick aluminium-Magnesium Alloy (Al-Mg AA5050) stove enamelled on both sides. The maximum length of the panel shall be up to 6m and in any desired colour of dry paint thickness of approx. 15-20 microns on the main side.

Panel Splice

Same as ceiling panel but 83mm wide and 150mm long. The Engineer may approve any other type and shape permanently colour coated Aluminum false ceiling system meeting strength, durability and other functional requirement specified above. Acoustical and insulation blanket

50mm thick resin bonded fibreglass wool of 24kg/m³ density as per IS:8183 bound in black polythene shall be laid on top of the ceiling panels to provide insulation and acoustics. Minimum density of the material shall be same as specified for wall cladding. Under deck insulation shall also be provided below the ceiling of roof slab wherever required according to Air-conditioning system. Under deck insulation below the floor slab shall also be provided wherever the space below the air conditioned area is not air conditioned.

b) **Erection**

J-hooks shall be inserted into the slab or overhead structural support with the help of nylon washers. The rod Hangers of desired

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height shall be hung from these and clipped on the Spring Steel Clips which in turn shall be clipped onto the 0.95mm thick Aluminium-Magnesium carriers. Hangers shall be fixed approx. 1.5 meters from each other. The panels shall then be clipped onto the carriers and spliced wherever necessary.

8.05 **Grid Frame**

A separate steel grid frame shall be provided above the false ceiling level to facilitate maintenance of fittings and installations wherever shown in the drawings. ISMC75 at a spacing of 1.2m c/c shall be provided with 12mm dia hanger bar. The false ceiling system shall be suspended from this grid frame. All members shall be painted.

8.06 **Under Deck Insulation**

a.General

Thermal insulation shall be provided on the ceiling of top/ or bottom slab of air conditioned areas according to the system requirements.

b. Material

Insulation shall be of fibreglass of density 32kg/cum. Conforming to IS:8183. Minimum thickness of the material shall be 50mm

c. Method of Fixing

The fixing shall generally be with slotted MS angles 100x65x6mm fixed to the soffit of RCC roof slab at 600mm centers in both directions by raw plugs/expansion fasteners of adequate strength. However, the available insert plates, if any provided at the time of casting of RCC slab, can also be used for fixing.

50mm thick insulation material shall be made out of fiber glass Wool 2000 faced with 8-9 Micron thick aluminium foil and 24 G (0.56) x 12mm mesh wire netting. The mat shall be stretched tightly across

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the slotted angles or slotted plates, holding it in place by means of wires. The joints of the wire netting shall be butted and tightly laced down with 12mm (14G) dia GI wire. The insulation shall also cover the existing steel beams in that area

9.0 **ROOF INSULATION AND WATER PROOFING**

9.01 **Scope**

The Contractor shall furnish all labour, materials and equipment required for insulation and water- proofing to be done for the Civil Works for the complete construction as per drawings.

9.02 **Foam Concrete**

The foam concrete where specified drawings shall be laid cast-in-situ to 50 mm average thickness. The insulating weight shall not exceed 480 kg. per metre cube, Thermal Conductivity of foam concrete shall be between 0.48 to 0.7 B.T.U./hr./Sq.ft/°F. Broken and other pieces damaged in any way shall not be used. Materials shall be check-tested and approved to ensure that insulation qualities are complied by each lot. The slab base and/or insulating slabs shall be laid to necessary slope for drainage.

9.03 **Felt Membrane Water Proofing**

Construction of water-proofing shall be as follows :

1. A 12 mm thick uniform or varying 1:4 cement plaster layer on the top of the foam concrete cast in-situ after it is fully cured and dried.
2. Three (3) layers of roofing hessian based Bitumen felt, alternated with four (4) layers of hot bitumen (Blown grade bitumen 85/25 at the rate of 1.6 kg/m²).
3. One (1) layer of washed pea-gravel well set in bitumen water-proofing of roofs shall be done in accordance with IS:1346.

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At the parapets, opening frames of ventilators and other openings the water-proofing (and the underlay, as required) shall be turned up, tucked, bevelled and/or finished to approved or detailed designs to ensure water-proof joints, while permitting freedom of expansion. The pea gravel shall be from an approved source and shall be washed. It shall pass through 6 mm screen.

The water-proofing shall be guaranteed for twenty five (25) years. Leakage or damages occurring during this period shall be made good by the Contractor at his cost at site.

9.04 **Elastomeric Waterproofing**

9.04.1 Waterproofing of flat roof slab shall be done with "BRUSHBOND", An elastomeric joint less waterproofing membrane.

Clean all surfaces free of dust, laitance, foreign matter etc., by stiff wire brushing. Oil and grease should be cleaned using a chemical degreaser and wash with clean water and allowed to dry. Remove all high spots from concrete surface and the surface shall be roughened by slight grinding. Clean the surface with a vacuum pump to remove fine dust. Pre-soak the surface by flooding water for a minimum period of 2-3 hrs. And should be completely removed prior to the application of waterproofing coating.

9.04.2 **Application of waterproofing membrane**

- Mix Brushbond (23 kg powder + 4 kg polymer) in a metal drum with recommended quantity of water using a slow speed drill machine fitted with a paddle for about 4-5 minutes. Hand mixing should be strictly avoided.
- Whilst the surface is damp with no traces of free water, apply the mixed Brushbond using short stiff nylon brush of 120-200 mm wide by scrubbing it well into the substrate. The Brushbond coating shall be taken continuously on the parapet wall to it is full height. Allow the first coat to dry for 6-8 hrs.

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- c. Apply the second coat of brushbond in right angles to the first coat and shall be allowed to dry and the third coat shall be applied in the same manner. Whilst the third coat is wet, sprinkle dry coarse sand for better adhesion of protection screed.
- d. Apply the second coat of brushbond in right angles to the first coat and shall be allowed to dry and the third coat shall be applied in the same manner. Whilst the third coat is wet, sprinkle dry coarse sand for better adhesion of protection screed.

9.04.3 **Protection Layers**

- a. Apply 15mm thick 1:3 cement sand screed as protection layers over the applied Brushbond coating. Polyester fibres shall be used to prevent cracking of the protection screed.
- b. A 50 mm thick screed concrete layer shall be provided over the proof slab in required slope.
- c. The top surface shall be finished by fixing brick tiles.

9.04.4 **Guarantee**

The contractor shall give a guarantee in writing in acceptable form for all works executed under this specification supplemented by a separate and unilateral guarantee from the specialised agency for the roof water-proofing treatment work. The Contractor shall give a guarantee for materials and workmanship and satisfactorily functioning of the water-proofing treatment for a period of (6) six years for heavy treatment and for a period of (8) eight years for extra heavy treatment in case of Bitumen felts and 15 years in case of Elastomeric membrane from the date of completion of the work or the date of handing over the site to the Engineer whichever is later. The specialist agency / Contractor shall endorse the guarantee, beyond the defect liability period as indicated, in favour of the Owner. The Contractor shall replace / rectify defects, if any, observed in the water-proofing treatment to the satisfaction of the Engineer.

9.05 **Measurement**

(Applicable for "Item Rate" contracts only)

These shall be computed on the basis of geometrical surfaces actually constructed in square metres.

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9.06 **Damp Proofing**

Damp proof course shall be 40mm consisting of cement concrete in the proportion 1:2:4 (1 cement, 2 Sand, 4 Graded aggregates 10mm down) with admixture of a water proofing compound as approved by the engineer. The percentage of admixture shall be as approved by the Engineer. The percentage of admixture shall be as per manufacturer's specifications but not less than 2% by weight of cement . The surface of the brick/stone work shall be leveled and prepared before laying the cement concrete. Edges of DPC shall be straight and even. The side shuttering shall consist of wooden forms and shall be strongly and properly fixed, so that it does not get disturbed during compaction and mortar does not leak through. The concrete mix shall be of workable consistency and density. When the side shuttering are removed the surface shall come without hone-combing. The top surface shall be double chequered and cured by ponding for at least 7 days. Cement Bitumen at the rate of 1.2 kg/sqm. shall be applied over the dried surface and cement concrete properly cleaned with brushes and finally with cloth soaked in kerosene oil. The Bitumen shall be applied uniformly so that no blank spaces are left any where

9.07 **Water Proofing Agent**

Where specified and approved by Engineer, Water Proofing Agent conforming to IS:2645, shall be added in quantities specified by Engineer.

10.00 **RAIN WATER PIPES**

10.01 Rainwater downtake pipes shall be UPVC / CI / MS pipes, as specified on drawings / elsewhere in the specifications. MS pipes shall be painted outside with two coats of anticorrosive paints under a coat of primer. Rain water pipes shall be adequately provided to drain out the rainwater without overflow. Minimum 100mm diameter pipe shall be provided to drain out 40 Sqm. of roof surface area and minimum 150mm diameter to drain out 80 Sqm. of roof surface area. All vertical down spout pipes and pipefittings shall run inside the walls. All vertical down spout pipes shall be connected to water proof roofing by means of lead funnels protected at the outside by a cover net of brass wire or by 90⁰ bends (elbow).

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10.02 All covers for water collecting pits, both inside and outside the buildings, shall be of cast iron, with proper holes, and designed to withstand any possible transient load. Such cast iron covers shall be of commercial size and as far as possible the closest to far indoor pits minimum 250mm x 250mm and for outdoor pits 600 x 600mm.

10.03 Cast iron pipes shall be straight and perfect in every detail, of uniform thickness and with smooth internal surface free from any casting faults, and shall comply with IS:1230. Pipes to be embedded in masonry shall be fixed in the masonry work as it proceeds. Care shall be taken to keep the pipes absolutely vertical or to the lines as directed by the Engineer. Pipes shall have a surrounding of 12mm minimum thickness of mortar at every position of the external surface. The mortar shall be of the same mix as is used in the masonry. The joints shall be caulked in with lead as soon as the next length of pipe is placed in position. The open end (socket end) of the pipe shall be kept closed till the next length of pipe is fitted and jointed to prevent any brick bats or concrete or pieces of wood falling in and choking the pipe. The spigot end shall butt the shoulder of the socket and leave no gap in between. The annular space between the socket and the spigot will be first well packed in with spun yarn leaving 25mm from the lip of the socket for the lead. The joints shall then be lead caulked as described in IS:3114. Cast iron pipe fittings shall be of standard size, and shall ring clearly when struck all over with a light hand hammer. The thickness of fittings and details of spigots and sockets shall be same as those of the corresponding size of straight pipes.

11.00 **GUTTERS**

The gutters shall be made of GI aluminium (INDAL). All gutters shall be supplied by reputable specialised firms. Each section shall be sufficiently rigid, edges and corners straight and the slopes perfectly uniform, GI gutters shall have the edges strengthened by suitable means.

Unless noted otherwise the gutters shall have a minimum fall of 1 in 120. adequate number of string supports shall be provided so that there is no reflection even when the gutter is full. Each joint must have a support. Unless otherwise specified the supports shall be fabricated MS brackets. All junctions shall be thoroughly watertight. The joints may be made by riveting, bolting or soldering. All joints between successive

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lengths of gutters shall have an overlap of at least 5cm. The drop in the overlap shall always be in the direction of the fall of the gutter. Ends of gutters shall be closed watertight. Junction with rainwater down comers shall be made fully watertight and secured.

12.00 **PLINTH PROTECTION**

All buildings shall be provided with 1000mm circle and 75 thick PLC of grade M-15 for plinth protection al-round. The plinth protection shall be laid over well-compacted soil and base formed with broken bricks on rubble compacted to a thickness of 75mm. Base shall include greeting with fine sand with approved suitable ground treatment/improvement for loose expansive soil underneath of necessary.

13.00 **APPLICABLE CODES AND SPECIFICATIONS**

The following codes, standards and specifications are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

13.01 **Plastering, Flooring, Painting & Finishes**

IS:2394	:	Code of practice for application of lime Plaster finish
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:777	:	Glazed earthen tiles
IS:427	:	Distemper, dry, colour as required.
IS:2395	:	Code of practice for painting concrete, masonry and plaster surfaces.

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- IS:1477 : Code of practice for painting of ferrous Metals in buildings ad allied finishes.
- IS:2338 : Code of practice for finishing of wood based materials (Part-I)
- IS:2932: Specification for enamel, synthetic, exterior type-I
- IS:2933: Specification for enamel, synthetic, exterior type – II.
- IS:5410 Specification for cement paint, colour as required.
- Specification for chlorinated rubber for paints.

13.02 Doors, Windows, Ventilators, Glazing

- IS:4021-1983 - Specification for timber door, window And ventilator frames.
- IS:2202-1991(Part-I) - Specification for wooden flush door shutters (Solid Core Type)
- IS:1003(Part –1&II) - Specification for timber panelled and glazed shutters
- IS:4020-1992 - Methods of tests for wooden flush doors shutters.
- IS:4351-1976 - Specification for steel door frames.
- IS:1038-1983 - Specification for steel doors, windows and ventilators.
- IS:1081-1960 - Code of practice for fixing and glazing of metal (Steel and Aluminium)doors, windows and ventilators

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IS:5807 (Part I&IV)	-	Method of test for clear finishes for Wooden Furniture.
IS:2835-1987	-	Flat transparent sheet glass.
IS: 3548	-	Code of practice for glazing in building
IS:419	—	Putty for use on window frames.
IS:6248	—	Specifications for metal rolling shutters and rolling grills.

13.03 **Water Proofing, damp Proofing & Insulation**

IS:2645-1975	:	Specification for Integral Cement Water Proofing Compounds.
IS:3384-1986	:	Specification for bitumen primer for use In water proofing and damp proofing.
IS:1580-1991	:	Bituminous compounds for water proofing and caulking purposes.
IS:1322-1982	:	Specification for bitumen felts for water Proofing and damp proofing.
IS:1346-1991	:	Code of practice for water proofing of roofs with bitumen felts.
IS:7290-1979	:	Recommendation for use of Polyethylene film for water proofing of roofs.
IS:9918-1981	:	Code of Practice for in-situ water proofing And damp proofing treatment with glass fibre tissue reinforced bitumen.
IS:6598-1972	:	Cellular concrete for thermal insulation.

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14.00 **SAMPLING, TESTING AND QUALITY CONTROL**

14.01 **General**

- a) The Contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards and / or International Standards and shall conduct such tests as are called for by the Engineer. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted Engineering practice to the directions of the Engineer. Tests shall be done in the field and at a laboratory approved by the Engineer, the test results in triplicate within three days after completion of a test. The Engineer may, at his discretion, waive off some of the stipulations given below, for small and unimportant operations.
- b) Material / work found unsuitable for acceptance, shall be removed and replaced by the Contractor. The works shall be redone as per specification requirements and to the satisfaction of the Engineer.

14.02 **Quality Assurance Programme**

The Contractor shall submit and finalise a detailed Field Quality Assurance Programme within 15 days from the date of award of the Contract according to the requirements of the specification. This shall include setting up of a testing laboratory, arrangement of testing apparatus / equipment, deployment of qualified / experienced manpower, preparation of format for record, field quality plan etc. On finalized field quality plan, Owner shall identify, customer's hold points beyond which work shall not proceed without written approval from the engineer.

- 14.03 Frequency of sampling and testing including the methods for conducting the tests are given in the Table below. The testing shall be done at site. The testing frequencies set forth are the desirable

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minimum and the Engineer shall have the full authority to carry out or call for tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specifications. Some of the type tests and performance tests which are not included in the table shall be carried out at the manufacturer's premises or at an independent Government approved laboratory.

- 14.04 All masonry shall be built true and plumb within the tolerances prescribed as below. Care shall be taken to keep the perpends properly aligned.
- Deviation in verticality in total height of any wall of a building more than one storey in height shall not exceed ± 12.5 mm.
 - Deviation from vertical within a storey shall not exceed ± 6 mm per 3m height.
 - Deviation from the position shown on the plan of any brick work more than one storey in height shall not exceed 12.5mm.
 - Relative displacement between load bearing walls in adjacent storey's intended to be in vertical alignment shall not exceed 6 mm.
 - Deviation of bed joint from horizontal in any length up to 12m shall not exceed 6mm, and in any length over 12m it shall not exceed 12.5mm total.
 - Deviation from the specified thickness of bed joints, cross-joints or perpends shall not exceed +3mm.

TABLE
FREQUENCY OF SAMPLING AND TESTING

Sl. No.	Nature of Test / Characteristics	Method of Test	No. of samples and Frequency	Remarks
A	<u>Burnt clay bricks & Fly ash bricks</u>			

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Sl. No.	Nature of Test / Characteristics	Method of Test	No. of samples and Frequency	Remarks
	a) Dimensions	Relevant clause of IS: 1077 of burnt clay bricks and IS: 12894 for fly ash lime bricks.		Max. 8% deviation for non-modular bricks. For modular bricks as per clause no. 5.2 of IS: 1077. For face bricks as per IS: 2691. For fly ash lime bricks as per IS: 12894.
	b) Compressive strength	IS:3495 (Part-I)		As specified.
	c) Water absorption	IS:3495 (Part-II)	A set of 20 bricks (min) for each lot of 50,000 or part thereof for all test (a to c)	Max. 20%. However, 15% for face bricks only.
B.	Sand			
	a) General quality	Visual	One set of samples from each source of material per 100cum or part thereof.	As specified.
	b) Deleterious material	IS:2386 (Part-I & II)	One set of samples from each source of material per 100cum or part thereof.	Clause 3.3 of IS:2116

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Sl. No.	Nature of Test / Characteristics	Method of Test	No. of samples and Frequency	Remarks
	c) Grading	Sieve analysis as per IS:2386 (Part-I)	One set of samples from each source of material per 100cum or part thereof.	Table 1 of IS:2116
C.	Cement			
	a) Setting time	IS:4031	One set of samples for each lot of material received.	No separate testing is required in case cement is tested for preparation of concrete mix.
	b) Compressive strength	IS:4031	One set of samples for each lot of material received.	No separate testing is required in case cement is tested for preparation of concrete mix.
D.	Water			
	a) Harmful substances. PH value	IS:3015	Once a month for each source	No separate testing is required in case water is tested for concrete mix.
	b) Initial setting time	IS:4031	Once a month for each source	No separate testing is required in case water is tested for concrete mix.
	c) Compressive strength pH value	IS:516	Once a month for each source	No separate testing is required in case water is tested for concrete mix.
E.	Mortar			

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Sl. No.	Nature of Test / Characteristics	Method of Test	No. of samples and Frequency	Remarks
	a) Compressive strength	Appendix –A of IS:2250	One sample (Consisting of min. 3 specimens)	Table – 1 of IS:2250
	b) Consistency	Appendix – B of IS:2250	One sample for each type of mix	Clause 7.2 of IS:2250
	c) Water Retentivity	Appendix –C of IS:2250	One sample for each type of mix.	Clause 7.3 of IS:2250
F.	Masonry Construction			
	a)Workmanship	Visual & Physical measurement	All work	As per specification and Clause No. 11.0 of IS: 2212 for brick work.
	b) Verticality and alignment	Physical measurement	All work	As per specification and Clause No. 6.3.4 of IS: 1005.

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37.0	Clean Up
38.0	Sampling, testing & quality control

1.00 **GENERAL**

This part of specification covers the general requirements for concrete to be used on jobs using on-site production facilities including requirements in regard to the quality, handling, storage of ingredients, proportioning, batching, mixing and testing of concrete and also requirements in regard to the quality, storage, bending and fixing of reinforcement. This also covers the transportation of concrete from the mixer to the place of final deposit and the placing, curing, protecting, repairing and finishing of concrete.

2.00 **APPLICABLE CODES AND SPECIFICATIONS**

The following specifications, standards and codes of practice are made a part of this specification. All standards, codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as applicable on the date of opening of the Bids. In case of discrepancy between this specification and codes/standards those referred to herein, this specification shall govern.

2.01 **Indian Standard Codes for Material and its Test**

- 1) IS: 269 - Specification for ordinary, rapid hardening and low Heat Portland cement.
- 2) IS: 455 - Specification for Portland blast furnace slag cement.
- 3) IS: 1489 - Specification for Portland porozzolana cement.
(Part 1 & Part 2)
- 4) IS: 4031 - Methods of physical tests for hydraulic cement.
(Part 1 to Part 15)
- 5) IS: 650 - Specification for standard sand for testing of cement.
- 6) IS: 383 - Specification for coarse and fine aggregates from Natural sources for concrete.
- 7) IS: 2386- Methods of test for aggregates for concrete. (Party to VIII)
- 8) IS: 516- Method of test for strength of concrete.
- 9) IS: 1199 - Method of sampling and analysis of concrete.

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- 10) IS: 6909- Specification for Supersulphated Cement
- 11) IS: 12330- Specification for Sulphate resisting Portland Cement
- 12) IS: 3025- Methods of sampling and test (physical and chemical) water used in industry.
- 13) IS: 432 - Specification for mild steel and medium (Party & II) tensile steel bars and hard drawn steel wire for concrete reinforcement.
- 14) IS: 1566 - Specification for hard drawn steel wires (Party) fabric for concrete reinforcement.
- 15) IS: 1786- Specification for high strength deformed steel Bars and wires for concrete reinforcement.
- 16) IS: 4990- Specification for plywood for concrete shuttering Work.
- 17) IS: 2645- Specification for integral cement waterproofing Compounds.
- 18) IS: 6452 - Specification for high alumina cement for structural Use.
- 19) IS: 8112 Specification for Grade 43 ordinary Portland Cement.

2.02 Codes for Equipment

- 1) IS: 1791- Specification for batch type concrete mixers.
- 2) IS: 2438 - Specification for roller pan mixer.
- 3) IS: 2505 - Specification for concrete vibrators immersion type.
- 4) IS: 2506 - Specification for screed board concrete vibrators
- 5) IS: 2514 - Specification for concrete vibrating tables.
- 6) IS: 3366 - Specification for pan vibrators.

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- 7) IS: 4656 - Specification for form vibrators for concrete.
- 8) IS: 2722 - Specification for portable swing weighs batchers for concrete (single and double bucket type)
- 9) IS: 2750 - Specification for steel scaffoldings.

2.03 Codes of Practices

- 1) IS: 456 - Code of practice for plain and reinforced Concrete.
- 2) IS: 3370 - Code of Practice for Concrete Structures for the Storage of Liquids.
- 3) IS: 2502 - Code of practice for bending and fixing of bars for Concrete reinforcement.
- 4) IS: 2751 - Recommended practice for welding of mild steel bars used for reinforced concrete construction.
- 5) IS: 3558 - Code of practice for use of immersion vibrators for consolidating concrete.
- 6) IS: 3414 - Code of practice for design and installation of joints in buildings.
- 7) IS: 4014 - Code of practice for steel tubular (Party & II) scaffolding
- 8) IS: 2571 - Code of practice for laying inset cement concrete Flooring.
- 9) IS: 3558 - Code of practice for use of immersion vibrators for Consolidating concrete.

2.04 Codes on Construction Safety

- 1) IS: 3696-- Safety code for scaffolds and ladders. (Party & II)

3.00 GENERAL

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3.1 The Contractor shall furnish all labor, materials and equipment required for the construction of all concrete and associated work. All cement concrete, reinforced or plain shall conform to Indian Standard Code of Practice IS: 456-2000, with latest amendment, unless otherwise specified herein. The concrete mixes used in various civil works, including the minimum cement contents, shall be as specified in the Design Basis Report / Drawings of the respective work. The proportions of fine and coarse aggregate shall be determined in the field at the instance of the Engineer and at the cost and arrangement by the Contractor.

3.2 Minimum content of cement remaining unchanged, as specified above for each type of concrete mix, the proportion and quantities of local sand and aggregate are to be worked out and determined in the field/laboratory and tested for design strength. Any change in the source of aggregates will require the re-designing of the concrete mix for Engineer's approval.

3.3 Minimum member thickness of underground walls / rafts of basements / tunnels, unless otherwise specified elsewhere, shall be as follows:

Wall of depth from 0 - 5m:	200 mm
Wall of depth from 5 – 10m:	400 mm
Wall of depth from 10 – 15m:	600 mm
Base slab of underground basement, tunnel:	600 mm

3.4 The Engineer shall have the right to inspect the source of materials used, its storage and order for any tests found necessary. The work shall be carried out to the Engineer's satisfaction.

4.00 MATERIALS FOR STANDARD CONCRETE

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement/ Sulphate Resistant Cement (SRC), Special cement, clean sand, natural coarse aggregate, clean water, and admixtures.

4.01 Cement

4.01.01 Cement Grade 43 shall conform to IS: 8112. Cement shall be ordinary Portland cement and/or Sulphate Resistant Cement (SRC) in 50 Kg. Bags. The use of bulk cement will be permitted only with the approval of Engineer. Changing of brands or type of cement within the same structure or portions there of shall be permitted only with the approval of Engineer.

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Different type of cement shall not be mixed together. In case more than one type of cement is used in any work, a record shall be kept showing the location and the types of cement used.

4.01.02 Contractor will have to make his own arrangements for the storage of adequate quantity of cement. Cement bags shall be stored in a dry enclosed shed (storage under tarpaulins will not be permitted) well away from the outer walls (at least 450mm away) and insulated from the floor to avoid contact with moisture from ground and stacking shall be done about 150 mm to 200mm clear above the floor using wooden planks and in a row of two bags leaving at least 600mm space to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the Site. The storage bins and storage arrangements shall be such that there is no dead storage. Not more than ten (10) bags shall be stacked in any tier to avoid lumping of cement under pressure. The storage arrangement shall be approved by Engineer. Consignments of cement shall be stored as received and shall be consumed in the order of their delivery.

4.01.03 **Special Test Requirement**

Cement will be sampled at the work Site and tests will be made by the Contractor under the supervision of Purchaser at his expense. The Contractors will have to carry out the tests as regards conformity/suitability of cement with reference to IS: 269. Once cement is accepted by the Contractors and if the same is found to be unsuitable, all responsibility as regards unsuitability of cement with reference to IS stipulations shall be completely borne by the Contractors.

4.01.04 **Transportation of Cement**

The Contractor shall make his own arrangements for transporting the cement from Purchaser's stores, where the cement will be issued, to the work spot and for handling and storing the cement in good condition.

4.02 **REINFORCEMENT**

4.02.01 **Supply**

Reinforcement shall consist of any of the following types but shall conform to requirements shown on the drawing: -

- High Yield Strength Deformed bars Grade Fe 415/ Fe 500D conforming To IS: 1786.

-In the event corrosion resistant steel is specified in view of the corrosive environment, any of the following reinforcement or equivalent shall be used.

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2) SAIL –TMT – HCR-M (High Corrosion Reinforcement - Marine)

4.2.2 Storage

4.2.2.1 The reinforcement shall not be kept in direct contact with the ground but stacked on top of a platform made of timber sleepers or the like.

4.2.2.2 if the reinforcing rods have to be stored for a long duration, they shall be coated with cement before staking and/or be kept under cover or stored as directed by Engineer.

4.2.2.3 Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deterioration.

4.2.3 Quality

4.2.3.1 All steel used shall be of Grade I quality unless specifically permitted by Engineer. No rerolled material will be accepted. If demanded by Engineer, Contractor shall submit the manufacturer's test certificate for steel. Random tests on steel supplied by Contractor may be performed by Purchaser as per relevant Indian Standards. All costs incidental to such tests shall be at Contractor's expense. Steel not conforming to specifications shall be rejected.

4.2.4 Laps

Laps and splices for reinforcement shall be as per ARE: 456-2000. Splices in adjacent bars shall be staggered and the locations of all splices shall be approved by Engineer. The bars shall not be lapped unless the length required exceeds the maximum available lengths of bars at site.

4.2.5 Bending

4.2.5.1 Reinforcing bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done in cold and without damaging the bars. This is considered as a part of reinforcement bending fabrication work.

4.2.5.2 All bars shall be accurately bent. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and recent in a manner that will injure the material; bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25 mm in diameter, which may be bent hot if specifically approved by Engineer. No reinforcement shall be bent when in position

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in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used.

4.2.6 **Fixing**

4.2.6.1 Reinforcement shall be accurately fixed by any approved means and maintained in the correct position by the use of blocks, spacers and chairs as per I.S. 2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be securely bound together at all such points with 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bars in beams or similar members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.

4.2.7 **Cover**

4.2.7.1 Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish) shall be as follows:

- A. At each end of reinforcing bar, not less than neither 25 mm nor less than twice the diameter of the bar.
- b. For a longitudinal reinforcing bar in a column / pedestal, not less than 40 mm, nor less than the diameter of the bar. In case of columns of minimum dimension of 200mm. or under, with reinforcing bars of 12 mm a cover of 25 mm may be used.
- c. For longitudinal reinforcing bars in a beams / lintel, not less than 25 mm nor less than the diameter of the bar.
- d. For tensile, compressive, shear, or other reinforcement in a slab or wall not less than 20 mm, nor less than the diameter of such reinforcement.
- e. For any other reinforcement not less than 20 mm, nor less than the diameter of such reinforcement.
- f. For footings and other principal structural members in which the concrete is deposited directly against the ground, cover to the bottom reinforcement shall be 75 mm. If concrete is poured on a layer of lean concrete the bottom cover may be reduced to 50mm.

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- g. For concrete surfaces exposed to the weather or the ground after removal of forms, such as retaining walls, grade beams, footing sides and top, etc. not less than 50 mm for bars larger than 16mm dia. And not less than 40 mm for bars 16mm dia. or smaller.
- h. Increased cover thickness shall be provided, as indicated on the drawings, for surfaces exposed to the action of harmful chemicals (or exposed to earth contaminated by such chemical), acid, alkali, saline atmosphere, sulphurous smoke etc.
- i. For liquid retaining structures, the minimum cover to all steel shall be 40 mm or the diameter of the main bar, whichever is greater.
- j. For base raft, face in contact with earth or water for underground structures shall be 50 mm and inside face shall be 25 mm.
- k. Clear cover for underground RCC hoppers shall be 30 mm.
- l. Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coatings, as specified on the drawings. In such a case the extra cover mentioned in (h) above, may be reduced by Engineer to those shown on the drawings.
- m. The correct cover shall be maintained by cement mortar cubes or other approved means. Reinforcement for footings, grade beams and slabs on sub grade shall be supported on precast concrete blocks as approved by Engineer. The use of pebbles or stones shall not be permitted.
- n. The 28 days crushing strength of cement mortar cubes/precast concrete cover blocks shall be at least equal to the specified strength of concrete in which these cubes/blocks are embedded.
- o. The minimum clear distance between reinforcing bars shall be in accordance with IS: 456 or as shown in drawings.
- p. For retaining walls, grade beams, top and sides of footings and similar surfaces exposed to weather or ground, 50mm for bars larger than 16mm and 40mm for bars upto 16mm.

4.2.8 Inspection

Erected and secured reinforcement shall be inspected and approved by Engineer prior to placement of concrete.

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4.3

Aggregates

All aggregates shall conform to IS: 383. The natural aggregates shall be chemically inert, strong, hard, and durable, of limited porosity, free from adherent coatings, clay lumps, coal and coal residues and shall contain no organic or other admixtures that may cause corrosion of reinforcement or impair the strength or durability of the concrete. The limits of the content of deleterious materials in aggregate are indicated below: -

Limits of the content of Deleterious Materials*

Deleterious Aggregates Substances	Fine Aggregates		Coarse	
	Uncrushed	Crushed	Uncrushed	Crushed
Crushed				
Coal and Lignite	1.00	1.00	1.00	1.00
Clay lumps	1.00	1.00	1.00	1.00
Soft fragments	--	--	3.00	--
Material passing 75 micron IS sieve	3.00	3.00	3.00	3.00
Shale	1.00	--	--	--
Sum of Percentages	5.00	2.00**	5.00	5.00

* Percent by weight of aggregate.

**Sum of percentage of coal and lignite and clay lumps.

Approved natural sand and crushed stone for structural concrete and well washed, thoroughly cleaned and graded natural gravel, shall be used as aggregates for lean and backfill cement concrete. Representative samples of selected aggregates shall be tested at the Contractor's cost of sieve analysis from time to time as required by the Engineer for approval.

4.3.1

Storage of Aggregates

All coarse and fine aggregates shall be stacked separately in stock piles in the material yard near the work Site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign materials and earth during storage and while heaping the materials shall be avoided. The aggregate must be of specified quality not only at the time of receiving at Site but more so at the time of loading into mixer. Racers shall

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be used for lifting the coarse aggregates from bins or stockpiles. Coarse aggregate shall be piled in layers not exceeding 1.20 meters in height to prevent coning or segregation. Each layer shall cover the entire area of the stockpile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected material after remixing may be accepted, if subsequent tests demonstrate conformance with required gradation. After the completion of the piling of the aggregate up to the required height the piled aggregate shall be marked with time.

4.3.2 Specific Gravity

Aggregates having a specific gravity below 2.6 (saturated surface dry basis), except for aggregates to be used in lightweight concrete, shall not be used without special permission of engineer.

4.3.3 Size

The maximum size of aggregates shall generally be 20mm and as specified on drawing. However, for thick RCC members like rafts, etc. and for lean concrete provided as mud mat below structural concrete, maximum size up to 40mm may be used if so specified on drawings.

5.0 FINE AGGREGATES

Fine aggregate (sand) for RCC work shall be the best locally available clean, sharp, coarse sand preferably with a fineness modulus between 2.5 and 3.2 (Fineness modulus is the sum of cumulative percentages retained on the IS sieves given below for gradation divided by 100). The Contractor shall check and ensure that local sand will satisfy this requirement and if necessary shall include for and supply materials from other sources, which comply with the specification

The objectionable foreign matter in sand shall be removed by screening or washing or both as required.

5.1 Machine Made Sand

Machine made sand will be acceptable, provided the constituent rock/gravel composition shall be sound, hard, dense, non-organic, uncoated and durable against weathering.

5.2 Screening and Washing

5.3

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Sand shall be prepared for use by such screening or washing, or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions.

5.4 Foreign Material Limitations

5.5

The percentages of deleterious substances in sand delivered to the mixer shall not exceed the following:

	<u>Percent by Weight</u>	
	<u>Uncrushed</u>	<u>Crushed</u>
I. Material finer than 75 micron I.S. sieve	3.00	15.00
ii. Shale	1.00	-
iii. Coal and lignite	1.00	1.00
iv. Clay lumps	1.00	1.00
v. Total of all above substances including items (I) to (iv) for uncrushed sand and items (iii) and (iv) for crushed sand.	5.00	2.00

5.4 Gradation

Unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder:

I.S.Sieve Designation	<u>PERCENTAGE PASSING FOR</u>			
	<u>Grading Zone I</u>	<u>Grading Zone II</u>	<u>Grading Zone III</u>	<u>Grading Zone IV</u>
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600-micron	15-34	35-59	60-79	80-100
300-micron	5-20	8-30	12-40	15-50
150-micron	0-10	0-10	0-10	0-15

Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron I.S. Sieve, by total amount not exceeding 5 percent, it shall be regarded as falling within that grading zone.

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This tolerance shall not be applied to percentage passing the 600 micron I.S. Sieve or to percentage passing any other sieves size on the coarser limit of Grading Zone I or the finer limit of Grading Zone IV. Fine aggregates conforming to Grading Zone IV shall be used unless mix designs and preliminary tests have shown its suitability for producing concrete of specified strength and workability.

- 5.5 The grading and fineness modulus of sand shall be altered by Engineer depending upon the requirements, suitability and availability. The Contractor shall procure process and supply the sand at no extra cost to the Purchaser.

5.6 **Soundness**

The average loss of weight for sand after five (5) cycles and subjected to sodium sulphate accelerated soundness test as specified in IS: 2386 (Part 5) shall not be more than 10%.

6.0 **COARSE AGGREGATE**

Coarse aggregate for concrete, except as noted above and for other than light weight concrete shall conform to IS: 383-1970. This shall consist of natural or crushed stone and gravel, and shall be clean, and free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkali, mica, organic matter or other deleterious matter.

6.1 **Screening and Washing**

- 6.1.1 Natural gravel and crushed rock shall be screened and/or washed for the removal of dirt or dust coating, if so demanded by Engineer.

6.2 **Grading**

- 6.2.1 Coarse aggregate shall be whether in single size or grade, in both cases, the grading shall be within the following limits.

I.S.Sieve Designation	Percentage passing for single sized aggregate of nominal size					Percentage passing for Graded aggregate of nominal size			
	40mm	20mm	16mm	12.5mm	10mm	40mm	20mm	16mm	12.5mm
63mm	100	--	--	--	--	100	--	--	--
40mm	85 – 100	100	--	--	--	95 – 100	--	--	--
20mm	0 –	85 –	100	--	--	30 –	95 –	100	--

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I.S.Sieve Designation	Percentage passing for single sized aggregate of nominal size					Percentage passing for Graded aggregate of nominal size				
	20	100				70	100			
16mm	--	--	85 – 100	100	--	--	--	90 – 100	--	--
12.5mm	--	--	--	85 – 100	100	--	--	--	90 – 100	--
10mm	0 – 5	0 – 20	0 – 30	0 – 45	85 – 100	10 – 35	25 – 55	30 – 70	40 – 85	--
4.75mm	--	0 – 5	0 – 5	0 – 10	0 – 20	0 – 5	0 – 10	0 – 10	0 – 10	--
2.36mm	--	--	--	--	0 – 5	--	--	--	--	--

The grading of coarse aggregate shall in general conform to the grading as given in IS: 383. The exact grading of coarse aggregate for different items of cement concrete works shall be approved by Engineer from time to time based on the laboratory test. Such changes in the grading shall be carried out by Contractor at no extra cost.

6.2.2

The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale, if present, shall be only in such quantities that will not, in the opinion of Engineer, affect adversely the strength and/or durability of concrete. The maximum size of coarse aggregate shall be the maximum size specified above, but in no case greater than one fourth (1/4) of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of the form. Plums above 160 mm and up to any reasonable size can be used in plain mass concrete work of large dimensions up to a maximum limit of 20% by volume of concrete when specifically approved by Engineer. Plums shall be distributed evenly and shall be not closer than 150mm from the surface. For heavily reinforced concrete members, the nominal maximum size of the aggregate shall be 5mm less than the minimum clear distance between the reinforcing main bars or 5mm less than the minimum cover to the reinforcement whichever is smaller. The amount of fine particles occurring in the free state or as loose adherent shall not exceed 1% when determined by laboratory sedimentation tests as per IS: 2386.

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Should at any time the Engineer have reason to consider any aggregate defective or of poor quality, then irrespective of any previous approval or tests, representative samples of such materials shall be immediately tested and until the results of such tests prove the material to be satisfactory, it shall not be used for any work. The Contractor shall not be entitled to any claim of any nature on this account. The cost of these tests (including collection of samples and transportation) shall be borne by the Contractor.

6.3 Foreign Material Limitations

The percentages of deleterious substances in the aggregate delivered to the mixer shall not exceed the following:

	<u>Percent by Weight</u>	
	<u>Uncrushed</u>	<u>Crushed</u>
i. Material finer than 75 micron I.S. sieve	3.00	3.00
ii. Coal and lignite	1.00	1.00
iii. Clay lumps	1.00	1.00
iv. Soft fragments	3.00	-
v. Total of all the above substances	5.00	5.00

6.4 Crushing Value

The aggregate crushing value, when determined in accordance with IS: 2386 (Part-IV) shall not exceed forty five (45) percent for aggregate used for concrete other than for wearing surfaces and thirty (30) percent for concrete for wearing surfaces.

6.5 Impact Value

As an alternative to clause 6.4 the aggregate impact value may be determined in accordance with the method specified in IS: 2386 (Part IV). The impact value shall not exceed forty-five (45) percent by weight for aggregates used for concrete other than for wearing surfaces and thirty (30) percent by weight for concrete for wearing surfaces.

6.6 Abrasion Value

Unless otherwise agreed to between the Purchaser and the Supplier the abrasion value of aggregates, when tested in accordance with the method specified in IS: 2386 (Part IV), using Los Angeles Machine, shall not exceed the following values: -

A. For aggregates to be used Thirty (30)

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In concrete for wearing Surfaces. percent

B. For aggregates to be used in other concrete (structural) Forty five (45) percent.

7.0 WATER

7.1 Water used for both mixing and curing shall be free from injurious amounts of deleterious materials. Potable waters are generally satisfactory for mixing and curing concrete.

7.2 In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS: 456. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water. The PH-value of water to be used shall not be less than 6.

7.3 Average 28 day compressive strength of at least three 15 cm concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water.

7.4 The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than ± 30 minutes from the initial setting time of control test block prepared with the appropriate test cement and distilled water. The test blocks shall be prepared and tested in accordance with the requirements of I.S. 4031.

7.5 Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer may refuse to permit its use. The following concentrations represent the maximum permissible values:

	<u>Permissible limit</u>
1) Organic	200mg/lit.
2) Inorganic	3000mg/lit.
3) Sulphates (as SO ₄)	500mg/lit.

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4) Chlorides (as Cl)

2000 mg/lit.
For plain
work and 1000 mg/lit.
for concrete
reinforced cement
concrete work)

5) Suspended matter

2000 mg/lit.

8.0 CONTROLLED CONCRETE

All concrete in the works shall be "Controlled Concrete" as defined in I.S.456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8 or 1:5:10. The proportioning of concrete, the quantity of both cement and aggregates should be determined by weight. Cement shall be measured by weight but aggregates may be converted into their volumetric equivalent to facilitate work. Water should be either measured by volume in calibrated tank or by weight. All the measuring conditions and the accuracy may be periodically checked.

8.1 NOMINAL MIX CONCRETE

- Nominal mix concrete shall be used only for plain cement concrete works and where shown on drawings or specifically allowed by the Engineer. Such concrete shall not required preparation of trial mixes and all such concrete shall be mixed in a mechanical mixer. Proportions for nominal mix concrete shall be according to Table-9 of ARE: 456-2000. In addition standard proportion by volume shall be used wherever specified.
- In proportioning concrete, the cement shall be measured by (mass) weight. The quantities of fine and coarse aggregates may be determined by volume (for corresponding weight) but preferably by weight. If fine aggregates are moist, the amount of surface water shall be determined. Also an allowance shall be made for bulking in case of volume batching, in accordance with IS: 2386 (Part-III). Allowance shall also be made for surface water present in the aggregates, when computing the water requirement. All the above data shall be maintained properly, to the satisfaction of the Engineer.
- The recommended maximum water cement ratios are specified in Table-1.

TABLE -1
RECOMMENDED WATER CEMENT RATIO

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Nominal mix concrete	Quantity of water per 50kg of cement
1:5:10	60 liters
1:4:8	45 liters
1:3:6	34 liters
1:2:4	32 liters

- d) Nominal mix concrete 1:5:10 shall correspond to grade M5, 1:4:8 shall correspond to grade M7.5, 1:3:6 to grade M10 and 1:2:4 to grade M15 of IS: 456.
- e) If nominal mix concrete made in accordance with specified proportions does not yield the specified strength of the corresponding grade and fails to satisfy the requirements of “acceptance criteria of concrete” as specified in IS: 456, such concrete shall be treated in the following manner:
- In case the Engineer is satisfied that lower strength of concrete is attributed to material and workmanship of the Contractor, then such concrete shall be replaced by concrete of specified strength. The Engineer may, however, also accept such lower strength concrete but such lower strength concrete shall be classified as belonging to the appropriate lower grade proportion.
 - In case the Engineer is satisfied that lower strength of concrete is not attributable to the Contractor, he may direct in writing to increase the cement content to obtain specified strength at no extra cost of Owner. The use of richer mix shall be continued until the Engineer instructs otherwise.
- f) Nominal mix proportion shall not be classified as higher-grade proportion either on the ground that the test strengths are higher than the minimum specified strength at no extra cost to Owner. The use of richer mix shall be continued until the Engineer instructs otherwise.

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9.0 COMPRESSIVE STRENGTH OF THE CONCRETE

9.1 Minimum compressive strength of 15cm cubes shall be as follows: -

	Grade of Concrete	Preliminary test at twenty eight (28) days (N/mm ²)	<u>Work test</u>	
			at seven (7) days (N/mm ²)	At eight (28) days
(N/mm ²)				
	M15	20	12	15
	M20	26	18	20
	M25	32	20	25
	M30	-	-	30
	M35	-		
	-	35		

10.0 PRELIMINARY TEST

10.1 Test specimens shall be prepared with at least two different water/cement ratios for each class of concrete consistent with workability required for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregate and water necessary to produce concrete of required consistency and to give the specified strength. It shall be the Contractor's sole responsibility to carryout these tests. He shall furnish to the Engineer a statement of proportions proposed to be used for the various concrete mixes.

10.2 For the preliminary tests, the concrete shall be mixed by hand or in a small batch mixer as per IS: 516 in such a manner as to avoid loss of water. Each batch of concrete shall be of such a size as to leave about 10% excess concrete, after molding the desired number of test specimens.

10.3 The consistency of each batch of concrete shall be measured immediately after mixing by the slump test in accordance with IS: 1199. The concrete test cubes shall be molded by placing fresh concrete in the mould and compacted as specified in IS: 516. Curing shall be as specified in IS: 516. The compression tests of concrete cubes shall be carried out as per IS: 516 on fifteen (15) centimeter cubes.

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10.4 The strength shall be determined based on not less than five cube test specimens for each age and each water cement ratio.

10.5 The test results shall be accepted by Engineer if the average compressive strengths of the specimens tested are not less than the compressive strength specified for the age at which specimens are tested, subject to the condition that only one out of the five consecutive tests may give a value less than the specified strength for that age. Engineer may direct Contractor to repeat the tests if the results are not satisfactory and also to make such change as he considers necessary to meet the requirements specified. All these preliminary tests shall be conducted by Contractor at his own cost in an approved laboratory. All testing shall be carried out as per IS: 516.

10.6 Work test shall be performed according to the following schedule:
Six (6) cubes of 15cm sides for every 150 cubic meter of concrete or for a shift of eight hours of concreting; of which three (3) shall be tested at tested at seven (7) days and three (3) at twenty eight (28) days. Concrete shall be considered unsatisfactory if the average strength of three - 28 days' cubes is below the specified value. However, only one of the three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength. Samples shall be taken while concrete is being poured in the presence of representatives appointed by the Engineer.

11.0 **MIX DESIGN**

11.1 All the preliminary tests and all mix design work and testing of samples/cubes etc. shall be got done by the Contractor at his own cost. The Contractor shall make all arrangements for transportation of samples from quarry/workshop to laboratory; he shall be required to associate himself with Purchaser in evolving the required design mixes by assigning the job to a qualified engineer under his employment.

12.0 **MIXING OF CONCRETE**

Cement, sand and crushed stone shall be measured by weight as directed by the Engineer-in-Charge; the components of the concrete shall be batched in such a way that each batch contains a whole number of cement bags. Concrete shall be mixed in concrete mixers of a size and type previously certified acceptable to the Engineer. Concrete shall be mixed in the machine for at least one (1) minute dry and for at least one and a half minutes after adding water. Mixed concrete shall be of even color and uniform consistency.

12.01.1 Concrete shall be mixed only in such quantities as are required for immediate use. No more concrete shall be mixed in any one lot than that can

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be laid in position before the 'initial setting' occurs. Partly set or re-tampered concrete shall not be used. After the finish of each day's work the mixing plats shall be thoroughly washed and cleaned. On commencing work, the first batch shall have 10% additional cement.

12.01.2 The mixer and weigh batchers shall be maintained in a clean, serviceable condition. The accuracy of weigh batchers shall be periodically checked. They shall be set up level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately. Volume batching will not be permitted. All concrete shall be mixed in mechanically operated batch mixers complying with IS: 1791 and of approved make with suitable provision for directly controlling the water delivered to the drum.

12.01.3 The water cement ratio to be adopted shall be determined in each case by the Contractor as frequently as desired by the Engineer-in-Charges and shall be approved by him.

12.2 Consistency and workability of Concrete

Consistency and workability of concrete shall be checked by measuring the slump of a truncated cone of concrete straight from the mixer under normal working conditions. The conical mould shall be of metal, 300mm high and 100mm and 200mm in diameter at top and base respectively.

12.2.1 Moulds shall be prepared by the Contractor. The slump range of concrete shall be as mentioned below.

12.2.2 Slump tests shall be performed as per IS:1199 at intervals established by the Engineer at the Contractor's cost in such a way as to check that the degree of consistency established by the Engineer for work in progress is maintained. The table below gives the general slump range to be followed for various types of construction unless otherwise shown on drawings of instructed by the Engineer.

SLUMP FOR VARIOUS TYPES OF CONSTRUCTION

Various types of Construction	Slump mm	
	Max.	Min.
Reinforced foundation walls and footings.	80	35
Plain footings & Sub-structure walls	75	35

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Slabs, beams & Reinforced walls	100	50
Pumps & other Misc. equipment foundation	75	35
Heavy Mass Construction	50	35

12.03 **Compaction Factor Test**

The workability test by means of compaction factor tests as per IS: the Contractor at his cost shall also carry out 1199.

12.04 **Batching and Mixing of Concrete**

The material and proportions of concrete materials as established by the preliminary tests for the mix design shall be rigidly followed for all concrete on the Project and shall not be changed except when specifically permitted by Engineer.

12.04.1 Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batchers shall be maintained in clean, serviceable condition. The accuracy of weigh batchers shall be periodically checked.

13.0 **SAMPLING AND TESTING CONCRETE IN THE FIELD**

Facility required for sampling materials & concrete in the field shall be provided by Contractor without any extra cost and the tests shall be got done by the Contractors at his own expense. The following equipment with operator shall be made available at Engineer's request (all must be in serviceable condition):

1. Concrete cube testing machine suitable for 15 Cm. cubes of 100 Tones capacity With proving calibration ring.	1 No.
2. Cast iron cube moulds 15 cm size	6Nos. (Min)
3. Slump cone complete with tamping rod	1 set
4. Laboratory balance to weigh up to 5 Kg. with sensitivity of 10 Gm.	1 No.
5. IS sieves for coarse and fine aggregates	1 set
6. A set of measures from 5 to 0.1	1 set
7. Electric oven with thermostat up to 120 Deg.C	1 No.

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8.	Flakiness gauge	1 No.
9.	Elongation index gauge	1 No.
10.	Sedimentation pipette	1 No.
11.	Pycnometer	1 No.
12.	Calibrated glass jar I liter capacity	2 Nos.
13.	Glass flasks & metal containers	as required
14.	Chemical reagents like sodium hydroxide, tannic acid, litmus papers etc.	as required
15.	Laboratory balance of 2 Kg. capacity	1 No. and of sensitivity of 1 gm.

14.0 **ADMIXTURES**

14.1 **General**

Admixtures shall be supplied by Contractor. Admixtures may be used in concrete only with the approval of Engineer based upon evidence that, with the passage of time, neither the compressive strength nor its durability reduces. Calcium chloride shall not be used for accelerating setting of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1-1/2 percent of the weight of the cement in each batch of concrete. When the admixtures are used the designed concrete mix shall be corrected accordingly. ISI mark Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer.

- 14.1.1 To minimize the deterioration of concrete from harmful chemical salts, the levels of such salts in concrete coming from the concrete materials i.e. cement aggregates, water and admixtures as well as by diffusion from the environments should be limited. Generally the total amount of chlorides (as Cl) and the total amount of soluble sulphates (as SO₃) in the concrete at the time of placing should be limited to 0.15 percent of mass of cement and 4 percent by mass of cement respectively.

14.2 **Air Entraining Agents**

Neutralized Vinsol Resin or any other approved air entraining agent may be used to produce the specified amount of air in the concrete mix and

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these agents shall conform to the requirements of ASTM standard 6-260; Air Entraining Admixtures for concrete. The recommended total air content of the concrete is 4% ($\pm 1\%$). The method of measuring air content shall be as per IS: 1199.

14.3 **Water Reducing Admixtures**

Water reducing lingo sulfonate mixture shall be added in quantities specified by Engineer. The admixtures shall be added in the form of a solution.

14.4 **Retarding Admixtures**

Where specified and approved by Engineer, retarding agents shall be added to the concrete mix in quantities specified by Engineer.

14.5 **Water Proofing Agent**

Where specified and approved by Engineer, ISI marked water proofing agent conforming to IS: 2645, shall be added in quantities specified by Engineer.

14.6 **Other Admixtures**

Engineer may at his discretion instruct Contractor to use any other admixture in the concrete.

15.0 **LOAD TEST ON MEMBERS OR ANY OTHER TESTS**

15.1 In the event of any work being suspected of faulty material or workmanship or both, Engineer requiring its removal and reconstruction may order, or Contractor may request that it should be load tested in accordance with the following provisions:

15.2 The test load shall be 125 percent of the maximum super-imposed load for which the structure was designed. Such test load shall not be applied before 28 days after the effective hardening of concrete. During the test, struts strong enough to take the whole load shall be placed in position leaving a gap under the members. The test load shall be maintained for 24 hours before removal.

15.3 If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 per cent of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a

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lapse of at least 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 80 percent of the maximum deflection shown during the second test. If the structure is certified as failed by the Engineer, the cost of the load test shall be borne by the Contractor.

- 15.4 Any other tests, e.g. taking out in an approved manner concrete cores, examination & tests on such cores removed from such parts of the structure as directed by Engineer, ultrasonic testing etc. shall be carried out by Contractor if so directed. If the tests show unsatisfactory results due to reasons attributable to Contractor the cost of such tests shall have to be borne by Contractor, otherwise such costs will be borne by Purchaser.

15.5 **Unsatisfactory Tests**

Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by Engineer/Purchaser. Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfill the test conditions is proved to be solely due to faulty design.

16.0 **PREPARATION PRIOR TO CONCRETE PLACEMENT, FINAL INSPECTION AND APPROVAL**

- 16.1 Before the concrete is actually placed in position, the insides of the formwork shall be inspected to see that they have been cleaned and oiled. Temporary opening shall be provided to facilitate inspection, especially at bottom of columns and wall forms, to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/holes shall be later suitably plugged.
- 16.2 The various trades shall be permitted ample time to install drainage and plumbing lines, floor and trench drains, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embedment's to be cast in the concrete as is necessary for the proper execution of the work. Contractor shall cooperate fully with all such agencies, and shall permit the use of scaffolding, form work etc., by other trades at no extra cost.
- 16.3 All embedded parts, inserts etc. supplied by Purchaser or Contractor shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete. Inserts etc. will

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have to be welded to reinforcement, if required, to keep them in position, as directed by Engineer.

16.4 All anchor bolts shall be positioned and kept in place with the help of properly manufactured templates unless specifically waived in writing by Engineer. The use of all such templates, fixtures etc. shall be deemed to be included in the rates.

16.5 Slots, openings, holes, pockets etc. Shall be provided in the concrete work in the positions as directed by Engineer.

16.6 Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.

16.7 Prior to concrete placement all work shall be inspected and approved by Engineer and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected at Contractor's cost.

16.8 Approval by Engineer of any and all materials and work as required herein shall not relieve Contractor from his obligation to produce finished concrete.

16.9 **Rain or Wash Water**

No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rains, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no other concrete shall be placed thereon until such water is removed. To avoid flow of water over/around freshly placed concrete, suitable drains and sumps shall be provided.

16.10 **Bonding Mortar**

Immediately before concrete placement begins, prepared surfaces except formwork which will come in contact with the concrete to be placed, shall be covered with a bonding mortar as specified in this section.

17.0 **TRANSPORTATION**

17.1 All buckets, containers or conveyors used for transporting concrete shall be mortar tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for

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transport of concrete without the written permission of Engineer and concrete shall not be remanded before placing.

17.2 Retendered or Contaminated Concrete

Concrete must be placed in its final position before it becomes too stiff to work. On no account, water shall be added after the initial mixing. Concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by Engineer.

18.0 PROCEDURE FOR PLACING OF CONCRETE

18.1 Engineer's Approval for Equipment and Methods

Before any concrete is placed, the entire placing programmed, consisting of equipment layout, proposed procedures and methods shall be submitted to Engineer for approval if so demanded by Engineer and no concrete shall be placed until Engineer's approval has been received. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job and placement location.

18.2 Time Interval Between Mixing and Placing

Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer, and once compacted it shall not be disturbed.

18.3 Avoiding Segregation

Concrete shall, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be remanded or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, Contractor shall provide suitable drop and "Elephant Trunks" to confine the movement of concrete. Special care shall be taken when concrete is dropped from a height, especially if reinforcement is in the way, particularly in columns and thin walls.

18.4 Placing by Mechanical Equipment

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- 18.4.1 The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved.

The control of placing shall begin at the mixer discharge. Concrete shall be discharged by a vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in its final position.

18.4.2 **Concrete in Layers**

Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 to 30 cm as directed by Engineer. These shall be placed as rapidly practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones into mortar rather than mortar on to stones. Such a condition shall be corrected by redesign of mix or other means, as directed by Engineer.

18.4.3 **Bedding of Layers**

The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

18.4.4 **Vibration**

Concrete shall be compacted during placing, with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution exercised not to over vibrate the concrete to the point that segregation results. Concrete to be vibrated shall be placed in level layers of suitable thickness not greater than the effective length of the vibrator needle. The concrete at the surface shall be

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distributed as horizontally, as possible; the vibration shall not be done in the neighborhood of slopes. The internal vibrator shall not be used to spread the concrete for filling. It is advisable to deposit concrete well in advance of the point of vibration. When the concrete is being continuously deposited to a uniform depth along a member, vibrator shall not be operated too near to the free end of the advancing concrete, usually not within 1.20 meters of it. Every effort shall be made to keep the surface of the previously placed layer of concrete alive so that the succeeding layer can be amalgamated with it by vibration process. The concrete shall be placed in shallow layers consistent with the method being used to place and vibrate the concrete. Usually concrete shall be placed in thickness not more than 300mm and on initial placing in thickness not more than 150mm.

18.4.5 **Type of Vibrators**

Vibrators shall conform to IS Specifications. Type of vibrator to be used shall depend on the structure where concrete is to be placed. Shutter vibrators to be effective, shall be firmly secured to the form work which must be sufficiently rigid to transmit the vibration and strong enough not to be damaged by it. Immersion vibrators shall have "no load" frequency, amplitude and acceleration as per I.S. 2505 depending on the size of the vibrator. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.

18.4.6 **Use of Vibrators**

The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly usually at the rate of 75 mm per second. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of a lift e.g. in a column or wall.

18.4.7 **Melding Successive Batches**

When placing concrete in layers, which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the succeeding layers.

18.4.8 **Penetration of Vibrator**

The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic up to a

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depth of 10 to 20mm to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

18.4.9 **Stone Pockets and Mortar Pond ages**

The formation of stone pockets or mortar pond ages in corners and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding, as directed by Engineer?

18.5 **Placement Interval**

Except when placing with slip forms, each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete and before the start of a subsequent placement.

18.6 **Special Provision in Placing**

When placing concrete in walls with openings, in floors of integral slab and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slab, as the case may be. Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined by Engineer.

18.7 **Placing Concrete Through Reinforcing Steel**

When placing concrete through reinforcing steel, care shall be taken to prevent segregation of the coarse aggregate. Where the congestion of steel makes placing difficult, it may be necessary to temporarily move the top steel aside to get proper placement and restore reinforcing steel to design position.

18.8 **Bleeding**

Bleeding or free water on top of concrete being deposited into the forms, shall be a cause to stop the concrete pour and the conditions causing this defect corrected before any further concreting is resumed.

19.0 **CONSTRUCTION JOINTS AND KEYS**

19.1 Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made where the work is stopped. The concrete shall be rebated and/or keyed at the Joint to such shape and size as may be

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required by the Engineer. Joints shall be either vertical or horizontal. In case of an inclined or curved member, the joint shall be at right angles to the axis of the member. Vertical joints shall be formed against a stop board; which are rigidly fixed and slotted to allow for the passage of the reinforcing steel, horizontal joints shall be level and wherever possible, arranged so that the joint lines coincide with the architectural features of the finished work. Battens shall be nailed to the form work so as to ensure a horizontal line and if directed, shall also be used to form a grooved joint. Horizontal and vertical construction joints and shear keys shall be located and shall conform in detail to the requirements of the plans unless otherwise directed by Engineer.

19.2 **Locations Of Joints:**

Construction joints shall be located as shown or described on the drawings. Where it is not described, the joints shall be in accordance with the following guidelines.

- i) In a column, the joints shall be formed about 75mm below the lowest soffit of the beams framing into it, including haunches, if any. In flat slab construction, the joint shall be 75mm below the soffit of the column capital.
- ii) Concrete in a beam shall be placed throughout without a joint. If unavoidable, the joint shall be vertical and within the middle-third of the span. When a beam intersects a girder, the joints in the girder shall be given an offset equal to a distance twice the width of the beam and additional reinforcement provided for shear. The joints shall be vertical throughout the full thickness of the concrete member with suitable shear key wherever shown on the drawing.
- iii) A joint in a suspended floor slab shall be vertical at one-quarter points of the span and at right angle of the principal reinforcement.
- iv) Construction joints in equipment foundations shall not be provided without specific concurrence of the Engineer.
- v) Vertical construction joints in equipment foundations shall not be provided without specific concurrence of the Engineer.
- vi) Vertical construction joints in water retaining structures shall not be permitted unless shown on the drawings.

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However, if the Contractor desires any adjustments in the location of construction joints (to suit site conditions) from those shown on drawings or from those explained above, he shall obtain prior approval from the Engineer.

19.3 **Dowels**

Dowels for concrete work, not likely to be taken up in the near future, shall be wrapped in tar paper and burlap.

19.4 **Mass Foundations**

Mass foundations shall be poured in lifts not exceeding 1.5 m in height unless otherwise indicated on the drawings or approved by Engineer.

20.0 **TREATMENT OF CONSTRUCTION JOINTS ON RESUMING CONCRETING**

A drier mix shall be used for the top lift of horizontal pours to avoid laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing/hacking and surface washed.

Just before concreting is resumed, the roughened joint surface shall be thoroughly cleaned and loose matter removed and then treated with a thin layer of cement grout of proportion specified by Engineer and worked well into the surface. The new concrete shall be well worked against the prepared face before the grout mortar sets. Special care shall be taken to obtain thorough compaction and to avoid segregation of the concrete along the joint plane.

20.1 **Expansion and Contraction Joints**

Provision shall be made for expansion and contraction in concrete by use of special type joints located suitably. The bitumen impregnated fiber board shall be used as joint filler which shall fill space between the concrete surfaces at the joints. The minimum thickness shall be 12mm and the material shall conform to IS: 1838.

21.0 **CURING, PROTECTING, REPAIRING AND FINISHING**

21.1 **Curing**

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21.01.1 All concrete shall be cured by keeping it continuously damp for the period of required time for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays, of pounded water, continuously saturated coverings of sacking, canvas, hessian or other absorbent materials, or approved effective curing compound applied with spraying equipment capable of producing a smooth, even-textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter. The quality of curing water shall be the same as that used for mixing concrete.

21.01.2 Certain types of finish or preparation for overlaying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.

21.01.3 Curing of concrete made of high alumina cement and supersulphated cement shall be carried out as directed by Engineer.

21.02 **Curing with Water**

Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete, following a lapse of 12 to 14 hours after laying concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately after the concrete has hardened. Water shall be applied to unformed concrete surfaces within one (1) hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

21.03 **Continuous Spraying**

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose, sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Engineer.

21.04 **Alternate Curing Methods**

21.04.1 Whenever, in the judgment of Engineer, it may be necessary to omit the continuous spray method, a covering of clean sand or other approved means such as wet gunny bags which will prevent loss of moisture from the concrete may be used. No type of covering will be approved which would stain or damage the concrete during or after the curing period. Covering shall be kept continuously wet during the curing period.

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21.05 **Curing Equipment**

All equipment and materials required for curing shall be on hand and ready for use before concrete is placed.

21.06 **Concrete for Equipment or Steel Structures Foundations**

21.06.1 Concrete for equipment foundation, whether principal or auxiliary, shall be poured continuously so that the structure becomes monolithic, particular care being exercised to see that the base slabs, if any, are of compact impervious construction. Tunnels, passages apertures and so forth shall be provided in accordance with the drawings for the installation of mechanical and electrical equipment, pipes or cables. The top elevation of the equipment foundations or parts shall be accurately cast to 20/50mm (or more as may be specified on the drawings) above the level required for grouting and it shall be pneumatically chiseled off and well roughened just prior to the erection of the equipment concerned. All embedded anchor bolts or bolt sleeves shall be accurately and firmly set with the aid of approved templates, steel supports and/or other accessories. For holding the embedded bolts or sleeves in the correct position during concreting, template shall have to be of steel of suitable section approved by the Engineer. Two (2) sets of templates shall have to be provided, one to hold the bottom and the other the top of the bolts or sleeves. The bottom template shall be securely and rigidly fixed by providing anchorage arrangement and by welding to the lowest part of the steel reinforcement and other structural supports. The top templates shall be securely fixed by tying with guy wires and turn buckle arrangement to firm and rigid adjoining structures and staging's.

21.06.2 Bolt pockets, where required, shall be cast with wooden taper wedges. These shall be withdrawn at an appropriate time when the concrete has set, the pockets cleaned roughened and then covered or blocked thoroughly to prevent debris getting into these. The exposed portions of bolts and embedded parts shall be kept well greased and adequately protected from damage throughout construction. Any damages found shall have to be corrected at the Contractor's cost. The Purchaser shall have the right to use the foundations, pads, piers, slabs, floors and all concrete work as needed for other works or equipment erected prior to its 'Taking Over'.

21.07 **Jointing with Adjacent Works**

The Contractor shall bond new work to adjacent completed work, as shown in the drawing or as directed, by chipping, cutting or drilling of old concrete, by embedding new dowels in old concrete, or by exposing and

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cleaning the reinforcement of the old structure and lapping/welding new reinforcement to obtain continuity. All precautions as specified for preparing construction joints shall also be taken for this work.

21.08 **Concreting in Too Hot Weather**

All concrete work performed in hot weather shall be in accordance with IS: 456. Concrete shall not normally be placed when the atmospheric temperature exceeds 40 degrees centigrade in the open. If, in spite of programming concrete work in the cooler hours of early morning, evening or night placement is necessary in too hot a weather, then the Contractor shall take the following other precautions:

- Admixtures may be used only when approved by Engineer.
- Stock-pile aggregates in shade.
- Do not use fresh factory hot cement.
- Use cold water/crushed ice.
- Cool formwork by sprinkling water without collecting water inside.
- Reduce to minimum the time interval between mixing and placing.
- Place, vibrate and finish as quickly as possible.
- Initiate curing as soon as concrete hardens.

21.09 **Concrete in Cold Weather**

Special precautions specified in IS: 456 shall be taken, should concreting be necessary when atmospheric temperature in the open is below five (5) degrees centigrade.

21.10 **Protecting Fresh Concrete**

Fresh concrete shall be protected from the elements, from defacements and damage due to construction operations by leaving forms in place for an ample period as specified later in this specification. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by Engineer shall also be taken to protect immature concrete from damage by debris, excessive loading, vibration, abrasion or contact with other materials etc. that may impair the strength and/or durability of the concrete. Workmen shall be warned against

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and prevented from disturbing green concrete during its setting period. If it is necessary that workmen enter the area of freshly placed concrete, Engineer may require that bridges be placed over the area.

21.11 **Repair and Replacement of Unsatisfactory Concrete**

21.11.1 Immediately after the shuttering is removed, the surface of concrete shall be very carefully gone over and all defective areas called to the attention of Engineer who may permit patching of the defective areas or also reject the concrete unit either partially or in its entirety. Rejected concrete shall be removed and replaced by Contractor at no additional expense to Purchaser. Holes left by form bolts etc. Shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing 4.75 mm I.S. Sieve after removing any loose stones adhering to the concrete. Mortar filling shall be struck off flush at the face of the concrete. Concrete surfaces shall be finished as described under the particular items of work.

21.11.2 Superficial honeycombed surfaces and rough patches shall be similarly made good immediately after removal of shuttering, in the presence of Engineer and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by Engineer, the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities, care being taken to avoid damaging the surface. Surface irregularities shall be removed by grinding.

21.11.3 If reinforcement is exposed or the honey combing occurs at vulnerable positions e.g. ends of beams or columns it may be necessary to cut out the member completely or in part and reconstruct. The decision of Engineer shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25 mm) the edges being cut perpendicular to the affected surface or with a small undercut if possible. Anchors, tees or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place. An area extending several centimeters beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

21.12 **Use of Epoxy**

The use of epoxy for bonding fresh concrete used for repairs will be permitted upon written approval of Engineer. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

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21.13 **Method of Repair**

21.13.1 Small size holes having surface dimensions about equal to the depth of the hole, holes left after removal of form bolts, grout insert holes and slots cut for repair of cracks shall be repaired as follows. The holes to be patched shall be roughened and thoroughly soaked with clean water until absorption stops. A 5 mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched, followed immediately by the patching concrete which shall be well consolidated with a wooden float and left slightly proud of the surrounding surface. The concrete patch shall be built up in 10 mm thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and a smooth finish obtained by wiping with hessian, a steel trowel shall be used for this purpose. The mix for patching shall be of the same materials and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible.

21.13.2 Mortar filling by air pressure (uniting) shall be used for repair of areas too large and/or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the color and texture of the surrounding concrete. White cement shall be substituted for ordinary cement, if so directed by Engineer, to match the shade of the patch with the original concrete.

21.14 **Curing of Patched Work**

The patched area shall be covered immediately with an approved non staining, water saturated material such as gunny bags which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by a fine spray or sprinkling for not less than 10 days.

21.15 **Approval by Engineer-in-Charge**

All materials, procedures and operations used in the repair of concrete and also the finished repair work shall be subject to the approval of Engineer. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and dried.

21.16 **Finishing**

This specification is intended to cover the treatment of concrete surfaces of all structures.

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21.16.1 **Finish for Formed Surfaces**

The type of finish for formed concrete surfaces shall be as follows, unless otherwise specified by the Engineer.

For surfaces against which backfill or concrete is to be placed, no treatment is required except repair of defective areas.

For surfaces below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper application of the waterproofing material which is specified for use.

Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repair of damaged or defective concrete, removal of fins and abrupt irregularities, filling of holes left by form ties and rods and clean up of loose or adhering debris.

21.16.2 **Standard Finish for Exposed Concrete**

The standard finish for exposed concrete shall be a smooth finish.

A smooth finish shall be obtained with the use of lined or plywood forms having smoothed and even surfaces and edges. Panels and form linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections, etc. removed leaving the surfaces reasonably smooth and unmarred.

21.16.3 **Integral Cement Concrete Finish**

Integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded, as per I.S. 2571. The surface shall be compacted and then floated with a wood float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or toweling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

21.16.4 **Rubbed Finish**

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A rubbed finish shall be provided only on exposed concrete surfaces. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, offsets leveled and voids and/or damaged sections immediately saturated with water and repaired by filling with a concrete or mortar of the same composition as was used in the surface. The surfaces shall then be thoroughly wetted and rubbed with carborundum or other abrasive. Cement mortar may be used in the rubbing, but the finished surfaces shall not be brush coated with either cement or grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

21.16.5 **Protection**

All concrete shall be protected against damage until final acceptance by Engineer/Purchaser.

22.0 **FORMWORK**

All formwork shall be made mortar proof and sufficiently strong and well anchored to withstand the loads they have to bear without any distortion. Before constructing forms, the Contractor, if required, shall submit detailed drawings and design, wherever necessary in critical areas of proposed formwork for examination by the Engineer. Safety against buckling of any member shall be investigated in all cases. If such drawings are not satisfactory to the Engineer, the Contractor shall make such changes as may be required prior to start of the work. The Engineer's approval of the drawings as submitted, or as corrected shall in no way relieve the Contractor of his responsibility for adequately designing, constructing and maintaining forms and the safety of formwork so that they will function properly under applicable conditions of work.

The formwork shall consist of shores, bracings, sides of beams and columns of slabs etc. Including ties, anchors, hangers, inserts etc. complete which shall be properly designed and planned for the work. False work shall be so constructed that vertical adjustments can be made to compensate for take up and settlements. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment or dismantling of the formwork.

22.01 **Design of Formwork**

22.01.1 The design and engineering of the formwork as well as its construction shall be the responsibility of Contractor. If so instructed, the drawings and/or calculations for the design of the formwork shall be submitted to Engineer

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for approval before proceeding with work, at no extra cost to Purchaser. Engineer's approval shall not however relieve Contractor of the full responsibility for the design and construction of the form work. The design shall take into account all the loads vertical as well as lateral, that the forms will be carrying including live and vibration loadings.

- 22.01.2 The vertical loads assumed shall consist of the dead load plus allowance for live load. The weight of formwork together with weight of freshly placed concrete is considered dead load. The live load consists of the weight of workmen, equipment, runways, and impact and will be taken as not less than 400 kg/m² of horizontal projection.
- 22.01.3 Forms, ties, and bracing must be designed for a lateral pressure of fresh concrete of maximum of 10 to 15 tones/m² unless higher loads are likely to occur in any special cases as may be specified on the drawings. Braces and shores must be designed to resist all possible lateral loads such as wind, cable tensions inclined supports, dumping of concrete, and starting and stopping of equipment. In no case should the assumed value of lateral load due to wind, dumping of concrete and equipment acting in any direction at each floor line be less than 150 kg/meter of floor edge or two (2) percent of total dead load of the floor, whichever be greater. Wall forms should be designed for maximum wind load at least 50kg/m² and bracing for wall forms shall be designed for a lateral load of at least 150 kg/meter of wall applied at the top.
- 22.01.4 The formwork must be designed for any special conditions of construction likely to occur, such as unsymmetrical placement of concrete, impact of machine delivered concrete, uplift, and concentrated load. Imposition of construction load on the partially completed structure shall not be allowed.
- 22.01.5 A design analysis will not be required for formwork for structures less than five (5) meters in height if all loads are transmitted directly to the ground by vertical supports. However, safety against buckling of any member shall be investigated in all cases. For heavy construction and for all other cases, design analysis shall be made and got approved by the Engineer. The formwork system shall be designed to transfer all lateral loads to the ground in such a manner as to ensure safety at all times. Diagonal bracing shall be provided in vertical and horizontal planes were required to provide stiffness and to prevent buckling of individual members.
- 22.01.6 Before constructing forms, the Contractor, if required, shall submit detailed drawings of proposed formwork for examination by the Engineer. If such drawings are not satisfactory to the Engineer, the Contractor shall make such changes as may be required prior to start of work. Although the

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Contractor shall be responsible for the design, construction and safety of formwork, the formwork design shall be subject to the approval of the Engineer. The Engineer's approval of the drawings as submitted, or as corrected in no way shall relieve the Contractor of his responsibility for adequately construction and maintaining the forms so that they will function properly under applicable conditions of work including emergent conditions.

- 22.01.7 The internal dimensions of the forms shall conform precisely to the structure to be built; they shall have smooth surfaces and their corners shall be rounded with 20mm side triangular wooden stats, unless otherwise specified on drawings. Forms shall be sufficiently rigid to hold without distortion the fresh concrete, the vibrations ensuing from transit and distribution of the concrete, with a minimum factor of safety of 2.0.
- 22.01.8 Beam forms shall be provided with ties to avoid horizontal distortion; formwork for columns shall be reinforced with square braces and those of considerable cross-section or height shall be bound with spirals of twisted wire.
- 22.01.9 All forms shall be generously nailed; boards for slab work shall have at least two (2) nails on such supporting tiered. Boards shall be of uniform thickness; edges shall be at right angles and smooth for easy jointing.
- 22.01.10 the number of supports shall be such as to safely support the loads specified; the Engineer may demand that their number be increased whenever it is considered necessary. A load spreading plate shall be placed on the top of the supports; their base shall rest on a dual wooden wedge arrangement.
- 22.01.11 Prior to the concreting and after concreting, the exposed surfaces of the shuttering or moulds shall be cleaned of all adhering concrete before depositing of fresh concrete. Details of construction joints shall be arranged so that a 'Starter' is provided to which the forms for the next pour can be tightly clamped and suitable baulking shall be used to prevent leakage of grout from the concrete.
- 22.01.12 Wherever concreting of narrow members is required to be carried out within forms of considerable depth temporary openings in the sides of the forms shall, if so directed by the Engineer, be provided to facilitate the pouring and consolidation of concrete.
- 22.01.13 Small temporary openings shall be provided if necessary at the bottom of forms for columns and beams to permit the expulsion of rubbish etc.

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Shuttering must be used for all slopes exceeding 15 degrees to the horizontal, to enable the concrete to be properly rammed.

- 22.01.14 No load shall be put or any weight suspended from slabs, for one month after casting and temporary props shall be left in for the support of the under-side of slabs, beams etc. for as long as is reasonably practicable after stripping of shuttering.
- 22.01.15 No shuttering or temporary props shall be removed without permission being obtained from the Engineer and being recorded in the Contractor's Log Book under the Engineer's signatures.
- 22.01.16 Form stripping shall be performed slowly and gradually. No shuttering or temporary props shall be removed without permission being obtained from the Engineer and being recorded in the Contractor's Log Book under the Engineer's signatures.
- 22.01.17 the form work in contact with concrete shall be clean and well coated with mould oil. Mould oil used shall be insoluble in water. No staining and not injurious to concrete. It shall not become flaky or be removed by water.

22.2 Tolerances

Tolerance is specified permissible variation from lines, grade or dimensions. No tolerances specified for horizontal or vertical building lines or footing shall be construed to permit encroachment beyond the legal boundaries. Unless otherwise specified, the following tolerance will be permitted.

22.2.1 Tolerance for Reinforced Concrete Works:

a)	Deviation from specified dimension Of cross section of column & beam	- 6 mm + 12 mm
b)	Deviation from dimension of footing	
	I) Dimension in plan	- 12 mm + 50 mm
	ii) Eccentricity	0.02 times the Width of the Footing in the Direction of Deviation but

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Not more than
50 mm.

iii) Thickness

± 0.05 times the
Specified thickness

22.2.2 Tolerances for reinforcement bars:

Description	Permissible Max. Deviation (mm)	
	Plus	Minus
Placing of reinforcement:		
- For effective depth 200mm or less	+10	-5
- For Effective depth more than 200mm	+15	-10
Cover to reinforcement :	-	-5
Cutting of reinforcement:		
- When minimum length specified	+75	-
- When maximum length specified	-	-
- When maximum or minimum length not specified	+75	-25

22.2.3 Tolerances in fixing anchor bolts:

- I) Anchor bolts without sleeves ± 1.5 mm in plan
- ii) Anchor bolts with sleeves ± 5.0 mm in elevation
 - a) For bolts up to & including 28 mm die ± 5 mm in all directions
 - b) For bolts 32 mm die and above ± 3 mm in all directions
- iii) Embedded Parts - + 5 mm in all directions

22.2.4 Dimensional Tolerance for formwork

Levels and heights - ± 6 mm
3mm for every meter subject to a maximum of 10mm

Unevenness of any surface - ± 3 mm

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Length / breadth - $\pm 12\text{mm}$

Diagonal - $\pm 15\text{mm}$

In case of inclined surfaces, the deviation in the alignment of inclined surfaces shall not exceed 3mm with reference to the theoretical alignment, for a length of 1000mm measured vertically, subject to a maximum of 10mm.

22.3 Type of Formwork

Formwork may be of steel plate/plywood. For special finishes the formwork may be lined with plywood, special, oil tempered hard board, etc. Sliding forms and slip forms may be used with the approval of Engineer.

22.4 Formwork Requirements

22.4.1 Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, walkers, braces, ties, straps, shores, etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal of forms. Forms shall be strong enough to permit the use of immersion vibrators. In special cases form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with the concrete shall be free from adhering grout, plaster, paint projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.

22.4.2 Steel plate shuttering shall be used below 0.0 m level for all the concrete structures. Any structure above 0.0 m level and where plastering is not envisaged and for all water proof structures even below 0.0 m level plywood shuttering shall be used.

22.4.3 All new and used form lumber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form lumber unsatisfactory in any respect shall not be used and; if rejected by Engineer, shall be removed from the Site.

22.4.4 Shores supporting successive storey's shall be placed directly over those below or be so designed and placed that the load will be transmitted directly to them. Trussed supports shall be provided for shores that cannot be secured on adequate foundations.

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- 22.4.5 Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings, shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be removed in its entirety and the formwork corrected prior to placing new concrete.
- 22.4.6 Excessive construction camber to compensate for shrinkage, settlement, etc. That may impair the structural strength of members will not be permitted.
- 22.4.7 Forms for substructure concrete may be omitted when in the opinion of Engineer the open excavation is firm enough to act as the form. Such excavations shall be slightly larger than required by the drawings to compensate for irregularities in excavation and to ensure the design requirements.
- 22.4.8 Forms shall be so designed and constructed that their removal will not damage the concrete. Face formwork shall provide true vertical and horizontal joints, conform to the architectural features of the structure as to location of joints and be as directed by Engineer.
- 22.4.9 Where exposed smooth or rubbed concrete finishes are required the forms shall be constructed with special care so that the resulting concrete surfaces require a minimum finish.

22.5 Bracings, Struts and Props

Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bearers.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Rewrapping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken

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whereby the props can be gently lowered vertically while striking the shuttering. If the shuttering for a column is erected for the full height of the column, one side shall be left open and built up in sections as placing of concrete proceeds, or windows may be left for pouring concrete from the sides to limit the drop of concrete to 1.0 M or as directed by Engineer.

22.6 **Mould Oil**

Care shall be taken to see that the faces of form work coming in contact with concrete are perfectly cleaned and two coats of mould oil or any other approved material applied before fixing reinforcement and placing concrete. Such coating shall be insoluble in water, no staining and not injurious to the concrete. It shall not become flaky or be removed by rain or wash water. Reinforcement and/or other items to be cast in the concrete shall not be placed until coating of the forms is complete. Adjoining concrete surfaces shall also be protected against contamination from the coating material.

22.7 **Chamfers and Fillets**

All corners and angles exposed in the finished structure shall be formed with moldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise specified, shall be 20 mm x 20 mm. Care shall be exercised to ensure accurate moldings. The diagonal face of the molding shall be planed or surfaced to the same texture as the forms to which it is attached.

22.8 **Vertical Construction Joint Chamfers**

Vertical construction joints on faces which will be exposed at the completion of the work shall be chamfered as above except where not permitted by Engineer for structural or hydraulic reasons.

22.9 **Wire Ties**

Wire ties passing through the walls shall not be allowed. In their place bolts passing through sleeves shall be used.

22.10 **Reuse of Forms**

Before reuse, all forms shall be thoroughly scrapped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary, repaired and the inside retreated to prevent adhesion, to the satisfaction of Engineer. Warped lumber shall be resized.

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Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

22.11 Removal of Forms

- 22.11.1 Contractor shall record on the drawing or a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.
- 22.11.2 In no circumstances shall form be struck until the concrete reaches a strength of at least twice the stress due to self weight and any construction/erection loading to which the concrete may be subjected at the time of striking form work.
- 22.11.3 In normal circumstances (generally where temperatures are above 20 ° C forms may be struck after expiry of the following periods:

Ordinary Portland cement concrete

a)	Walls, columns and Vertical sides of Beams	24 to 48 hours as directed by The Engineer-in-Charge
b)	Slabs (Props left Under)	3 days
c)	Beam soffits (Props Left under)	7 days
d)	Removal of props to slabs:	
	i) Spanning up to 4.5 m	7 days
	ii) Spanning over 4.5 m	14 days
e)	Removal of props under Beams	
	Spanning up to 6m	14 days
	Spanning over 6m	21 days
f)	Cantilever slabs	14 days

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22.11.4 Striking shall be done slowly with utmost care to avoid damage to arises and projections and without shock or vibration, by gently easing the wedges. If after removing the form work, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

22.11.5 Reinforced temporary openings shall be provided, as directed by Engineer, to facilitate removal of formwork which otherwise may be inaccessible.

22.11.6 Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours no later than 40 hours after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties, withdrawn from walls and grade beams shall be pulled toward the inside face. Cutting ties back from the faces of walls and grade beams will not be permitted.

23.0 FOUNDATION BEDDING, BONDING AND JOINTING

All surfaces upon or against which concrete will be placed shall be suitably prepared by thoroughly cleaning, washing and dewatering as Engineer may direct, to meet the various situations encountered in the work.

Soft or spongy areas shall be cleaned out and back filled with either a approved soil from borrow areas / stock pile, lean concrete or clean sand fill compacted to a minimum density of 90% Modified Proctor, Unless otherwise mentioned in Schedule of Quantities.

23.01 Preparation of Earth Strata for Foundations

All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft, yielding soil shall be removed and replaced with suitable earth well compacted as directed by Engineer. Where specified, lean concrete shall be provided on the earth stratum for receiving concrete.

23.02 Preparation of Concrete Surfaces

The preparation of concrete surfaces upon which additional concrete is to be placed later shall preferably be done by scarifying and cleaning while the concrete is between its initial and final set. This method shall be used wherever practicable and shall consist of cutting the surface

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with picks and stiff brooms and by use of an approved combination of air and water jets as directed by Engineer.

When it is not practicable to follow the above method it will be necessary to employ air tools to remove laitance and roughen the surface.

The final required result shall be a pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

24.0 **PLACING CONCRETE UNDERWATER**

Under all ordinary conditions all foundations shall be completely de-watered and concrete placed in the dry. However, when concrete placement under water is necessary all work shall conform to IS:456 and the procedure shall be as follows:

24.1 **Method of Placement**

Concrete shall be deposited underwater by means of tremies, or drop bottom buckets of approved type.

24.2 **Direction, Inspection and Approval**

All work requiring placement of concrete underwater shall be designed, directed and inspected with due regard to local circumstances and purposes. All underwater concrete shall be placed according to the plans or specifications and as directed and approved by Engineer.

25.0 **SLOTS, OPENINGS, ETC.**

Slots, openings or holes, pockets etc. shall be provided in the concrete work at required location or as directed by Engineer. Any deviation from the approved drawings shall be made good by Contractor at his own expense, without damaging any other work. Sleeves, bolts, inserts, etc. shall also be provided in concrete work where so specified.

26.0 **GROUTING**

26.1 **Standard Grout**

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26.01.1 The proportions of grout shall be such as to produce a flow able mixture consistent with minimum water content and shrinkage. The grout proportions shall be limited as follows:

	<u>Use</u>	<u>Grout Thickness</u>	<u>Mix Proportions</u>	<u>W/C Ratio</u>
a)	Fluid Mix	Under 25 mm	One part Portland Cement to one part of sand	0.44
b)	General	25 mm and over but less than 50 mm	One part Portland cement to 2 parts of sand	0.53
c)	Stiff Mix	50 mm and over	One part of Portland cement to 1 parts of sand and 2 parts of coarse aggregate with 12mm or down chips	0.53

26.01.2 a) Sand shall be such as to produce a flow able grout without any tendency to segregate.

b) Sand, for general grouting purposes, shall be graded within the following limits:

Passing IS 2.36 mm sieve	95 to 100%
Passing IS 1.18 mm sieve	65 to 95%
Passing IS 300 micron sieve	10 to 30%
Passing IS 150 micron sieve	3 to 10%

c) Sand for fluid grouts, shall have the fine material passing the 300 and 150 micron sieves at the upper limits specified above.

d) Sand, for stiff grouts, shall meet the usual grading specifications for concrete.

26.01.3 a) Surfaces to be grouted shall be thoroughly roughened and cleaned of all foreign matter and laitance.

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b) Anchor bolts, anchor bolt holes and the bottom of equipment and column base plates shall be cleaned of all oil, grease, dirt and loose material. The use of hot, strong caustic solution for this purpose will be permitted.

26.01.4 a) Prior to grouting, the hardened concrete surfaces to be grouted shall be saturated with water.

b) Water in anchor bolt holes shall be removed before grouting is started.

26.01.5 Forms around base plates shall be reasonably tight to prevent leakage of the grout.

26.01.6 Adequate clearance shall be provided between forms and base plate to permit grout to be worked properly into place.

26.01.7 Grouting, once started, shall be done quickly and continuously to prevent segregation, bleeding and break-down of initial set. Grout shall be worked from one side of one end to the other to prevent entrapment of air. To distribute the grout and to ensure more complete contact between base plate and foundation and to help release entrapped air link chains can be used to work the grout into place.

26.01.8 Grouting through holes in base plates shall be by pressure grouting. All anchor bolt sleeves/pockets and spaces under column bases, machine base, shoe plates etc shall be grouted with ready mix non - shrink cementitious grout as approved by the Engineer. Crushing strength of grout shall be one grade higher than the foundation concrete. Minimum crushing strength shall be 30N/mm² unless higher strength requirement is specified by the equipment supplier.

27.0 **SPECIAL NON-SHRINKING GROUT**

27.01.1 Proprietary material of approved manufacture used as an admixture to obtain non-shrinking grout shall be mixed in the proportion of 1:1:1 (1 cement:1 admixture: 1sand), or as per manufacturer's instructions.

27.01.2 Pre-mixed non-shrinking grout of approved manufacture shall be used, all as per manufacturer's instructions and without any additional materials/admixtures such as cement, sand and aggregates etc.

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28.0 **PRE-MOULDED BITUMINOUS JOINT FILLER AND SEALING COMPOUND**

- 28.01 Pre-molded joint fillers shall be of non-deteriorating and resilient type conforming to IS:1834. Sealing compound shall be of Grade 'A' as per IS:1834. Bitumen primer shall conform to IS:3384.
- 28.02 The concrete surface shall be made clean, smooth and free from dirt or loose particles. When the surface is completely dry a coat of hot blown bitumen conforming to IS:702 of grade 85/25 shall be given with brush or spray.
- 28.03 When the bitumen is still hot the remolded joint filler fibre board shall be pressed against the surface held in position till the time it automatically remains fixed in position. Where the joint filler has been specified in two layers, the second board will be fixed on the board fixed as above with a few tacking patches to bitumen between the two. After placing the filler in position, the surface of the filler against which further concreting is to be done is given a coat of bitumen.
- 28.04 Before application of the sealing compound the joints are splayed or brushed with bitumen primer. The primer is then allowed to dry thoroughly for at least 24 hours and then mixed with a mixture of 30% fine sand and 70% sealing compound by weight.

29.0 **STRUCTURAL WATER PROOFING**

- 29.01 Waterproofing work shall be carried out by a firm of specialists in the trade approved by the Engineer. The Contractor shall guarantee the water proofness of the underground RCC structure for a period of ten (10) years after the certified completion and handing over the same to the Engineer.
- 29.02 The site shall be kept dry by adequate arrangement for pumping out water till the waterproofing work has been completed.
- 29.03 Two coats of slurry coating of approved polymer modified cementitious composite as per manufacturer's specifications shall be applied over the mud mat (rendered smooth with 20mm thick cement plaster 1 cement : 3 sand admixed with approved water proofing compound).
- 29.04 Threaded G.I. nozzles 12mm diameter (Nominal Bore) and of suitable length shall be placed & fixed in an approximate grid pattern of 1.50m center to center on the entire base slab and walls prior to or during concreting. Nozzles shall be kept flush with the top surface of base slab & inside faces of

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walls. Similar nozzles shall also be provided at regular intervals (not exceeding 1.50m apart) at least 300mm above the construction joints (where such joints are permitted or shown in the drawings) and at critical points as directed by the Engineer. Nozzles shall be kept plugged at both ends to prevent them from getting clogged by concrete.

30.00 **GUNITING / SHOTCRETING**

30.01 Generally shotcreting shall be done in accordance with IS:9102. Uniting of RCC members, where specified shall be with an intimate mixture of cement, sand (or fine aggregate) and water. This mixture is forced or ejected through a cement gun and shot into place by compressed air. Uniformly graded, thoroughly mixed dry materials, with low water / cement ratio are charged into the gun and shot under pressure by compressed air. Sand shall be slightly moist to works better., The usual proportions of cement and fine aggregate are 1:3. The fine aggregate should be will graded up to a maximum size of 10mm, preferably 4.75mm downwards.

30.02 Reinforcement for concreting shall be as detailed below, unless specified otherwise.

- a) Reinforcement in one direction consisting of 6mm MS bars at 750mm c/c shall be connected to the lugs for fastening of the wire fabric. This shall be used in case of 50mm or above thick shotcreting.
- b) Wire fabric conforming to IS:1566 shall be used as reinforcement and shall consist of wire, 3mm diameter, and spaced 50mm both ways and shall be electrically cross welded. Wire fabric shall be securely tied to 6mm bars for 50mm thickness. Adjacent sheet of wire fabric shall be lapped at least 100mm and tied.
- c) Clear cover to reinforcement mesh shall not be less than 15mm.

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31.00 **ANCHOR BOLTS**

31.01 Supply, fabrication, erection and installation of foundation bolts assembly shall comprise of foundation bolts, stiffener plates, washers, nuts, lock, nuts, pipe sleeves etc.

31.02 **MATERIALS**

31.02.01 Foundation bolts shall generally conform to IS: 5624. Mild steel bars used for the fabrication of bolt assembly shall conform to grade -1 of IS: 432, IS: 2062 or any other material including high carbon / high tensile steel as specified.

31.02.02 Hexagonal nuts and lock nuts shall conform to IS:1363 & IS:1364 up to M 36 dia and IS:3138 for M42 to M150 dia. Flat plain washers shall be of mild steel and punched / machined type conforming to IS:5369. Steel pipe sleeves shall conform to Medium class of IS: 1161.

31.03 **FABRICATION, ERECTION, ETC.**

31.03.01 the fabrication and erection of bolt assemblies shall include threading, cutting, grinding, drilling, welding, etc. complete. All bolts, bolt assemblies etc. shall be fabricated by the Contractor to the correct dimensions and shapes as shown on drawings, supplied by the Engineer. The bolts shall have coarse pitch screw thread in the diameter range, 8 to 64 mm and 6mm pitch screw for diameter >64 mm as per IS:4218.

31.03.02 For fabrication of any particular size of bolt indicated on the drawing, the diameter of the threaded portion of the bolt shall be considered as the diameter of the bolt.

31.02.03 Fabrication & erection shall be carried out as per IS: 800. Welding shall conform to IS: 816 and IS: 9595.

31.02.04 every bolt shall be provided with a steel washer under the nut. The washer shall be flat and minimum outside inscribed circle have a diameter 2.50 times that of the bolt and of suitable thickness. All nuts shall be of every bolt shall be provided with a steel washer, under the nut. The washer shall be flat steel with well formed hexagonal heads, unless specified otherwise, forged from solid metal and shall be dipped in hot boiled linseed oil as soon as these are made. The nuts shall fit well on the bolts.

31.02.05 during erection, the Contractor shall provide necessary template, temporary bracings, supports etc to ensure proper positioning of the assemblies and holding them firmly until they are cast / grouted and the grout has set. All materials shall be erected in plumb and in level (unless otherwise specified)

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and at true locations as shown on the drawings. Threads shall be protected by using PVC tape.

32.00 **ENCASEMENT OF STEEL STRUCTURES / ELEMENTS.**

32.01 **GENERAL REQUIREMENTS**

- 32.01.01 all concrete work, reinforcement, formwork and staging work shall be done as per stipulations in the relevant sections of this specification.
- 32.01.02 the reinforcement to be provided for encasement of steel elements shall be mild steel bars or in the form of wire netting. Such reinforcement shall be kept 20 mm away from the steel member and held securely to it.
- 32.01.03 the minimum grade of concrete to be used for encasing shall be M-20 unless specified. The aggregate to be used in concrete shall be 12.5 mm maximum size unless specified otherwise. In case of box type steel sections, encasement shall be done with cement sand mortar (1:4) with thickness of 50mm over 0.9mm size wire netting conforming to IS:3150, or as shown on the drawings.
- 32.01.04 In the case of encasement of beams with concrete, if the gap between the edge of the shuttering and flange is hardly sufficient for placing the concrete, the workability of the concrete shall be increased suitably by increasing the water cement ratio.
- 32.01.05 Minimum cover for concrete encasement shall be 50mm.

32.02 **MATERIALS**

- 32.02.01 the materials shall be in accordance with the relevant clauses of Technical Specification for Properties, Storage and handling of common Building Materials which shall be deemed to form the part of this specification. Hexagonal wire netting shall be 0.9 mm dia and 19mm aperture size, conforming to IS: 3150.

33.00 **INSERTS AND CUTOUTS IN CONCRETE WORKS**

- 33.01 Numerous inserts are required to be fixed/embedded as indicated in construction drawings/as directed by Engineer in various civil works and other miscellaneous equipment foundations and works. These inserts comprise plates, angles, pipe sleeves, anchor bolt assemblies etc. While most of the inserts will be supplied by owner, free of cost at his stores, for incorporation in the works, certain inserts are required to be fabricated by the

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tendered. These would be indicated clearly on the construction drawings.

33.02 The rate quoted by the tendered for placing in position of inserts shall hold good for accurately fixing the inserts at the correct levels/alignment and shall include for the cost of any temporary or permanent supports/anchors such as bars including cutting, bending, welding etc. as required.

33.03 Steel templates shall be used by Contractor to locate and very accurately position bolts, group of bolts, inserts, embedded parts etc. At his cost. Such templates shall be got previously approved by the Engineer. Templates shall invariably be supported such that the same is not disturbed due to vibration, movement of laborers, materials, shuttering work, reinforcement etc. While concreting. The contractor will have to suitably bend, cut or otherwise adjust the reinforcement in concrete at the locations of inserts as directed by the Engineer. If the Engineer so directs, the inserts will have to be welded to reinforcement to keep them in place. Contractor shall be responsible for the accuracy of dimensions, levels, alignments and centre lines of the inserts in accordance with the drawings and for maintenance of the same until the erection of equipment/structure or final acceptance by Owner.

33.04 Contractor shall ensure proper protection of all bolts, inserts, etc. from weather by greasing or other approved means such as applying white lead putty and wrapping them with gunny bags or canvas or by other means as directed by Engineer to avoid damage due to movement of his laborers, material, equipment, etc. No extra claim from the contractor on this account shall be entertained. Contractor shall be solely responsible for all the damages caused to bolts, inserts, etc. due to his negligence and in case damages do occur, they shall be rectified to the satisfaction of Engineer at the Contractor's cost.

33.05 Cutouts, chamfers, pockets, etc shall be left as indicated in the drawings and no extra cost shall be payable for providing these at correct locations. Contractor shall take all necessary precautions to protect the cutouts from accidentally getting filled up or the edges getting broken.

34.00 **WATER STOPS**

34.01 PVC/Rubber water stops of the width and type as specified on the drawings shall be of approved manufacture and prior approval of the Engineer shall be obtained by the Contractor before procurement and incorporation in the works.

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34.02 Water stops shall be cleaned before placing them in position. Any dirt/grease shall be removed using water/detergent as directed by Engineer. Water stops shall be procured in long lengths as supplied by manufacturer to avoid joints as far as possible. Standard intersection pieces shall also be procured depending on the requirement. Splicing/Jointing and installation of water stops shall be done as per manufacturer's instructions. Projecting portions of water stop shall be thoroughly cleaned of all mortar/concrete coatings as directed by Engineer before resuming further concrete work.

35.00 **PRE-CAST CONCRETE WORKS**

35.01 Precast concrete shall comply with IS: 456 and with the following requirements.

35.02 All precast units shall be cast on a suitable bed or platform with firm foundation and free from wind. Contractor shall be responsible for the accuracy of the level or shape of the bed or platform. A suitable serial number and date of casting shall be impressed and painted on each unit.

35.03 **Striking Forms**

Side shutters shall be struck in less than 24hours after depositing concrete and no precast unit shall be lifted until the concrete reaches strength of least twice the stress to which the concrete may be subjected at the time of shifting.

35.04 **Handling**

The lifting and removal of precast units shall be undertaken without causing shock, vibration or undue bending stress. Before lifting and removal take place contract shall satisfy the Engineer or his representative that the methods proposed to be adopted for these operations will not overstress or otherwise affect seriously the strength of the precast units. The reinforcement side of the units shall be distinctly marked.

All slabs shall have a standard approved width, except when specially required for the geometry of the work. All slabs shall be unwrapped, free from cracks and broken edges. Defective pieces shall be rejected. Hole and opening shall be provided during casting or cut afterwards as required, without any extra changes. After installation of piers, vents, sleeves etc. the openings shall be plugged with concrete of original grade.

35.05 **Curing**

All precast shall be protected from the direct rays of the sun for at least 7 days after casting and during that period each unit shall be kept

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constantly watered preferably be completely immersed in water.

36.00 **INSPECTION**

36.01 All materials, workmanship and finished construction shall be subject to the continuous inspection and approval of Engineer.

36.02 All materials supplied by Contractor and all work or Construction performed by Contractor rejected as not in conformance with the specifications and drawings, shall be immediately replaced at no additional expense to the Purchaser.

36.03 Approvals of any preliminary materials or phase of work shall in no way relieve the Contractor from the responsibility of supplying concrete and/or producing finished concrete in accordance with the specifications and drawings.

36.04 All concrete shall be protected against damage until final acceptance by Purchaser or his representative.

37.00 **CLEAN-UP**

37 01 Upon the completion of concrete work, all forms, equipment construction tools, protective coverings and any debris resulting from the work shall be removed from the premises.

37 02 All debris i.e. Empty containers, scrap wood, etc. Shall be removed to "dump" daily or as directed by Engineer.

37 03 the finished concrete surfaces shall be left in a clean condition satisfactory to Engineer.

38.00 **SAMPLING, TESTING & QUALITY CONTROL**

Frequency of sampling and testing of various materials shall be as given in the table below:

S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS

A COURSE AGGREGATES:-

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS
a.	Particle size	IS:2386(Pt-I)	One per 100 cum or part there of or change of source whichever is earlier	Result should be as per the requirement of design mix, subject to variations within the limits specified in relevant Indian Standards Codes.
b.	Moisture content	IS:2386(Part-3)	Once for each stack of 100 cum or part thereof except during monsoon when this has to be done every day before starting of the work.	Accordingly, water content of the concrete shall be adjusted.
c.	Specific gravity, density, voids, absorption	IS:2386(Part – 3)	Once in 12 weeks or change of source, whichever is earlier	These tests shall be carried out while establishing design mix and results to be intimated.
d.	Mechanical properties crushing value, abrasion value and impact value	IS:2386 (Part-IV)	Once per source	Acceptance norms shall be as per IS: 383.
e.	Soundness	IS:2386(Part-V)	Once per source	Acceptance norms shall be as per IS: 383.
f.	Reaction with acid and alkali	IS:2386 (Part-VII)	Once per source	These tests shall be carried out while

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS
				establishing design mix and results to be intimated.
g.	Flakiness and petrographic examinations	IS:2386	This is to be done once and should be repeated in case, the source is charged.	These tests shall be carried out while establishing design mix and results to be intimated.
h.	Deleterious materials	IS:2385 (Part – II)	Once per source	Results should be within the limit as specified in relevant Indian Standard Codes and in this Specification.

B. FINE AGGREGATES / SAND :				
a.	Particle size and shape	IS:2386 (Part – I)	One per 100 cum or part thereof or change of source, whichever is earlier	Should be as per the requirement of design mix, subject to variation within the limits as specified in relevant IS Codes.
b.	Specific gravity, density, voids, absorption and bulking	IS:2386 (Part – III)	Once in 12 weeks or change of source, whichever is earlier?	These tests will be carried out while establishing design mix and results to be intimated.
c.	Bulk age, moisture content (Routine test)	IS:2386 (Part – III)	To be done every day before start of work	Volume of sand and weight of water shall be adjusted as per

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S. NO.	NATURE OF TEST / CHARACTERISTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS
				bulk age and moisture content.
d.	Silt, clay, deleterious materials, organic impurities	IS:2386 (Part – III)	Once per source and to be repeated if source is changed.	Acceptance norms shall be as per IS: 383.
e.	Soundness and petrographic examination	IS:2386 (Part-5 and 8)	Once per source	Acceptance norms shall be as per IS: 383.
f.	Mortar making properties	IS:2386 (Part-VI)	Once per source	Acceptance norms shall be as per IS: 383.
g.	Reaction with acid and alkali	IS:2386 (Part-VII)	Once per source	Acceptance norms shall be as per IS:383 and IS:2386 (Part-7)
C. CEMENT:				
a.	<u>Received from supplier :</u> Setting time and compressive strength and all other tests as per relevant IS codes	IS:4031	Once sample from each consignment	Acceptance norms shall be as per relevant Indian Standard Codes.
b.	<u>If stored for more than 2 months of original receipt :</u> Setting time and compressive strength as per relevant IS codes	IS:4031	Once sample from each lot of 100 t or part thereof / each consignment	Acceptance norms shall be as per relevant Indian Standard Codes.
c.	Ensure that cement is stored in covered storage on raised platform and weather proof conditions	Visual	100 %	As per specifications

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS
D.	WATER:			
	Harmful substances, pH value, initial setting time, compressive strength	IS:3025, IS:4031 & IS:456	Once a month for each source	Acceptance norms shall be as per IS: 456.
E.	CONCRETE :			
a.	Workability (Slump and compaction factor)	IS:1199	One sample every two hours from every mixing plant	Acceptance value shall be as per Cl. 6.1 of IS:456
b.	Crushing Strength	IS:516	(i) As per Clause 14.2.2 IS: 456 for initial period.	Acceptance value shall be as per Cl. 15 of IS:456
			ii) One sample of six cubes per 150 cum or part thereof for mass concrete for subsequent period.	A minimum of 3 specimens / samples shall be tested for 28 days strength
c.	Water-cement ratio	IS:1199	At random at the time of batching	According to mix design
d.	Cement content	IS:1199	At random at the time of batching	According to mix design.
e.	Water tightness test retaining Structures	IS:3370	Each tank or reservoir	Acceptance criteria as per specification.
f.	Finished dimensions	Physical measurement	All structures	Acceptance criteria as per specification.

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS

F.	FORM WORK :

a.	Staging (Durability, strength & soundness of staging, joint, adequacy of its foundation and specific level)	Visual	Each member	Any staging intended for use shall be approved by the Engineer for its durability and strength. After erection of staging, nominated representatives of Engineer shall check the soundness of the staging as a whole, its joints, adequacy of its foundation & the specific levels.

b.	Shuttering			

i)	Materials	Visual	Random	Formwork materials shall be strictly as per specifications and approval of the Engineer Materials for formwork shall be unwrapped, thoroughly clean and without broken or damaged edges either due to repetitive use or otherwise Oiling of form work before concreting shall be resorted to.

ii)	Joints	Visual	Random	Joints shall be leak-proof to avoid loss of

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS
				liquid.
iii)	Dimensions and Plumb	Physical measurement	Each member and before every lift	Tolerance as per specifications
G.	REINFORCEMENT:			
a.	Physical and chemical properties	Review of manufacturer's correlated test certificates	Each lot	These tests shall be consistency of the quality, grade and type of materials.
b.	Placement	Visual	100 %	The bar bending schedule with the necessary hooks, laps covers, pacers and chairs shall be 100% checked for all concrete works before start of the work.
c.	Cutting tolerance	Physical examination	Random	Tolerance shall be as per specification
d.	Freedom from defects	Visual	Random	Any of the bars selected for use shall be free from cracks, surface flaws, laminations and rough jagged and imperfect edges.
H.	EMBEDDED PARTS :			
a.	Type of embedment	Visual	Each part	Type / Details shall

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S. NO.	NATURE OF TEST / CHARACTERSTICS	METHOD OF TEST	NOS. OF SAMPLES & FREQUENCY OF TEST	REMARKS

				be as per drawings. Tolerance as per specification.

b.	Location and dimensions	Physical measurement	Each part	Details as per drawings. Tolerance as per specification.

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STANDARD TECHNICAL SPECIFICATIONS FOR CAST-IN-SITU RCC PILES

CONTENTS:

1.0	General
2.0	Materials
3.0	Driven Cast-In-Situ Piling
4.0	Bored Cast-In-Situ Piling

1.00 **GENERAL**

1.01 The work covered under this specification is installation of cast-in-situ driven friction cum end bearing piles or bored cast-in-situ friction cum end bearing piles and construction of pile caps, grade beams and pedestals conforming to the relevant Indian Standards and as detailed below:

1.02 **Line and Levels**

The Contractor shall establish and locate all lines and levels & shall be responsible for the correct location of all piles.

1.03 All tenderers shall furnish information about the type of piles they specialized in, which shall be submitted along with the bid.

1.04 The diameter and type of pile and the method of piling shall be given to the Contractor. The detailed calculations, assumptions etc. in arriving at the standard depth shall be submitted by the contractor based on the set criteria.

1.05 In any case, the actual design shall be established after trial pile has been tested and results compared with the analytical design. The acceptance of the design calculations does not relieve the contractor from the responsibility of adequacy of piles to carry the design loads.

1.06 The piles shall be founded on suitable and continuous strata.

1.07 Location of Piles: A plan in triplicate, showing clearly the designation of piles to be installed by an identifying system shall be given to the Contractor before the installation of piling is started. The Contractor has to execute the piling work as per the detailed design drawing .

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- 1.08 **Obstructions:-**
Where boulders or other obstructions make it impossible to drive/bore certain pile in the location shown and to the proper bearing strata, the Contractor shall resort to all usual methods to install piles as required, including studding, jetting or other feasible means.
- 1.09 A record of pile driving/boring shall be kept by the Contractor in an approved format. The Contractor shall furnish signed typewritten copies of the recorded data to the Engineer-in-Charge. The record shall give the diameter, length, location, type, calculated safe load, penetration under the last five blows of hammer if any and the result of any tests. Any deviation from the designed location, alignment or load carrying capacity or any upheaval noticed on any pile during installation shall be immediately reported to the Engineer-in-charge and adequate corrective measures shall be taken as, decided by the Engineer-in-charge at the cost of the Contractor. On the completion of pile installation, pile driving records together with the records of such additional borings or other information that were obtained during the installation of pile shall also be filed by the Contractor with the Engineer in charge in triplicate.
- 1.10 The cut-off levels for piles shall be as shown in the construction drawings. The top of concrete in a pile shall be brought above the cut-off level to permit removal of all laitance and weak concrete before capping and to ensure good concrete at the cut-off level for proper embedment in to the pile cap. No extra payment will be made for the length from existing ground level to cut off level. The rates for piling work shall include the cost of breaking of concrete in pile above the cut-off level and removal of debris etc. resulting from cutting off of piles for constructing the pile cap. However, the length of pile for purpose of payment shall be considered from bottom of the shoe (of pile) to cut-off level only.
- 1.11 **Layout**
The complete laying and setting out of work required for piling shall be done by the Contractor at his own cost. The Contractor at his own cost shall build and preserve benchmarks constructed with reference to the permanent benchmark and Reference pillars indicated by the Engineer. He shall give all help with accurate survey instruments including Theodolite of high quality, and other test equipment, materials and men to the Engineer for checking the detailed layout and levels. The contractor shall be solely responsible for correctness of layout and levels. The

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checking and approval of the engineer will not absolve the contractor from his responsibility of carrying out the work at correct locations and levels.

2.00 **MATERIALS**

2.01 **Grade of Concrete**

2.01.01 Concrete mix for piles shall be of grade M-25 **with minimum cement content as 400 kg/m³**. Concrete Mix and Tests shall conform to Clause 10.0 Section B3 of this specification.

2.02 **Reinforcement**

2.02.01 Reinforcement to be used shall be TMT/TOR steel bars conforming to latest IS codes and plain mild steel bars conforming to IS:2062 (Part-I) (latest) and shall conform to specifications for Reinforcement Steel mentioned in Clause 5.0, Section B3 of this specification.

2.02.02 The longitudinal reinforcement (Main Steel) shall not be less than 0.4% of the cross sectional area of the pile and diameter of the longitudinal bars shall not be less than 12mm. Minimum number of longitudinal reinforcement bars shall be six. The dia of the lateral reinforcement shall be 8 mm and provided for the entire length of the pile. The longitudinal bars shall project above pile cut off level to have adequate bond length inside pile cap. Laps in reinforcement bars shall be staggered.

2.03 **Cement**

2.03.01 Cement shall be Ordinary Portland Cement grade 43, unless otherwise specified, conforming to IS: 8112 of the recent manufacture and shall conform to the specifications. This shall conform to clause 1.01 of Section B3 of this Specification.

2.03.02 Cement of different brands/batches shall be stored separately and consumed in works in the same order as supply unless otherwise directed.

2.04 **Aggregates**

2.04.01 All coarse and fine aggregates shall conform to the Clause No. 1.02, Section B3 of this specifications. Graded coarse aggregates of size 20mm and down shall be used.

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2.05 **Placing Reinforcement**

2.05.01 Reinforcement as required shall be made into stiff cages sufficiently wired with 2 strands of 16 gauge annealed soft iron binding wire (Galvanized) welded to withstand handling without any damage or distortion. Reinforcement shall be placed after piling tubes are installed properly and it is ensured that no water has percolated from out side. The reinforcement should be supported away from the sides of the shaft by means of suitable space block to ensure concentric alignment in the shaft. Steps shall be taken to ensure correct positioning during concreting of reinforcement in the piles without any distortion.

2.05.02 Nominal lap between reinforcement cages shall be minimum 600mm and the main reinforcing steel shall project for a length of 50 times the diameter of the reinforcement bar, sufficient to develop bond above the level of the under side of the pile cap. The nominal cover to outermost reinforcement shall be not less than 50mm and suitable spacer blocks shall be provided in intervals not exceeding two (2) meters and wired to the main reinforcement. In addition to binding with the wire after giving laps the reinforcement shall also be tack welded at certain intervals as approved by the Engineer in charge.

2.05.03 The longitudinal bars shall project above pile cut-off level to have Adequate bond length inside pile cap. To protect the exposed reinforcement of the piles, cement slurry coat as approved by the Engineer shall be provided at no extra cost.

2.05.04 In case the reinforcing cage is made up of more than one segment; these shall be assembled before being lowered by providing necessary lap and also intermittent welding. Care shall be taken for welding of Tor steel using proper electrodes.

2.06 **Placing of Concrete**

2.06.01 before placement of concrete care shall be taken to ensure that the inside of the casing is free from sludge or any foreign matter. Concreting may be permitted if the water level inside is 150mm above the inner surface of shoe and no additional percolation is there. Water cement ratio is to be restricted to 0.45 to 0.50 maximum. Slump should be restricted between 150mm to 175mm. For this, if needed plasticizer is to be used.

2.06.02 The concrete shall be placed by termite method in such a way that it fills the entire volume of the casing without the formation of voids caused by entrapped air and is properly compacted. The volume of concrete placed shall be observed in the case of few piles initially cast and the average

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figure obtained shall be used to check, whether there are undue deviations in the volume of concrete placed for the subsequent piles.

2.06.03 The top of concrete in a pile shall be brought above the cut-off level as per Cl. 7.8 of IS:2911 (part1/sec2). The balance portion shall be concreted with lean concrete of grade M10 with 40mm down aggregate.

2.06.04 Withdrawal of casing (if used) shall be carried out with utmost care. It shall be ensured that the level of concrete in the casing is usually two meter above the bottom level of casing at any time.

2.06.05 Since supervision at night becomes difficult concreting shall be carried out only from morning to evening on two shifts basis. However, driving may be permitted round the clock. The contractor shall bring such number of rigs considered by him adequate to complete a minimum of 750 piles per month.

2.07. **Load Test on Piles**

Load test on piles shall be carried out to check the bearing capacity of piles in the manner as follows:-

2.07.01 Load test shall be conducted as per IS:2911 (Part-IV). However the method of testing and maximum test load as specified else where in the specification.

2.07.02 The observation and recording of settlements and rebound shall be done by the contractor in the presence of Engineer's representative. Three copies of all the readings for the test shall be supplied by the Contractor to the Engineer. Recording of the observations shall be in the Performa enclosed with this specification. The pile load test shall be carried out only after four weeks of casting of the pile.

2.07.03 Prior to the commencement of piling, initial trial test piles shall be constructed and tested for vertical (compression), pullout and lateral load capacities. Number of tests shall be conducted as per the directions and to the satisfaction of the Engineer. However for each size, minimum two piles are required to be tested for each type of test.

2.07.04 In addition to the initial tests, routine tests for vertical load capacity and lateral load capacity shall be carried out on the working piles as per the direction of the Engineer/Consultant. Number of such routine tests shall be minimum of one percent (1%) of the total number of piles or as directed by engineer.

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2.07.05 Routine Load Test on Working Piles

2.07.05.1 These tests shall be carried out on working piles by maintained load method up to one and half times the working load and the maximum settlement of test loading in position being not exceeding 12 mm as per IS2911 (Part - IV).

These tests shall be done for :

a. Vertical load

b. Lateral load

2.07.05.2 In case a pile fails under or during the load test, the Engineer shall select two additional piles in lieu of each of such failed pile and the Contractor shall carry out load tests on such additional piles at his own cost.

2.07.06 Initial Pile Load Test on Test Piles

The initial pile load tests shall be conducted as per IS:2911 (Part-IV) to assess the capacity of the pile and to fix a more accurate driving criteria viz set/blow, total number of blows and approximate depth etc. of founding level. The initial pile load tests shall be conducted on test piles installed for this purpose. These tests shall be done for

a) Vertical (Compression) Load

Initial load test for safe vertical compression load is to be done by Cyclic load method (as per IS:2911 (Part 4)-1985). This test shall be carried out up to a maximum of 3 times the safe load.

b) Lateral Load

Lateral load test shall be carried out as per IS: 2911 (Part 4) 1985. This test shall be continued up to a maximum test load of 3 times the safe load.

c) Pull out load

Pullout test requirements shall be as per clause 8 of IS.2911 (Part 4) 1985. This test shall be continued up to a maximum test load of 3 times the safe load.

2.08 Load Test Arrangement

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2.08.01 The Contractor shall arrange at his own cost sufficient amount of kentledge for loading well in advance of the commencement of the load test. The kentledge/reaction provided shall be at least 25% more than the load at which the piles are to be tested. Detailed proposal together with a sketch for the load test arrangement shall be furnished by the Contractor to the Engineer for the later's checking and approval. Detailed pile testing records and results including all information shall be submitted in triplicate by the Contractor to Engineer for approval.

2.08.02 Jacks used in any particular load test should be of the same capacity and their number shall be limited to two only. They should preferably be connected and operated by one pump. The contractor shall submit certificates certifying the correctness of the calibrations of the pressure gauges and jacks before use. All jacks should be fitted with locking devices. Settlement and rebound shall be recorded by four (4) dial gauges having sensitivity of 0.01 mm and also by other independent means of direct measurement. Dial gauges shall be supported independently and in such a way as to be not affected by the settlement of the piles.

2.12.03 During the actual testing of test piles, the Contractor's plant and personnel may remain temporarily idle. Again, during the period of redesign, if any (based on the pile test results), the plant and personnel of the Contractor may remain idle during the period of construction. For such idle periods mentioned above, the contractor will not be entitled to any claim and rates quoted by him shall include the same. However, during testing of piles and other holdups wherever possible and in case when load tests are not completed, pile construction may be allowed in flexible pattern as approved by the Engineer.

2.09 Accepted Standards

2.09.01 The piles shall be accepted as satisfactory only when the work has been executed in accordance with this specification and IS Codes to the satisfaction of the Engineer and the following conditions are met: -

a) Permissible Tolerances

The head of the pile shall be within 75mm of the specified plan position on the drawings and the pile shall not be out of plumb by more than one and a half percent. The toe of the pile shall be at the approved bearing level in each case. Any pile deviating from

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these limits shall be replaced or supplemented by an additional pile by contractor at no extra cost to owner. No forcible correction shall be made to piles once that are installed.

b) **Casing of Piles**

The casing, reinforcement cage, concrete mix, placing consolidation and curing shall be strictly as per the specification. The concrete shall show the specified strength as indicated by the cube test results.

c) **Load Tests**

The result of the load tests carried out in accordance with the specifications and IS Codes for load test shall be as described above.

2.10 **Defective Piles**

2.10.01 If an individual pile should fail to meet the requirements specified in clauses 2.07 above such piles may be deemed to be defective and the Engineer may order such investigation to be made as he considers appropriate.

2.10.02 Any pile which is shown to be defective under the load test shall not be accepted and the Engineer will relate such failure to the acceptance of other piles in the area.

2.10.03 When any piles are found defective, the Contractor shall perform at his own expense one or more of the following remedial measures as directed by the Engineer: -

a) Replacement of defective piles

b) Providing additional piles

3.00 **DRIVEN CAST-IN-SITU PILING**

3.01 This specification deals with the requirements of materials, workmanship and installation of cast-in-situ driven reinforced concrete piles. The materials and workmanship shall conform to the specification, the provision of the following latest Indian Standard Codes in particular and such other standard as mentioned elsewhere in the specification.

I. IS: 456-2000 : Code of Practice for Plain and

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Reinforcement Concrete

ii. IS: 2911 (Part-I) : Code of Practice for Design and
Section I Construction of Pile Foundation
(Driven Cast-in-Situ)

iii. IS: 2911 (Part-IV): Load Test on Piles

3.02 The specification does not cover minute details and the work shall be executed according to the specifications and in the absence of the latter, the work shall be carried out according to the best prevailing practices and to the recommendations of Indian, American, British Standard Institutions at the discretion of the Engineer.

3.03 The Contractor shall design the piles based on the soil investigation report and data available with the Owner and data collected by the bidder at Site. However, the minimum factor of safety shall be 2.5.

3.04 The information provided herein for the bidders are for guidance only. The Owner/Consultant does not guarantee the reliability or accuracy of the data and does not assume any responsibility whatsoever for any variations, conclusions or interpretations that might be made there from.

3.05 Care shall be taken while driving piles that no existing foundation and sub-structures are disturbed by providing suitable arrangement like shoring etc.

3.06 PILING

3.06.01 Sequence of Piling

The sequence of piles to be installed shall be such that the adjacent piles already installed are not disturbed nor their carrying capacity reduced by subsequent driving or boring operation. In a group the installation of the piles shall normally proceed from the center of the group towards the periphery. The Contractor shall submit the sequence order and construction schedule to the Engineer and get his approval before the commencement of work.

3.06.02 These piles shall be installed by driving a temporary steel casing with detachable shoe into the ground up to the specified depth. To cushion against impact, standard steel helmets shall be provided and fitted to the casing. Driving shall be performed using leaders to fix casing in position

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and maintain axial alignment of hammer and casing. Pile drivers shall have supporting leads up to the lowest point the hammer can reach. The shift in position shall be subject to tolerances specified in IS Code.

3.06.03 The shoes shall preferably be of double collar of MS type. In case double collar fabricated shoes are used, the same shall be painted with one coat of bituminous Paint. Details of shoes shall be got approved by Engineer/Consultant before commencement of work.

3.06.04 Casings may be driven by drop, single or double acting, differential or diesel hammers. When driving casings to final set these hammers shall be driven at full rated energy required. Temporary compression on the casings as per IS: 2911 shall be taken into account. Casing shall be driven continuously to final elevation or specified resistance. If the driving is interrupted due to unavoidable circumstances then it should be driven to the final elevation of adjacent casings driven uninterrupted.

3.06.05 Set calculation will be furnished separately.

3.06.06 Tendered shall furnish information regarding pile driving method, equipment details, formula or data curves etc.

3.06.07 A record of sudden changes in the rate of penetration not attributable to solid strata shall be maintained and brought to the notice of the Engineer-in-Charge immediately on occurrence before resuming further operation.

3.06.08 Piling shall be carried out from existing ground level itself and as per the directions of the Engineer and approved drawings.

3.07 **Data Recording**

The Contractor shall maintain a register signed jointly by Contractor/Engineer, giving the information for each pile in the Performa appended to this Annexure.

4.00 **BORED CAST-IN-SITU PILING**

The specification deals with the requirements of materials, workmanship and installation of Bored Cast-in-situ reinforced concrete piles.

The materials and workmanship shall conform to the specification, the provision of the following latest Indian Standard Codes in Particular and

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such other standard as mentioned elsewhere in the specification:

- I. IS: 456-2000 : Code of Practice for Plain and Reinforced Concrete
- ii. IS: 2911 (Part-I) : Code of Practice for Design and Construction of Pile Foundations (Bored Cast-in-Situ).
Section II
- iii. IS: 2911 Part-IV : Load Test on Piles

4.01 The Contractor shall design the piles based on the soil investigation report, data available with the Owner and data collected by the Bidder at site. However, the minimum factor of safety shall be 2.5.

4.02 Care shall be taken while boring and constructing piles and pile cap that no existing foundations/sub-structures are disturbed by providing suitable arrangements like shoring etc.

4.03 **Piling**

4.03.01 **Sequence of Piling**

The sequence of piles to be installed shall be such that the adjacent piles already installed are not disturbed nor their carrying capacity reduced by subsequent boring operation. In a group the installation of the piles shall normally proceed from the center of the group towards the periphery. The Contractor shall submit the sequence order and construction schedule to the Engineer and get his approval before the commencement of work.

4.03.02 **Control of Alignment**

Piles shall be installed as accurately as possible as per the designs and drawings either vertically or to the specified batter. Greater care should be exercised in respect of installation of single pile or piles in two pile group. For vertical piles a deviation of 1.5 percent should not normally be exceeded. Piles should not deviate more than 75mm or D/10 whichever is more in case of piles having diameter more than 600mm from their designed positions at the working level of the piling rig. In the case of a single pile in a column positional tolerance should not be more than 50mm (100mm in case of piles having diameter more than 600mm)

4.03.03 For piles carried to substantial depth, the design should provide for the worst combination of the above tolerance in position and inclination. In case of piles deviating beyond these limits and to such an extent that the

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resulting eccentricity cannot be taken care of by a redesign of the pile cap and ties, the piles shall be replaced or supplemented by one or more additional piles, as directed by the Engineer, at no extra cost to the Owner.

- 4.03.04 Any deviation from the designed location, alignment or load capacity or any pile shall be noted and brought to the attention of the Engineer and rectification and supplemental works carried out to the satisfaction of the Engineer at no extra cost.
- 4.03.05 A minimum length of one meter of temporary casing shall be inserted in each bored pile unless otherwise specifically desired. Additional length of temporary casing may be used depending on the condition of the strata etc.
- 4.03.06 Drilling mud of suitable consistency may also be used instead of temporary casings for stabilizing sides of the holes.
- 4.03.07 In case, a bore hole is stabilized by drilling mud the bottom of the hole shall be cleaned very carefully before concreting work is taken upon. The cleaning of the hole is ensured by careful operation of boring tool and/or flushing of the drilling mud through the bottom of the hole. Flushing of bore holes before concreting with fresh drilling fluid/mud is preferred.
- 4.03.08 In case a hole is bored by use of drilling mud, the specific gravity of the mud suspension near about the bottom of the hole shall, whenever practicable, be determined by suitable slurry sampler and at suitable interval of piles and recorded. Consistency of the drilling mud suspension shall be controlled throughout the boring as well as concreting operations in order to keep the hole stabilized as well as to avoid concrete getting mixed up with the thicker suspension of the mud.
- 4.03.09 The concreting operations should not be taken up when the specific gravity of bottom slurry is more than 1.2. Concreting shall be done by tremie method in all such cases.
- 4.03.10 Deleted
- 4.03.11 In case, defective piles are formed, they shall be removed or left in place if so directed by the Engineer if these do not affect the performance of the adjacent piles or the cap as a whole. Additional piles shall be provided to replace them as directed by the Engineer.

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- 4.03.12 Any deviation from the designed location alignment or load capacity of any pile shall be noted and adequate measures taken well before the concreting, of the pile cap and plinth beam if the deviations are beyond the permissible limit.
- 4.03.13 During chipping of the pile top manual chipping may be permitted after three days of pile casting; pneumatic tools for chipping shall not be used before seven days after pile casting.
- 4.03.14 After concreting, the actual quantity of concrete shall be compared with the average obtained from observations actually made in the case of a few piles initially cast. If the actual quantity is found to be considerably less, special investigations shall be conducted and appropriate measures taken.
- 4.03.15 The bentonite suspension used for piling work shall satisfy the following requirements:
- The liquid limit of bentonite when tested in accordance with IS: 2720 (Part V) shall be more than 300 percent and less than 450 percent.
 - The sand content of the bentonite powder shall not be greater than 7 percent.
 - Bentonite solution should be made by mixing it with fresh water using pump for circulation. The density of the freshly prepared bentonite suspension shall be between 1.034 and 1.10 gm/ml depending upon the pile dimensions and type of soil in which piling is to be done. However the density of Bentonite suspension after mixing with deleterious materials in the bore holes may be up to 1.25 gm/ml.
 - The Marsh viscosity when tested by a Marsh cone shall be between 30 to 60 seconds.
 - The differential free swell shall be more than 540%.
 - The PH value shall be between 9 and 11.5.

4.04 **Data Recording**

The Contractor shall maintain register signed jointly by the

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Contractor/Engineer, giving the information for each pile in the approved Performa.

ANNEXURE - A

PILE INSTALLATION RECORDS

Pile No. :
Date of Piling:

Pile type : Driven/Bored cast-in-situ

Pile Dia : Pile capacity :

Location of Pile Date and time of
driving/boring

Date of casting

Concrete mix Test Cube Results
.....

Nature of founding Strata

Elevation of Ground Elevation of Cut
off level

Standing ground water level

Reinforcement Details

Any interruptions in the work (if so the details Yes/No

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shall be furnished)

DRIVEN PILES

Type of Hammer

Weight of Hammer Height of Fall

Number of Blows during last 25mm driving
.....

Set of 10 blows mm

Depth finally driven

Net length :

Total concrete quantity :

Quantity of Cement per m3

Extra cement added, if any

DETAILS OF PILE TEST

Pile type :

Pile No. :

Location of pile :

Pile dia :

Pile capacity :

Date of Casting :

Date of Testing :

Total blows :

Set in last 10 blows :

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Elevation of Driving :

Elevation of cut-off level :

Gross length from Elev. Of driving to
Bottom of Pile Shoes :

Net length :

Cement Consumed :

Reinforcement :

DETAILS OF TESTING JACKS

Jack Ram Dia : m

Load Applied on Ram : Ton

Dial Gauge 1 Div. : mm

DETAILS OF PILE TEST

(A) Loading Reading

Date	Time	Period	Load in Tons	<u>Deflection on load</u>				Average Reading	Gross Settle- ment(mm)	Remarks
				A	B	C	D			
1	2	3	4	5	6	7	8	9	10	11

(B) Unloading Reading

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1	2	3	4	5	6	7	8	9	10	11

[C] Loading Settlement Curve

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STANDARD TECHNICAL SPECIFICATIONS
FOR
FABRICATION OF STRUCTURAL STEEL

CONTENTS:

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3.	Fabrication
4.	Inspection
5.	Shop Matching
6.	Drilling Holes for Other Works
7.	Stairways and Intermediate Landing
8.	Handrails
9.	Chequered Plates & Gratings
10.	Marking of Members
11.	Errors
12.	Painting
13.	Methods of Measurement of Fabrication & Erection
14.	Final inspection – Fabrication check list
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1.0 General

1.1 This specification covers the general requirements for supply, where specified, fabrication and delivery at site and erection of structural and miscellaneous steel as specified elsewhere in this specification based on Design Drawings issued by the Purchaser/Engineer or based on Contractor's own drawings in case of lump sum contracts.

1.2 This specification also covers design of all connections and substituted members, preparation of shop fabrication drawings based on Design drawings issued by the Purchaser, redesign where necessary, inspection and painting of structures as specified.

2.0 APPLICABLE CODES AND SPECIFICATIONS

The following specifications, standards and codes are made a part of this specification. All standards, specifications, codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.

a) MATERIALS

1. IS:808 - Rolled Steel Beam, Channel and Angle Sections
2. IS:961 - Structural Steel (High Tensile)
3. IS:2062 - Structural Steel (Fusion Welding Quality)
4. IS:1977 - Structural Steel (Ordinary Quality)
5. ASTM A6 - General Requirements for Delivery of Rolled Steel Plates, Shapes Sheet Piling and Bars for Structural Use
6. IS:1383 - Black hexagonal Bolts, Nuts and Lock Nuts (diameter 6 or 39 mm) and Black hexagonal Screw (diameter 6 to 24mm)
7. IS:1364 - Precision and Semi-precision Hexagonal Bolts, Screws, Nuts and Lock Nuts (Diameter 6 to 39mm)
8. IS:1367 - Technical Supply Conditions for Threaded Fasteners.
9. IS:3757 - High Tensile Friction Grip Fasteners for Structural Engineering Purposes.

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10. BS.1083 - Precision Hexagonal Bolts, Screws and Nuts (BSW & BSF Threads)
11. BS.3139 - High Strength Friction Grip Bolts for Structural Engineering.
12. IS:2016 - Plain Washers.
13. IS:814 - Specification for Covered Electrodes for Metal Arc Welding for Mild Steel.
14. IS:3613 - Acceptance Tests for Wire Flux Combinations for Submerged - Arc Welding.
15. IS:1852 - Specification for Rolling and Cutting Tolerance for Hot Rolled Steel Products.

CODES OF PRACTICES

1. IS:800 - Code of Practice for Use of Structural Steel in General Bldg. Construction.
2. IS:875 - Code of Practice for Structural Safety of Building - Loading Standards.
3. IS:1893 - Recommendations for Earthquake Resistant Design of Structures.
4. IS:919 - Recommendations for Limits and Fits for Engineering.
5. IS:4000 - Code of Practice for high strength bolts in steel structures
6. IS:816 - Code of Practice for Use of Metal Arc Welding for General Construction.
7. IS:4353 - Recommendations for Submerged Arc Welding of Mild Steel and Low Alloy Steels.
8. IS:823 - Code of Procedure for Manual Metal Arc Welding of Mild Steel.

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9. IS:817- Code of Practice for Training and Testing of Metal Arc Welders.

10. IS:1181 - Qualifying Tests for Metal Arc Welders (engaged in welding structures other than pipes)

11. IS:1182 - Recommended Practice for Radiographic examination of Fusing Welded Butt Joints in Steel Plates.

12. IS:2595 - Code of Practice Radiographic Testing.

13. IS:3658 - Code of Practice for Liquid Penetrant flaw detection.

14. IS:5334 - Code of Practice for magnetic particle flaw detection of welds.

15. ASTM E94 - Recommended Practice for Radiographic Testing

16. ASTM E109 - Dry Powder Magnetic Particle Inspection.

17. ASTM E138 - Wet Magnetic Particle Inspection

18. ASTM E165 - Liquid Penetrant Inspection.

19 IS:1477 - Code of Practice for Painting of Ferrous Metals in buildings (Pretreatment & Painting)

20. IS:3757 - Specification for High Strength Structural Bolts.

21. IS:2075 - Ready Mixed Paint, Stoving, Red Oxide - Zinc Chrome Priming specification.

3.0 FABRICATION

3.1 General

All workmanship and finish shall be of the best quality and shall conform to IS:800 as well as other applicable codes as stipulated in the specifications. All materials shall be completely shop fabricated and finished with proper connections for ready assembly at site. All materials shall be finished straight

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and shall be machined true and square where so specified. All holes and edges shall be free of burrs. Shearing and chipping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Material at the shop shall be kept clean and protected from weather.

3.2 Connections

3.2.1 Shop connections shall be effected either by welding, or bolting as specified and /or on the ENGINEER'S design drawings.

3.2.2 However standard M.S. bolts to IS: 1363 may be used for field connections, for light members such as purlins, girts, staircase stringers, hand railings, and landing beams.

3.2.3 High tensile bolts shall comply with the requirements of BS.1083 R quality or its equivalent in IS: 4000.

3.2.4 Where necessary, tapered washers or flat washers or spring washers shall be used with bolts. In case of high strength friction grip bolts, hardened washers shall be used under the nuts or the heads depending upon whether the nuts or the heads are turned to tighten the bolts. The length of the bolt shall be such that at least one thread of the bolt projects beyond the nut, except in case of high strength friction grip bolts where this projection shall be at least three times the thread pitch.

3.2.5 In all cases where bearing is critical, the unthreaded bolt shall bear on the members assemblies. A washer of adequate thickness may be provided to exclude the threads from the bearing thickness, if a longer grip bolt has to be used for this purpose.

3.2.6 All connections and splices shall be designed for full strength of members or loads indicated unless otherwise approved. Column splices shall be designed for the full tensile strength of the minimum cross section at the splice. Unless otherwise specified, beams and connections shall be designed for capacity of the beam section plus additional axial forces, if any, shown on the ENGINEER'S design drawings.

3.2.7 All bolts, nuts washers, rivets, electrodes, screws etc. shall be supplied/brought to site in adequate quantity as per the requirement in each category and size. Rates of fabrication and erection shall cover the cost of this extra quantity not more than one shop splice shall be provided to make up the full length of a member. Splicing near the middle third portion of any beam should be avoided. Splicing shall be done after the approval of the Engineer.

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Gusset plates shall be at least 6mm thick for light structures like roof truss (up to 12 m spans), otherwise gusset plate of minimum 8mm thick shall be provided for all other connections.

Chequered plates shall be tack welded at adequate places, to supporting frame work below.

For any structural member, a minimum of 2 Nos. 16mm dia black bolts (IS: 1363) shall be used for bolted connections.

Beam column connection shall be based on 60% of maximum shear capacity of the section for the beam or the reaction of the beam whichever is greater.

Bracing member connection shall be suitable for 50% of maximum tensile capacity of the section for the loads whichever is greater.

For flexural members, at least ISA 50 x 50 x 6 or ISMC-75 shall be used as per IS: 800.

For axially loaded members in frame works, at least ISA 50 x 50 x 6 shall be used.

3.3 Straightening

Rolled material, before being worked, shall be straightened, unless otherwise required/specified. If straightening or flattening is necessary, it shall be done by methods that will not injure the material, long plates shall straightened by passing through a mangle or levelling rollers and structural shapes by the use of mechanical or hydraulic bar/section straightening machines. Heating or forging shall not be resorted to. Minor kinds of bends may be corrected by limited heating under careful supervision and with the prior approval of the Engineer in writing.

3.4 Cutting

3.4.1 Cutting may be by shearing, cropping, sawing or by gas cutting by mechanically controlled torch. Gas cutting by hand may only be used when specially authorised in writing by the Engineer in Charge. The edges of all plates shall be perfectly straight and uniform through out. Shearing, cropping and gas cutting shall be clean, square and free from distortion and burrs, and clean, square and free from distortion and burrs, and if found necessary the edges shall be ground afterwards by the contractor within the unit rates quoted by him.

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3.4.2 Grinding

All the edges cut by flame shall be ground before they are welded. Ends of all bearing stiffeners shall be ground to fit tightly at both top and bottom. The maximum permissible gap between the bearing stiffeners and the flanges shall be not more than 0.1 mm locally.

3.5 Rolling and Forming

Plates channels, R.S.J, etc. for circular bins, bunkers, hoppers gantry girders etc. shall be accurately laid off and rolled or formed to required profile/shapes as called for on the drawings. Adjacent sections shall be match marked to facilitate accurate assembly, welding and erection in the field.

3.6 Punching and Drilling

Holes in secondary members such as purlins, girts, lacing bars etc. may be punched full size through material not over 12mm thick. Holes for all other cut, without burr or ragged edges. Holes for all other connections shall be drilled accurately and the burrs removed effectively. Where several parts are to be connected to very close tolerances such parts shall be first assembled, tightly clamped together and drilled through.

3.6.2 Sub- punching may be permitted before assembly, provided the holes are punched 3mm smaller in diameter than the required size and reamed after assembly to the full diameter. The thickness of material punched shall not, even in such case, exceed 16mm.

3.6.3 When batch-drilling is carried out in one operation through two or more separable parts, these parts shall be separated after drilling and the burrs removed.

3.6.4 Holes for turned and fitted bolts shall be drilled to a slightly smaller diameter and reamed to a diameter equal to the nominal diameter of the shank or barrel subject to H8 tolerance specified in IS.919

3.6.5 Where reamed members are taken apart for shipping or handling, the respective pieces reamed together shall be so marked that they may be reassembled in the same position in the final setting up. No interchange of reamed parts will be permitted. Poor matching, over drilling, and ovality in holes shall be a cause for rejection. Burning holes for bolts with gas is strictly prohibited.

3.6.6 Wherever a horizontal member is likely to collect water suitable holes shall be provided for drainage.

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3.7 Bolting

3.7.1 Every bolt shall be provided with a steel washer under the nut so that no part of the threaded portion of the bolt is within the thickness of the parts bolted together.

3.7.2 Flat washers shall be circular with an out side diameter 3 times that of the bolt and of suitable thickness. Where bolt heads/nuts bear upon the bevelled surfaces they shall be provided with square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.

3.7.3 All bolts and nuts shall be of steel with a well formed hexagonal heads unless specified otherwise, forged from the solid and shall be dipped in hot boiled linseed oil as soon as they are made. The nuts shall be good fit on the bolts and two clear threads shall show through the nut when it has been finally tightened up. At least 6mm threaded portion of bolt shall project beyond the nut when it has been finally tightened up Not withstanding anything contrary contained in IS:1363 and IS:1367 the unthreaded length of the bolt shank shall be equal to total thickness of metal being bolted together plus 2mm. The threaded length shall be equal to at least the diameter of the bolt plus 6mm.

3.8 High Strength Friction Grip Bolting

3.8.1 High strength friction grip bolts and nuts shall conform to IS: 3757 and /or BS3139 and/or ASTM A325.

3.8.2 Installation of high strength friction grip bolts in joints shall comply with IS: 4000 and/or BS3294 and/or Specification for Structural Joints Using ASTM A325 or A490 Bolts by Research Council or Riveted and Bolted Structural Joints. The diameter of the bolt holes must not be more than 1.5mm larger than the nominal diameter of the bolt. All contact surfaces in a connection including those associated with the bolt heads, nuts and washers, shall be free of scale, burrs, dirt and other foreign matter tending to inhibit uniform sealing of the joint components. However, tight mill scale and the light residual oil coating on bolts, nuts and washers need not be removed.

3.8.3 All fasteners in a joint shall be tightened to a tension equal to or greater than the specified proof load shown in the following table, either by the calibrated wrench method or the turn-or-nut method.

BOLT SIZE	PROOF LOAD (KG)

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BOLTS TO
IS:3757-BC

BOLTS TO
IS:3757-10K

M16	9720	10790
M20	14700	17150
M22	18180	21210
M24	21180	23710
M27	27450	32130
M33	41640	48580

Tightening may be achieved by use of pneumatic powered impact wrenches, long-handled manual torque wrenches with or without torque multipliers or electric wrenches. A hardened washer shall be placed under the element being turned. Bolts shall be tightened at the most rigid portion of the joint, proceeding towards the free edges.

3.8.4 When using the calibrated wrench method, adjustable power impact wrenches and manual torque wrenches shall be calibrated to induce bolt tensions of 5 per cent in excess of the proof load values for each size of bolt to be used in the installation. Every wrench shall be calibrated by having it tighten a minimum of three bolts of the same diameter, in a hydraulic tension measuring device. Calibration shall be repeated whenever a wrench is required to tighten different size bolts, of at least once each working day if there is no change in the bolt size. Impact wrenches shall be set so as to stall or cut at the torque effort corresponding to the prescribed fastener tension. When manual torque wrenches are used the torque indication corresponding to the calibrating tension shall be determined and taken as the job standard. Torque measurements shall be read while the turned element is in tightening motion. As subsequent tightening of bolts in any particular assembly is liable to loosen bolts already tightened, all bolt must be "Touched up"

3.8.5 When using the turn of nut method a sufficient number of bolts must initially be "snuggled up" to bring the connection components into full contact, by either a standard power impact wrench or an ordinary spud wrench. Sung tight condition shall indicate the point at which the turned element ceases to rotate freely and impact wrench begins to impact or if common spud wrench is employed, sung tightness shall mean the position resulting from the full effort of a man. Subsequently, the remaining bolts in the joint shall also be brought to sing tightness. All nuts and projecting bolt points shall be match marked in this starting position and all bolts in the joint given the additional differential rotation prescribed in the relevant specifications for the bolt length and type of connection proceeding in an orderly fashion from the most rigid portion of the joint, towards the free edges.

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3.8.6 If the finger-tight condition is used as a starting point an extra full turn shall be taken to correspond to one half turn from the snug tight position.

3.8.7 Load indicating bolts or load indicating washers may be used if so approved by the ENGINEER in writing.

3.8.8 Inspection after tightening of bolts shall be carried out as stipulated in the appropriate standards depending upon the methods of tightening and the type of bolt used.

3.9 Welding

3.9.1 Electrodes for shielded arc manual welds shall comply with the requirements of IS: 814 and/or BS.634 and/or AWS A-5.1 and shall be of approved make.

3.9.2 The electrodes for manual arc welding shall be suitable for use in the position and type of work, as laid down in the above specifications and as recommended by the manufacturers. Electrodes classification group 1 or 2 as given in IS:814 shall be used for welding steel conforming to IS:2062 and electrodes shall conform to IS:1442 for steel conforming to IS:961. Joints in materials above 20mm thick and all important connections shall be made with low hydrogen electrodes.

3.9.3 The filter wire and flux combination for submerged arc welding shall conform to the requirements for the desired application as laid down in IS: 3613. The weld metal deposited by the submerged arc process shall have mechanical properties not less than that specified for American Welding Society's classification 5.17 F60 for Steel conforming to IS:2062 and AWS classification 5.17 F70 for steel to IS961.

3.9.4 Electrodes flux covering shall be sound and unbroken. Broken or damaged coating shall cause the electrodes to be discarded. Covered electrodes for manual arc welding shall be properly stored in an oven prior to use in a manner recommended by the MANUFACTURER and only an hour's quota shall be issued to each welder from the oven.

3.9.5 Electrodes larger than 5mm diameter shall not be used for root-runs in butt welds.

3.9.6 Welding plant and accessories shall have capacity adequate for the welding procedure laid down and shall satisfy appropriate Standards and be of approved make and quality the VENDOR/ CONTRACTOR shall maintain all welding

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plant good working order. All the electrical plant in connection with the welding operation shall be properly and adequately earthed and adequate means of measuring the current shall be provided.

3.9.7 All welds shall be made only by welders and welding operators who have been properly trained and previously qualified by tests to perform the type of work required as prescribed in the relevant applicable standards.

3.9.8 All welds shall be free from defects like blow holes, slag inclusions, lack of penetration, undercutting, cracks etc. All welds shall be cleaned of slag or flux and show under from sections, smoothness of weld metal, feather edges without overlap and freedom from porosity.

3.9.9 Fusion faces and surfaces adjacent to the joint for a distance of at least 50mm on either side shall be absolutely free from grease, paint, loose scales, moisture or any other substance which might interfere with welding or adversely affect the quality of the weld. Joint surfaces shall be smooth, uniform and free from fins, tears, laminations etc. Preparation of fusion faces shall be done in accordance with the approved fabrication drawings by shearing, chipping, machining or matching flame cutting except that shearing shall not be used for thickness over 8mm.

3.9.10 in the fabrication of cover-plated beams and built up members all shop splices in each component part shall be made before such component part is welded to other parts of the member. Wherever weld reinforcement interferes with proper fit up between components to be assembled for welding, these welds shall be ground flush prior to assembly.

3.9.11 Members to be joined by fillet welding shall be brought and held as close together as possible and in no event shall be separated by more than 3 mm. If the separation is 1.5 mm or greater the fillet weld size shall be increased by the amount of separation. This shall only apply in the case of continuous welds. The fit up of joints at contact surfaces which are not completely sealed by welds shall be close enough to exclude water after painting.

3.9.12 The separation between laying surfaces of lap joints and butt joints with backing plate shall not exceed 1.5 mm. Abutting parts to be butt welded shall be carefully aligned and the correct root gap maintained throughout the welding operation. Misalignments greater than 25 per cent of the smaller shall be corrected and in making the correction the parts shall not be drawing into a slope sharper than 2 degrees (1 in 27.5).

3.9.13 Prequalified welding procedures recommended by appropriate welding standards and known to provide satisfactory welds shall be followed. For non

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standard procedures, qualification tests as prescribed in ARE: 823 / ASME Sec. IX shall be made to verify the adequacy of the procedures. A welding procedure shall be prepared by the VENDOR/CONTRACTOR and submitted to the ENGINEER for approval before start of welding. This shall include all detail of weld procedure with reference to provisions of IS: 823 & IS: 4353 / ASME Sec. IX.

Approval of the welding procedure by the ENGINEER shall not relieve the CONTRACTOR of his responsibility for correct and should weld without undue distortion in the finished structure.

3.9.14 Submerged arc, automatic or semi-automatic welding shall generally be employed. Only where it is not practicable to use submerged arc welding manual arc welding may be resorted to.

3.9.15 Voltage and current (and polarity if direct current is used) shall be set according to the recommendations of the MANUFACTURE of the electrode being used and suitability to thickness of material, joint form etc.

3.9.16 The work shall be positioned for flat welding wherever practicable and overhead weld shall be avoided.

3.9.17 No welding shall be done when the surface of the members is wet nor during periods of high wind unless the welding operator and the work are properly protected.

3.9.18 In joints connected by fillet welds, the minimum sizes of single run fillet welds or first runs and minimum full sizes of fillet welds shall conform to the requirements of IS: 823

3.9.19 Fillet welds larger than 8mm shall be made with two or more passes.

3.9.20 All complete penetration butt welds made by manual arc welding, except when produced with the aid of backing material or welded in flat position, from both sides in square edge material not over 8mm thick with root opening not less than one half the thickness of the thinner part jointed, shall have the root of the initial layer gouged out on the back side before welding is started from that side, and shall be so welded as to secure sound metal and complete fusion throughout the entire cross section.

3.9.21 Butt welds shall be terminated at the ends of a joint in a manner that will ensure their soundness. Where abutting parts are 20mm or more in thickness run on and run off plates with similar edge preparation and having a width not less than the thickness of the thicker part joined shall be used. These extension pieces

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shall be removed upon completion of the weld end, the ends of the weld made smooth and flush with the abutting parts. Where the abutting parts are thinner than 20mm the extension pieces may be omitted but the ends of the butt welds shall then be chipped or gouged out to sound metal and side welded to fill up the ends to the required reinforcement.

3.9.22 Each layer of multiple layer weld except root and surface runs may be moderately peened with light blows from a blunt tool. Care shall be exercised to prevent scaling or flaking of weld and base metal from overweening.

3.9.23 No welding shall be done on base metal at a temperature below 5° C. Base metal shall be preheated to the temperature given in the table below prior to tack welding or welding. When base metal not otherwise required to be preheated, is at a temperature below 0°C it shall be preheated to at least 20° C prior to tack welding or welding. Preheating shall bring the surface of the base metal within 75mm of the point of welding to the specified preheat temperature, and this temperatures shall be maintained as minimum interpass temperature while welding is in progress.

Thickness of Minimum Preheat & Interpass
thickest part Temperature
at point of welding

	Other than low hydrogen welding electrodes		Low Hydrogen welding electrodes	
	IS:2062 Steel	IS:961 Steel	IS:2062 Steel	IS:961 Steel
Upto 20 mm incl.	None	Welding with this process	None	10°C
Over 20mm to 40mm Incl.	65°C	Not allowed	20°C	65°C
Over 40mm to 63mm Incl.	110°C		20°C	110°C
Over 63mm .	150°C	110°C		150°C

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3.9.24 Electrodes other than low-hydrogen electrodes shall not be permitted for thickness of 75mm and above.

3.9.25 Before commencing fabrication of a member or structure in which welding is likely to result in distortion and/or locked up stresses a complete programme of fabrication, assembly and welding shall be made and submitted to the ENGINEER for approval. Such a programme shall include, besides other appropriate details, full particulars in regard to the following:

Proposed pretending in components such as flanges and presetting of joints to offset expected distortion.

Make up of subassemblies proposed to be welded before incorporation in final assembly

Proposed joints forms, classification of wire and flux or covered electrodes, welding process including fitting and welding sequence with directions in which freedom of movement is to be allowed.

Proposed number, spacing and type of strong details of jigs and fixtures for maintaining proper fit up and alignment during welding

Any other special features like assembling similar members back to back or stress relief.

If so desired by the ENGINEER mock up welding shall be carried out at the VENDOR/CONTRACTOR'S cost of establish the efficacy of the proposed programme, with any modification suggested by the ENGINEER in limiting distortion or/and residual stress to acceptable levels. Such modification will not relieve the VENDOR/ CONTRACTOR of any of his responsibilities.

3.9.26 Inspection of welds. All welds shall be inspected for flaws by any of the methods described under clause 9 "Inspection". The choice of the method adopted shall be determined by the PURCHASER/ ENGINEER.

3.9.27 The VENDOR/CONTRACTOR shall quote separately for carrying out each test as called for in the schedule of quantities. The VENDOR/CONTRACTOR shall be paid only for tests which establish soundness of welds. In case the tests uncover defective work, such tests will be at the VENDOR/CONTRACTOR's cost and the VENDOR/CONTRACTOR shall correct such defects at his own cost, and prove the soundness of rectified work.

3.9.28 The correction of defective welds shall be carried out as directed by the

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ENGINEER without damaging the parent metal. When a crack in the weld is removed, magnetic particle inspection or any other equally positive means as prescribed by the ENGINEER shall be used to ensure that the whole of the crack and material up to 25mm beyond each end of the crack has been removed. Cost of all such tests and operations incidental to correction shall be to the VENDOR/ CONTRACTOR's account

3.10 The dimensional and weight tolerance for rolled shapes shall be in accordance with IS: 1852 for indigenous steel and equivalent applicable codes for imported steel. The acceptable limits for straightness (sweep and chamber) for rolled or fabricated members are:

Struts and columns	-	L/1000 or 10mm whichever is smaller
For all other members not primarily in compression such as purlins, girts, bracing and the web members of trusses and latticed girders	-	L/500 or 15mm whichever is smaller

Where L is the length of finished member of such lesser length as the ENGINEER may specify.

A limit for twist prior to erection in Box girders and Heavy Columns	-	L/1500
Other members	-	L/1000

The twist of the member between any two sections shall be measured with the web vertical at one of the sections.

The length of members with both ends finished for contract shall have a tolerance of $\pm = 1\text{mm}$

Members without ends finished for contact bearing shall have tolerance of $\pm 1.5\text{mm}$ for members up to 10metres long and a tolerance of $\pm 3\text{mm}$ for members over 10m in length.

3.10.1 End of Members

Beam to beam and beam to column connections - Where the abutting parts are to be jointed by butt welds, permissible deviation from the squareness of

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the end is :

Beams upto 600mm in depth - 1.5mm
Beams over 600 mm in depth - 1.5mm every 600mm depth to
a max. of 3mm

Where abutting parts are to be jointed by bolting through cleats or end plates, the connections require closer tolerance. Permissible deviation from the squareness of the end is:

Beams upto 600mm : 1mm per 600 mm of depth to a max. of 1.5mm

3.10.2 Butt Joints

For full bearing, two abutting ends of columns shall first be aligned to within 1 in 1000 of their combined length and then the following conditions shall be met:

Over at least 80% of the bearing surface the clearance between the surfaces does not exceed 0.1 mm

Over the remainder of the surfaces the clearance between the surfaces does not exceed 0.3mm.

Where web stiffeners are designed for full bearing on either the top flange or bottom flange or both, at least half the stiffener shall be in positive contact with the flange. The remainder of the contact face could have a max. gap of 0.25mm

3.10.3 Depth of Members

Acceptable deviation from the specified overall depth is:

For depth of 900 mm and under - +3mm
For depth over 900mm and under 1800mm- +5mm
For depths of 1800 and over - -5mm

3.10.4 Web Plates

An acceptable deviation from flatness in girder web in the length between the stiffeners or in a length equal to the girder depth shall be 1/150th of the total web depth

3.10.5 Flange Plates

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A reasonable limit for combined war page and till on the flanges of a built up member is 1/200 of the total width of flange or 3mm whichever is smaller measured with respect to centreline of flange. Lateral deviation between centreline of web plate and centreline of flange plate at contact surfaces, in the case of built up sections shall not exceed 3mm.

3.11 End Milling

Column ends bearing on each other or resting on base plates and compression joints designed for bearing shall be milled true and square to ensure proper bearing and alignment. Base plates shall also have their surface milled true and square.

4.0 INSPECTION

The VENDOR/CONTRACTOR shall give due notice to the PURCHASER/ENGINEER in advance of the materials or workmanship getting ready for inspection. All rejected material shall be promptly removed from the shop and material shall be promptly removed from the shop and replaced with new material for the PURCHASER/ENGINEER's approval/inspection. The fact that certain material has been accepted at the VENDOR/CONTRACTOR's shop shall not invalidate final rejection at site by the not invalidate final rejection at site by the PURCHASER/ENGINEER if it fails to be in proper condition or has fabrication inaccuracies which prevents proper assembly. No materials shall be painted or despatched to site without inspection and approval by the PURCHASER/ENGINEER unless such inspection is waived in writing by the ENGINEER.

4.1.2 Shop inspection by the ENGINEER or his authorised representative or submission of test certificates and acceptance thereof by the ENGINEER shall not relieve the VENDOR/CONTRACTOR from the responsibility of furnishing material conforming to the requirements of these specifications, not shall it invalidate any claim which the PURCHASER may make because of defective or unsatisfactory material and/or workman ship.

4.1.3 The VENDOR/CONTRACTOR shall provide all the testing and inspection services and facilities for shop work except where otherwise specified. The VENDOR/CONTRACTOR's inspection work shall be under the control of a competent Chief Inspector, whose primary responsibility is inspection, reporting to management and not to production departments.

4.1.4 For fabrication work carried out in the field the same standard of supervision and quality control shall be maintained as in shop fabricated work. Inspection and testing shall be conducted in a manner satisfactory to the ENGINEER.

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4.2 Inspection and tests on structural steel members shall be as set forth below:

4.2.1 Material Testing

If mill test reports are not available for any steel materials the same shall be got tested by the VENDOR/CONTRACTOR to the ENGINEER'S satisfaction to demonstrate conformity with the relevant specification.

4.3 Tests on Welds

4.3.1 Visual Inspection

100 percent of the welds shall be inspected visually for external defects. Dimensions of welds shall be checked. The length and size of weld shall be as per approved fabrication drawings. It may be slightly over sized but should not be under sized. The profile of weld is affected by the position of the joint but it should be uniform. In case of butt and corner welds, the profile shall be convex and in case of submerged arc fillet weld it shall be slightly concave. The welds should have regular height and width of beads. The height and spacing of ripples shall be uniform. The joints in the weld run where welding has been recommended shall as far as possible be smooth and should not show any humps or craters in the weld surface. Welds shall be free from unfilled craters on the surface, under cuts, slags on the surface and visible cracks. Such inspection shall be done after cleaning the weld surface and with steel wire brushes and chisel to remove the sputter metal, scales, slag etc. If external defects mentioned above are noticed there is every possibility of internal defects and further radiographic/ultrasonic examination shall be undertaken as per Indian standards. Weld gauges shall be used to measure the size of the welds.

4.3.2 Magnetic Particle Test (MPT)

Where root and intermediate passes of weld are examined by magnetic particle testing, such testing shall be carried out throughout its entire length in accordance with ASTM specification E-109. In the case of complete welds, such tests shall be carried out in accordance with ASTM specification E-109 or E-138 as directed by Engineer. If heat treatment is performed the completed weld shall be examined after the heat treatment. All defects shall be repaired and tested. Magnetic Particle Test shall be carried out using alternating current. Direct current may be used with the permission of Engineer.

4.3.2 Dye penetration/Liquid Penetrant Inspection

In the case of welds examined by Liquid Penetrant Inspection, such tests shall be carried out in accordance with IS: 3658. All defects shown shall be repaired and rechecked.

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4.3.3 Radiographic Inspection

All full strength butt welds shall be fully radiographed in accordance with the recommended practice for radiographic testing as per IS: 2595/ASTM E-94 and Part U.N. 53 of ASME Code Section VIII.

4.3.4 Rectification of Defective Welding Works

Wherever defects like improper penetration, extensive presence of blow holes, undercuts, cracking, slag inclusion, etc., are noticed by visual inspection/other tests, the welds in such location shall be removed by gouging process. The joints shall be prepared again by cleaning the burrs and residual matters with wire brushes and grinding, if necessary, and rewelded. The gouging shall as far as possible be done using gouging electrodes.

4.4 Dimensions, Workmanship and cleanliness

Members shall be inspected at all stages of fabrication and assembly to verify that dimensions, tolerances, alignment, surface finish and painting are in accordance with the requirements shown the VENDOR/CONTRACTOR's approved shop drawings and the ENGINEER's drawings.

4.5 Inspection or Test Failure

In the event of any failure of members to meet an inspection or test requirement, the VENDOR/CONTRACTOR shall notify the ENGINEER or his authorised representative. The VENDOR/CONTRACTOR must obtain permission from the ENGINEER BEFORE REPAIR IS UNDERTAKEN. The quality control procedures to be followed to ensure satisfactory repair shall be subjected to approval by the ENGINEER.

4.6 The ENGINEER has the right to specify additional inspection or testing as the deems necessary, and the additional cost of such testing will be borne by the PURCHASER.

5.0 SHOP MATCHING

Some steel work, particularly columns along with the tie beams/bracings may have to be shop assembled to ensure satisfactory fabrication, obtaining of adequate bearing areas etc. If so desired by the ENGINEER, at not extra cost to the PURCHASER.

6.0 DRILLING HOLES FOR OTHER WORKS

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Holes in members required for installing equipment or steel furnished by other manufacturers or other contractors shall be drilled at no extra cost to the PURCHASER, in the VENDOR/CONTRACTOR's shop as part of this contract, the information for which will be supplied by the PURCHASER/ENGINEER before fabrication

7.0 STAIRWAYS AND INTERMEDIATE LANDINGS

All stairways and intermediate landings show and/or listed on the drawings shall be fabricated as a complete unit and shall include grating treads, landing, hangers, brackets, struts, clips, bracings etc. as detailed or as necessary for connections to structural steel framing. The gratings shall be capable of sustaining a minimum safe live load of 500 kg./sq. meter of plan area unless otherwise specified on the ENGINEER'S design drawings and shall have a minimum thickness of 25mm. Treads and landings shall be suitable for the prescribed loadings and be furnished complete with a one piece standard non-slip abrasive nosing of approved type. The maximum width of openings in grating shall not exceed 40mm. The minimum thickness of main bars shall be 5mm. The usual span of grating will not generally exceed 1.5 metres. The usual span of gratings pattern shall be approved by the PURCHASER/ENGINEER.

8.0 HANDRAILS

8.1 Handrails shall be provided on open sides of platform, stairways and around all openings as shown on drawings. Handrails shall be of standard weight M.S. steel pipe of flush welded construction, ground smooth, using 32 mm nominal bore medium class pipe provided with double rail, top rail about 1 metre above platform level and pipe posts spaced not more than 1.50 metres apart. Angle handrail posts shall be provided only if specifically called for in the ENGINEER'S drawings.

8.2 Smooth uniform curves and bends shall be provided at stair returns and also wherever required/specified. Posts connected to curb plates shall have a neat closure at the bottom and a 6mm thick plate neatly welded to posts for attachments to curb plate. All necessary fittings including inner dowels at splices, brackets, bolts, bends, flanges and chains, where required shall be furnished by the VENDOR/CONTRACTOR. Open ends of all pipe posts shall be plugged and welded. A minimum radius of 3 times the pipe diameter shall be provided at all points of direction changes in the handrail.

8.3 The rate quoted for handrails, in item rate contracts, shall be per running metre of completed hand railing including posts, fittings, etc. It shall be

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clearly understood that individual lengths of runners, posts etc. will not be measured for purposes of payment.

9.0 CHEQUERED PLATES & GRATINGS

9.1 Chequered Plates

Chequered plates used shall be 6mm thick or as indicated on drawings and shall be capable of carrying a minimum live load of 400 kg/sq. meter unless other wise specified on design drawings. Chequered plate shall be fixed by 8 mm diameter cadmium plated M.S. Screws with counter sunk heads at a maximum spacing of 400mm. Members supporting the chequered plate shall have matching holes tapped in them or staggered welded on the supporting member. The Chequered plate pattern shall be approved by the PURCHASER/ENGINEER. Chequered plates may also be required to be welded to the structural steel framing. Where so required as per design the chequered plate may be stiffened by welding mild steel flats, angles or channels of suitable size underneath the chequered plate. The decision in this regard will be given by the PURCHASER/ ENGINEER.

9.2 Steel Gratings

All grating units shall be of 40 mm thickness rectangular in pattern and pressure locked assembly. The size and the spacing of the bearing bars and cross bars shall be as approved in detailed drawings.

The gratings shall be made up in panel units designed to coincide with the span of the structural steel framing as indicated in the drawings or as directed by the Engineer-in-Charge.

The grating units shall be accurately fabricated and finished free from warps twists or any defects that would impair their strength serviceability and appearance.

Grating work shall include cut outs and clearance openings for all columns, pipes, ducts, conduits or any other installation penetrating through the grating work. Such cut outs and clearances shall be treated as follows:

The gratings shall be notched, trimmed and neatly finished around flanges and webs of the columns, moment connections, cap plates and such other components of the steel structures encountered during the placement of the gratings. In all such cases, the trimming shall be done to follow the profile of the component encountered. After trimming, the binding strip shall be provided on the grating to suit the profile so obtained.

Opening in gratings for pipes or ducts that are 150 mm in size or diameter or

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larger shall be provided with steel bar toe plates of not less than 5 mm thickness and 100 mm width, set flush with the bottom of the bearing bars.

Penetrations in gratings that are more than 50 mm but less than 150 mm in size or diameter shall be banded with plates of the size shown in the detailed drawings set flush with the bottom of the grating panel.

Penetrations, in gratings that are less than 50 mm in size or diameter shall be cut in field by others.

Unless otherwise indicated on the drawings, grating units at all penetrations shall be made up in split section, accurately fitted and neatly finished to provide for proper assembly and erection at the job site.

Grating units shall be provided with all necessary clips, bolts, units and lock washers required for proper assembly and rigid installation and fastening to abutting units and supporting structural steel framing members.

All fabricated grating section and accessories shall be primed in the shop prior to erection at site.

Prior to painting all surfaces shall be cleaned, free from rust, mill-scale, grease, oil or any other foreign matter that might effect the adherence of the paint by sand blasting. While the primer shall be applied by spray guns or by brushes, the final coat of finished paint shall necessarily be applied by means of spray guns only.

The applied coatings shall be uniform, free from voids and streaks, drilled or punched holes shall be touched up prior to erection or assembly.

All gratings shall be designed to sustain a minimum live load of 500 kg/m² on the plan area unless otherwise specified. The usual span of gratings shall not exceed 1.5 meters

In case, the fabrication of gratings is done by the contractor at his own workshop outside the project, then the percentage quoted by him for the work shall be inclusive of transport of the fabricated materials from his shop to the project site. He shall also in such a cases provide all facilities and access to the Engineer-in-Charge or his representative to carry out inspection of the components being fabricated at his workshop during all stages of fabrication. Maximum deviation in linear dimensions from the approved dimension shall not exceed 12 mm. With prior approval of engineer-in-charge the contractor will be allowed to procure and erect the factory-fabricated gratings subject to their conformance to the technical specifications and drawings.

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10.0 MARKING OF MEMBERS

10.1 After checking and inspection, all members shall be marked for identification during erection. This mark shall correspond to distinguishing marks on approved erection drawings and shall be legibly painted and stamped on it. The erection mark shall be stamped with a metal dye with figures at least 20mm high and to such optimum depth as to be clearly visible, even after a member is galvanised.

10.2 All erection marks shall be on the outer surface of all sections and near one end, but clear of bolt holes. The marking shall be so stamped that they are easily discernible when sorting out members. The stamped marking shall be encircled boldly by a distinguishable paint to facilitate easy location.

10.3 Erection marks on like pieces shall be at identical locations. Members having lengths of 7.0 m or more shall have the erection mark at both ends.

10.4 In addition, colour code marking wherever specified in Section F shall be clearly painted on the member in the manner specified.

10.5 Separate colour code of identification mark shall be adopted for members fabricated from steel supplied by the PURCHASER AND VENDOR/CONTRACTOR.

11.0 ERRORS

Any error in shop work which prevents proper assembling and fitting up of parts in the field by moderate use of drift pins or moderate amount of reaming will be classified by the ENGINEER as defective workman ship.

All charges incurred by the PURCHASER/ENGINEER either directly or indirectly because of the poor workmanship will be deducted from the amount due to the VENDOR/CONTRACTOR before payment is made. The amount of such deduction will consists of the sum total of the costs of labour direct or indirect, material, plant, transportation, equipment rental and overhead expenses. In case the ENGINEER chooses to reject the material because of poor workmanship, the cost of all handling and returning the material shall be to the VENDOR/CONTRACTOR's account. All the replacement materials shall be supplied free and in all such cases, the cost of handling, transport and delivery to site shall be borne by the VENDOR/ CONTRACTOR.

12.0 PAINTING

12.1 Only branded paints (primer and finish both) from reputed manufacturers Berger / Asian / Shalimar / ICI shall be used. For any other brand the contractor shall obtain Engineer's prior written approval. Manufacturer's test certificates shall be

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obtained by Contractor and got approved from Engineer before making bulk purchases.

12.2 Prior to painting all surfaces shall be cleaned, free of rust, mill scale greases oil etc. that might effect the adherence of the paint by sand blasting, where so specified on drawings and directed by Engineer. The primer shall be applied by spray guns or by brushes, and the final coats of finished part shall be applied by brushes only.

12.3 The touch up primers shall be red oxide primer conforming to the requirements of IS specification No. IS: 2074.

12.4 The contents of paint drums shall be thoroughly mixed so that no material remains at the bottom before the paint is used and the paint shall be stirred at regular intervals while being applied.

12.5 The primers should not be diluted or thinned except as hereinafter specifically provided. Where the paint has thickened due to loss of solvent by evaporation in partially used tins, it may be brought to consistency suitable for applications, in consultation with the manufacturer who shall give all necessary information particularly with regard to the appropriate viscosity.

12.6 **Preparation of Surface**

12.6.1 The surface preparation shall be done in accordance with IS: 1477 (Part-I), Code of Practice for finishing of Ferrous Metals in Buildings: Painting and Allied Finishes Part-I Operation & Workmanship.

12.6.2 The surface shall be cleaned and degreased in accordance with one or more of the methods given in IS: 1477 (Part-I).

12.6.3 Wherever necessary, the surface shall be derusted and descaled either mechanically or chemically by one or more of the methods given in IS:1477 (Part-I) to the satisfaction of the Engineer-in-Charge.

12.6.4 While cleaning with power wire brush, care shall be taken not to do it excessively, since mill scale easily gets burnished to a smooth even surface to which paint does not adhere, and this will be detrimental to the performances of paint. All accessible weld flux and splatter shall be removed by power tools.

12.7 **Application of Priming Coat, Touch-up paint**

12.7.1 Primers should be applied by brushing. In areas which are difficult to reach either by brushing or spraying, daubers, mops or both may be used by dipping the same in paints and pulling or pushing them through the narrow spaces. The paint

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for primer shall be Zinc rich red oxide. One shop coat of above primer shall be applied on the structure as per manufacturer's specification after fabrication. The DFT of priming coat shall be 50 micron or as directed by the Engineer-in-charge.

12.7.2 During painting, the air temperature shall be well above the dew point and not less than 4.4 Deg.C and the relative humidity not greater than 80%. The time of painting shall be such that moisture does not condense on the structure before or during painting or until the paint is dry.

12.7.3 Primer coat shall be applied without any time lag after the precleaning or pre-treatment and care shall be taken to ensure that paint is not applied to damp surface (in early morning under humid conditions, dew etc.).

12.7.4 Surfaces of fabricated steel where shop priming coat has been removed or damaged during transit or defaced during welding shall be cleaned and applied with touch-up primer coat.

12.7.5 Surfaces to be permanently in contact shall receive a priming coat immediately prior to being jointed together at the works except where jointed by welding.

12.7.6 Machined, sliding or rocking surfaces of casting blocks, slabs or pins shall be coated with a mixture of white lead and tallow after the work has been inspected and approved by the Engineer- in-Charger.

12.7.7 The paint, on all contact surfaces, which was applied in the fabrication shop shall be carefully removed and a fresh coat of priming paint shall be applied to all surfaces in permanent contact and the surfaces shall be brought together while the paint is still wet.

12.7.8 All steel structures shall be provided with a second primer coat of DFT 50 microns after erection but prior to final painting with paint of approved make and colour.

12.8 Protection of Works

12.8.1 The contractor shall provide and use sufficient number of drop cloths, covers, tarpaulin and other screens to protect adjacent surfaces and shall remove all spatter and stains from such surfaces. The contractor shall also protect his own work.

12.8.2 All damage to adjacent work or any part of the premises due to carelessness during painting or accidental spilling, smearing etc., shall be repaired or made good at the contractor's expense.

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12.8.3 Painting shall be discontinued during rain and dust storms and shall not commence until the surfaces are perfectly dry and clean. Wherever practicable, surfaces shall be painted when in shade or when the temperature is falling.

12.8.4 Welds and adjacent parent metal shall not be painted or touched up prior to de-slagging, inspection and approval.

12.8.5 Parts of the steel structures to be encased in concrete shall not be painted.

12.8.6 After touching up one additional coat of primer shall be applied over the erected steel work.

12.9 Finish painting

12.9.1 Paint to be used shall be synthetic enamel paint conforming to IS:2932. The brand and colour/shade shall be as approved by the Engineer.

12.9.2 Painting shall be carried out in two coats consisting of one under coat and one subsequent coat. The DFT of each finishing coat shall be 75-100 microns or as directed by the Engineer-in-charge. However the total DFT of painting shall not be less than 250 micron.

12.9.3 The primer coat shall be dry out without scratching or in any way damaging the primer coats and the surface shall be cleared from dust. Over this dry surface an optimum coat of under coating of synthetic enamel paint shall be applied. The under coat shall be allowed to dry hard.

12.9.4 Paint shall be applied by brushing except for gratings for which reference may be made to clause 10.12 and 10.13 of this section. It shall be ensured that brush marks are a minimum and the requirements of workmanship is as specified in IS: 1477.

12.9.5 Paint shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mixed type in original sealed container as packed by the main manufacturer and no thinners shall be permitted.

12.9.6 No painting shall be done in frosty/foggy weather, when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is 4.4 Deg.C or lower.

12.9.7 Surfaces in-accessible after assembly shall receive an additional coat

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of the specified primer prior to assembly.

13.0 METHOD OF MEASUREMENT OF FABRICATION AND ERECTION (For Item Rate Contracts Only)

13.1 For the purpose of payment, the weight of the actual, completed structures shall be calculated from the approved drawings for different items of work. The VENDOR/CONTRACTOR shall submit to the PURCHASER relevant material list containing weight of each item.

13.2 Weight of bolts and welds shall not be taken into account in calculating the weight of the completed structure. No allowances will be permitted for galvanising, welding or for rolling margins. One tonne for the purpose of payment shall mean ONE METRIC TONNE i.e. 1000 kg.

13.3 The weight of a member made out of standard rolled section such as beam, channels, angles etc. shall be based on the standards IS book weight of the member, without deducting for holes, notches, level cuts etc. The length shall be taken as distance between planes normal to the axis of the member passing through the extreme points of the section. Where a component consists of a cut joint or channels, the full weight of the rolled section shall be considered only if more than half the section unit weight shall be considered for calculation of the weight of the component. Deductions shall be made in the weight of gussets/plates for skew cuts and notches of 900 sq.cm. Or larger.

13.4 For gussets/plates used in trusses, bracings columns, beams etc. the area shall be that of the minimum circumscribing rectangle except as stated in 18.3 above.

13.5 The weight of any built up member shall be separated in the weight of each component.

13.6 For the bunkers, if applicable, hopper wall plates and Stainless steel lining, the minimum circumscribing rectangle of the individual plates out of which these wall plates are assembled by butt welding shall be measured.

14.0 FINAL INSPECTION – FABRICATION CHECK LIST

Dimensional checks shall be as given in the table below :

Tolerable deviations from designated linear dimensions in mm in the parts processed for fabrication :

S.	Characterstics	DEVIATIONS / TPLERANCE (mm)

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No.		1.5 m & Below	1.5 m to 2.5 m	2.5 m to 4.5 m	4.5 m to 9.0 m	9.0 m to 15.0 m	15.0 m to above
1 a.	Deviations in length and width of part cut out by :						
i.	Manual gas cutting	2.5	3.0	3.5	4.0	4.5	5.0
ii.	Gas cutting by automatic and semi- automatic machines	1.5	2.0	2.5	3.0	3.5	4.0
iii.	Shear or saw cutting	1.5	2.0	2.5	3.0	3.5	4.0
iv.	Parts machined by edge – planning or milling machine	0.5	1.0	1.5	2.0	2.5	3.0
1 b.	Difference in diagonal lengths of sheet parts :						
i.	For butt welding	-	-	4.0	5.0	6.0	-
ii.	For lap welding	-	-	5.0	8.0	10.0	-
1 c.	Deviation in distances between hole centres formed as per :						
i.	Marking of extreme ones	2.0	2.0	2.5	3.0	3.5	4.0
ii.	Marking of adjacent ones	1.5	-	-	-	-	-
2.	Deviation in the dimensions of structural despatch members after finishing :						
a.	When assembled upon assembly benches as per marking	3.0	4.0	5.0	7.0	10.0	15.0
b.	When assembled in the jig and other devices with fastening of fixtures	2.0	2.0	3.0	5.0	7.0	10.0
c.	Dimensions (lengths and breath) between milled surfaces (after finishing)	0.5	1.0	1.5	2.0	2.5	3.0
3.	Distance between groups of erection holes (in finished members) :						
a.	Formed during machining of separate parts, installed when assembling as per marking	3.0	4.0	5.0	7.0	10.0	15.0
b.	Formed during	2.0	2.0	3.0	5.0	7.0	10.0

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S. No.	Characterstics	DEVIATIONS / TPLERANCE (mm)					
		1.5 m & Below	1.5 m to 2.5 m	2.5 m to 4.5 m	4.5 m to 9.0 m	9.0 m to 15.0 m	15.0 m to above
	machining of separate parts, installed when assembling with the help of fixtures						
c.	Drilled with the help of templates in finished members	0.5	1.0	1.5	2.0	2.5	4.0

Tolerable deviations of fabricated members from designed geometrical shapes :

S.NO.	CHARACTERISTICS	DEVIATION/ TOLERANCE	REMARKS
1.	Curvature of assembly parts		
a.	Gap between a sheet and steel rule face over 1 m length	1.5 m	
b.	Gap between a taut string and vertex face of an angle flange or web of channel and joist	0.001 L, but not greater than 10 mm	L – Length of member
2.	Deviation of edge line of sheet parts from theoretical profiles :		
a.	During butt and tee welding	2 mm	
b.	During lap welding	5 mm	
3.	Deviation of radius of the bend :		
a.	Clearance between template and the surface of rolled sheet flange or face of cold bent profile	2 mm	Template length (along with curve 1 to 5 m)
b.	Clearance between template and the surface of rolled sheet flange or face of cold bent profile for hot bent profile	3 mm	Template length (along the curve 1 to 5 m)
c.	Ellipticity (difference of diameters) in space sheet structures	0.005 D	(D-diameter of Circle)
d.	Ellipticity (difference of diameter) in space sheet structures in erection joints	0.003D	(D-diameter of Circle)

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4.	Deformation of despatch members :		
a.	Inclination of flanges with the web:		
i.	Junction point	0.005 b	(b–width of flange)
ii.	At other places	0.01 b	b- width of flange
b.	Transverse bending of flanges:		
i.	At junction point with other members	0.005 b	b–width of flange
ii.	At other places	0.01 b	b – width of flange
c.	Warping of the web	0.003 h	h – depth of web
d.	Sag of member	L/750 but of more than 15 mm	L – length of the member
5.	Other deviations :		
a.	Shifting of axes of riveting/ bolting lines for lattice structures from theoretical (eccentricity)	3.0 mm	
b.	Inclination of the milled surface from designed position	1/1500	

Acceptable deviations in “As fabricated Steel structures“:

S.NO.	CHARACTERISTICS	DEVIATION/ TOLERANCE
1.	Columns	
a.	Deviation in length ‘L’ as measured distance from bottom surface of the column footings to the group of holes trusses, fasteners, collar, beams, purlins and other elements to be connected to column	
	When L is under 10 m	+/- 10 mm
	When L is over 10 m	+/- 15 mm
b.	Deviation in distance ‘L’ from bottom surface of the column footing to the top of crane bracket.	
	When L is under 10 m	+/- 5 mm
	When L is over 10 m	+/- 10 mm
c.	Deviation in distance from bearing surface of the bracket to the first fastener of the element to be connected to column	+/- 1 mm
d.	Deviation in distance between any group of holes for	+/- 2 mm

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S.NO.	CHARACTERISTICS	DEVIATION/ TOLERANCE
	connection of bracings to column	
e.	Sag of column element (curvature)	1/1000 of length element but not more than 15 mm
f.	Difference in web depth of column	
	At splice point	+/- 2 mm
	At another point	+/- 10 mm
g.	Deviation in distance from supporting surface of milled end of the despatch element of column to the cleat of seating plate for fastening of collar, beams, purlins, girders etc. (Fish plates, brackets)	+/- 3 mm
2.	Trusses	
a.	Deviation in span 'L' of the truss between end erection holes in gussets of supporting units or between external planes of supporting gussets or angles when trusses are resting on brackets or supports.	
	When L is under 25 m	+/- 7 mm
	When L is over 25 m	L/2500 but not more than 10 mm
b.	Deviation in distance between the centre of holes of webs of angles for fastening bracing, purlins, monitors etc.	+/- 1 mm
c.	Deviation in distance between the first row of erection holes and the bearing surface at cleat or seating plate.	+/- 1 mm
d.	Distance between holes for fasteners of top and bottom chords of trusses on supports.	+/- 3 mm
e.	Sag of separate elements between node points.	1/1500 of length but not more than 10 mm
3 a.	Deviation in span L of beams between end erection holes, outer surfaces of end plates	
	When L is under 25 m	+/- 10 mm
	When L is over 25 m	+/- 1/2500 of length but not more than 15 mm
b.	Deviation in the height of beam as measured from the bearing surface to the top of upper flange.	+/- 3 mm

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S.NO.	CHARACTERISTICS	DEVIATION/ TOLERANCE
c.	Deviation in distance between the group of holes for fastening of purlins, monitors, bracings, bracing grids etc.	+/- 3 mm
d.	Sag (curvature) of the girder despatch member	1/1000 of length but not more than 15 mm
4.	Elements Of Frame Work Bracing, Purlins Etc.	
a.	Deviation in distance between end erection holes determining the span of element.	+/- 3 mm
b.	Sag of despatch members	1/1000 length but not more than 15 mm
c.	Deviation in distance between the group of erection holes of the element	+/-3mm
5.	Shop Assembly (Before Despatch For Erection)	
a.	Columns weighing more than 20 t	i) Every first and further every tenth set of identical structure to be put for control assembly. ii) Number of erection bolts shall be 30% of the total number of holes
b.	Trusses of 30 m or more span	-do-

15.0 WELDING PROCEDURE DATA SHEET

Welding procedure data sheets shall be maintained in typical format as under:

WELDING PROCEDURE DATA SHEET

Contractor

Address

Quality of weld metal

Specification.....

Inspection and Test Schedule

Specification

Material Specification

Thickness

Batch / Cast No

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Joint preparation (Fig)
 Gap.....
 Location of Specimens

 Weather conditions

 Times of day

 Wind break used
 Electrode Group No.

 Make

 Specimen

 Pre and Post – Heating

 Size of reinforcement

 Whether removed

 Weldingsequence.....

 Backing strip used

 Type

 Welding process

 Current Conditions

 Polarity

 Size of electrode

 Amperage and Voltage

 Number of Electrodes used per run

 Cleaning Method

 Remarks

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Welding Engineer

(Inspecting Authority)

Signature

For and on behalf of Contractor

Date :

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16.0 PAINTING CHECK LIST :

SL. NO.	DESCRIPTION	SURFACE PREPARATION		PRIMER		MEDIATE COAT	FINISH COAT	FINAL FINISH COAT	REMARKS
		BLAST CLEANING	MANUAL CLEANING	ZINC PHOSPHATE	ZINC SILICATE				
1.	Structural steel works	Yes			Yes	Yes	Yes	Yes	
2.	Grating for track hopper	Yes			Yes	Yes	Yes	Yes	
3.	MS Grating		Yes	Yes		Yes	Yes	Yes	**
4.	Chequered plate	Yes			Yes	Yes	Yes	Yes	
5.	Hand rail	Yes			Yes	Yes	Yes	Yes	
6.	Staircase	Yes			Yes	Yes	Yes	Yes	
7.	MS Louvers		Yes	Yes		Yes	Yes	Yes	**
8.	Monorail door	Yes			Yes	Yes	Yes	Yes	
9.	MS Plates	Yes			Yes	Yes	Yes	Yes	
10.	Rail (105lb)								
11.	Rail clamp								
12.	For 12 G seal plate	Yes			Yes	Yes	Yes	Yes	
13.	600 Dia MS dust chuit	Yes			Yes	Yes	Yes	Yes	
14.	Roller / Sliding PTEF bearing								
15.	Monorail								
16.	Translucent Sheet								
17.	Foundation Bolts		Yes	Yes					*
18.	Insert Plates		Yes	Yes					*

* Embedded in concrete
** Sand blasting not possible

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17.0 FIELD QUALITY PLAN

The field quality plan shall be as under:

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I.	STRUCTURAL							
1.	PRIOR TO FABRICATION							
a)	STEEL MATERIALS:							
	i) Steel supplied by Contractor Physical & Chemical Properties	Review of correlated physical and chemical properties for manufacturer's test certificates	As per relevant IS Code	A	Each Lot.	IS Code 2062, 8500, Technical specification	Correlated Mill Test Certificate	If Correlated Mill Test report not available then the mater be got tested to conformity with relevant IS Codes and Technical Specification
	ii) Plate 40mm thick and above to check laminations	Ultrasonic test	NDT (UT) Equipment	A	100%	ASTMA 435	Mill Test Report	
	iii) Storage	Visual		B	100%	Relevant IS Codes &	Site Register / Log Book	



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						Technical Specification		
	iv) Visual examination to ensure free from scales, rust, cracks, surface flaws laminations & imperfect edges.	Visual & Measurement	Measuring Tape	B	100%	IS Code 2062, 8500, Technical Specification & Approved Drg.	Site Register / Log Book	
b.	FILLER MATERIALS :							
	i) Electrodes	Review of TCs	As per relevant IS Code of Welding Procedure	A	Each Lot	Preferable Electrode E7018	Manufactures test certificate	
	ii) Visual examination to ensure sound & unbroken electrode flux	Visual	-	B	Random	Technical specification	Site register / Log Book	-
	iii) Welding test	Physical test	As per relevant IS Code	B	Once per approved brand & quality of electrodes	IS Code 4353, 3613, 814 & Technical specifications	Site Register / Log Book	To be procured from the manufactures approved by BHEL. If Test Certificate is



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								not available then the material shall be got tested to prove conformity with the relevant IS codes.
c)	Welding Procedures and Welders Performance & Qualification	Visual Physical test	Testing as per ASME IX / AWS D1.1	A	100%	AWSD 1.1 / ASME IX	Site Register / Log Boom / Test Record	WPS to be furnished for BHEL approval
d)	WELDING EQUIPMENT & ACCESSORIES :							
	i) Capacity & Rating	Visual	As per Requirement	B	Random	As per BHEL Stipulation & Welding Procedure approved.	Site Register / Log Book	
	ii) Proper measuring means	Visual			Random			



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	iii) Proper arrangement	Visual			Random			
2.	DURING FABRICATION							
a.	Structural Material	Visual & Measurement	Measuring Tape Vernier Caliber	B	100%	IS Codes, Technical Specifications & Approves Drg.	Site Register /Log Book	
b.	Dimensional and lift up checks	Visual & Measurement	Measuring Tape Vernier Caliber	B	100%	IS Codes, Technical Specifications & Approves Drg.	Site Register /Log Book	
c.	Check for defects like blow holes, slag inclusions, lack of penetration, undercutting, cracks in the weld.	Visual & Physical	Visual Exam DPT Macroetch Exam NDT (RT /UT)	A A A A	100% 10% / 100% for main fillet weld 10%/100%	AWSD 1.1 AWSD 1.1 AWSD 1.1 AWSD 1.1	Site Register / Log Book Test Report	10% for fillet weld 100% for Butt weld On Butt weld (10% on Comp. Zone) (100% on tension zone)



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d.	Check on Tack Assembly set up							
	i) Bevel	Measurement	Measuring Tape & Vernier caliper	B	100%	As per approved drgs and Technical specification	Site Register /Log Book	Tolerance shall be within the limit specified in BHEL Specification.
	ii) Gap	Measurement	-do-	B	100%	-do-	-do-	
	iii) Off setting	Measurement	-do-	B	100%	-do-	-do-	
	iv) Shrinkage allowance	Measurement	-do-	B	100%	-do-	-do-	
	v) Fitment sequence	Measurement	-do-	B	100%	-do-	-do-	
	vi) Principal overall size	Measurement	Measuring Tape & Vernier caliper	B	100%	-do-	-do-	



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e.	Inspection of Main welds of principle components (Shop & Site Welds)							
	i) Fillet Welds	Visual & Physical	Visual exam Size DPT Macroetch Exam	A A A A	100% 100% 10% For main fillet weld	As per AWS D 1.1 and Tech. Specs. / Approved Drgs.	Site Register / Log Book	
	ii) Butt welds	Visual & Physical	Visual exam DPT NDT (RT/UT) -do-	A A A A	100% 100% 10% 1005	As per AWS D 1.1 and Tech. Specs. / Approved Drgs.	Site Register / Log Book	10% RT / UT test on compression Zone and 100% RT / UT test on tension zone. (Ultrasonic test shall be carried out where radiography test is not possible)
f.	Cleaning & Priming	Visual	--	B	Random	As approved Drgs. & Technical	Site Register / Log Book	



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						specification		
g.	Application of shop coat Dry film thickness	Visual & measurement	--	B	Random	As approved Drgs. & Technical specification	Site Register / Log Book	
3.	DURING ERECTION							
a.	Lifting arrangement	Visual	--	B	100%	As per Erection Scheme	Site Register / Log Book	
b.	Correctness of location & Anchor Bolts	Measurement	Measuring Tape Theodolite	B	100%	As per Erection Scheme	Site Register / Log Book	
c.	Correctness of Member No.	Visual	-	B	100%		Site Register / Log Book	
d.	Orientation Bracing Legs	Visual		B	100%		Site Register / Log Book	
e.	Alignment & levels	Physical	Theodolite Levelling M/c	B	100%		Site Register / Log Book	Tolerance shall be within limit specified in Technical Specs.

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f.	Field Welding if any	Visual	--	B	As per Sl. No. 2 (e)	As per approved drawings & Technical specifications and welding procedures.	Site Register / Log Book	
g.	Grouting	Visual	--	B	100%	-- DO --	Site Register / Log Book	
h.	Final Coat of Paint & DFT	Visual , Measurement	--	B	Random	-- DO --	Site Register / Log Book	

Note :

Class checks to be witnessed by BHEL associating exccuting Deptt.

Class checks to be witnessed by BHEL.

Class checks to be checked by contractor, surveillance by BHEL.

All works and inspection & testing shall be done as per this approved FQP, BHEL technical spec. / BOQ / Relevant IS code and approved drawings and this document should be read in conjunction with BHEL tech. Spec.

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STANDARD TECHNICAL SPECIFICATIONS
FOR
:- ROADS, DRAINS & CULVERTS :-

CONTENTS :

Clause	Description
1.0	General
2.0	Roads
2.01	Scope
2.02	General
2.03	Quality Control:
2.04	Codes and Standards
2.05	Earthwork
2.06	Asphalt Surfacing
2.07	Seal Coat
3.0	Drains/Culverts
4.0	Drains
5.0	Supplying, Laying and Fixing in Position RCC Pipes

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1.00 General

The scope of work covered by this specification shall comprise of :

1.01 A. Roads, Drains and Culverts

- i) Excavation in all types of soils for drains/roads/culverts.
- ii) Preparation of subgrade, subbase, base and Asphalt surfacing for roads in accordance with relevant IRC codes
- iii) Grade the areas around the drains to augment the flow of surface water into the drains and subsequent disposal.
- iv) For crossing of drains, pipes, cable trenches etc. suitable culverts shall be provided.

1.02 B. Miscellaneous Works

All other works required for the satisfactory completion of the subject works, even though not specifically mentioned herein.

2.00 ROADS

2.01 Scope

The contractor shall furnish all labour, materials and equipments required for the construction of all embankments and roads as per these specifications and those prescribed by Indian Road Congress.

2.02 General

- a) All road shall be constructed in accordance with IRC 37, IRC 19.
- b) The roads shall be of width as shown on drawings with shoulders on both sides.

2.03 Quality Control:

- 2.03.1 The Contractor shall establish and maintain quality control for the various aspect of the work, method, materials and equipment used. All works performed shall conform to the lines, grades, cross sections and

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dimensions shown on the drawings or as directed by the Engineer.

2.03.2 Permitted tolerances for road works are described hereinafter.

I) **Horizontal Alignment:**

Horizontal alignments shall be reckoned with respect to the centre line of the carriageway as shown on the approved drawings. The edges of the carriageway as constructed shall be correct within a tolerance of ± 25 mm there from. The corresponding tolerance for edges of the roadway and lower layers of pavement shall be ± 40 mm.

II) **Longitudinal Profile:**

The levels of the sub grade and different pavement courses as constructed shall not vary from those calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer, and shall not exceed the tolerances mentioned below:

Sub-grade ± 25 mm

Sub-base ± 20 mm

Base course ± 15 mm

Wearing course ± 10 mm

Tolerance in wearing course shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6 mm.

III) **Surface Regularity of Subgrade and Pavement Courses:**

The surface regularity of completed sub-bases, base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated In Table-1.

The longitudinal profile shall be checked with a 3 metre long straight edge, at the middle of each traffic lane along a line parallel to the centre of the road. The transverse profile shall be checked with a set of three camber boards at interval of 10 m.

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TABLE – I

**PERMITTED TOLERANCE OF SURFACE REGULARITY
FOR PAVEMENT COURSES**

	Type of Construction	Longitudinal Profile with 3 metres Straight Edge					Cross Profile
		Maximum Permissible Undulation (mm)	Maximum number of undulations permitted in any 300 meters length exceeding : (mm)				Maximum Permissible Variation from Specified profile under camber template (mm)
			18	12	10	6	
1	2	3	4	5	6	7	8
1	Earthen sub-grade	25	30	-	-	-	15
2	Granular sub-base	15	-	30	-	-	12
3	Water Bound Macadam with Oversize metal (45-90mm size)	15	-	30	-	-	12
4	Water Bound Macadam with normal size metal (22.4 -53mm size and 45-63 mm size),	12	-	-	30	-	8
5	Premix carpet, mix-seal surfacing	10	-	-	-	30	6
6	Asphaltic concrete	8	-	-	-	10***	4
7	Bituminous macadam	10	-	-	-	20***	6

NOTES:

- 1.*** These are for machine laid surfaces. If laid manually due to unavoidable reasons, tolerance upto 50 percent above these values in this column may be permitted at the discretion of the Engineer. However, this relaxation does not apply to the values of maximum undulation for longitudinal and cross profiles mentioned in columns 3 and 8 on the table.

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2. Surface evenness requirements in respect of both the longitudinal and cross profiles should be simultaneously satisfied.

2.04 Codes and Standards

All work under this specification unless specified otherwise, shall conform to the latest revision and/or replacements of the following or any other relevant I.S. Specifications and Codes of Practice.

Specification for road and bridge works of Ministry of surface & Transport Published by the IRC.

- a) IRC-19 Standard specifications and Code of Practice for Water Bound Macadam.
- b) IRC: SP-11 Hand Book of Quality Control for Construction of Roads and Runways.
- c) IS:456 Indian Standard Code of Practice for Plain and Reinforced Concrete
- d) IS:2212 Code of Practice for Brickwork.
- e) IS:783 Code of Practice for Laying of Concrete Pipes.
- f) IS:73 Specification for paving bitumen.
- g) IS:215 Road Tar specification
- h) IS:217 Specification of cutback Bitumen
- i) IS:454 Cutback bitumen from waxy crude -Specification
- j) IS:460 Specification for test sieves: Part I Wire cloth test sieves
- k) IS: 1077 Common burnt clay Building bricks
- l) IS:1124 Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones.
- m) IS:1195 Specification for bitumen mastic flooring

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- n) IS:1834 Specification for hot applied sealing compound for Joints in concrete
- o) IS:2386 Methods of tests for aggregates for concrete
- p) IS:2720 Methods for test for soils
- q) IS:6241 Method of Test for Determination of Stripping value of road aggregates
- r) IRC:16 Specification for Priming of Base Course with Bituminous Primers
- s) IRC:17 Tentative Specifications for Single Coat Bituminous Surface Dressing
- t) IRC:29 Specification of Bituminous Concrete(Asphaltic Concrete) for Road pavement
- u) IRC:37 Guidelines for the Design of Flexible Pavements.
- v) Other specifications mentioned elsewhere in this specification.

In case any particular aspect of work is not covered specifically by the specification / Indian Standard Specification, any other standard practices as may be specified by the Engineer shall be followed.

2.05 **Earth Work**

2.05.01 **Earth Work in excavation**

Excavation shall include cutting or loosening and removing earth including rock from its original position, transporting and dumping it as a fill or spoil bank. Earth work excavation work shall be divided as excavation or cutting, grading and compaction. The depth of excavation is decided on the requirement of vertical profile of the Road. The slope to be provided is governed by the type of soil and the depth of the cutting. Construction of side drains, where applicable; also require excavations along road side. Sides and bottom of excavation shall be cut sharp and the under-cuttings will not be permitted. The bottom of excavation shall be trimmed to the required levels by chiseling and when carried out deeper by error shall be brought to level by compacted

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backfill to the satisfaction of the Engineer at the cost of the Contractor.

2.05.02 **Earth Work in Embankment**

- a) When it is required to raise the grade line of Road above the existing ground level it may be necessary to construct embankment.
- b) The embankment shall be formed of earth obtained either from borrow pits or from places as directed by the Owner/Consultant.
- c) The height of the embankment shall depend on the desired grade line of the Road and the soil profile or topography. It also governed by stability of slopes, particularly when the foundation soil is weak.
- d) Before commencing any embankment, the foot of the slope of each side shall be marked by pegs driven into ground at interval of 5 meter or by a continuous dag-belling to indicate the limits of side slopes. Earth profiles shall then be set up for guidance of the workers at intervals along the embankment. These profiles shall show the total height of the embankment with due allowance for settlement.
- e) Before placing any embankment material, after clearing and grubbing, the top 150 mm of soil strata receiving it shall be scarified, watered and compacted with 8-10T roller so as to achieve minimum dry density of 95% as per IS:2720 (part 8). No mud, slush or decayed matter of any kind shall be used. Embankment shall be raised in regular layers not exceeding 150mm thick. They shall be carried out to the full width upto the slopes, so that no additional earth is required for the slope. Clods above 75mm shall be broken up.
- f) Each layer of earth shall be adequately watered to aid compaction. Each layer shall be rolled not less than 6 times with roller of minimum 8-10 tonne weight till it gets evenly and densely consolidated. Each layer below top 500 mm thick subgrade shall be compacted to a minimum of 95% maximum dry density where as each layer in the top 500 mm thick subgrade shall be compacted to a minimum of 97% maximum dry density. Where roller cannot work, the earth shall be consolidated with wooden or steel rammers of 7 to 10 kilograms weight having a base of

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200mm square; or 200mm diameter. The labour for ramming shall be atleast one rammer to six (6) diggers. Before placing the next layer, the surface of the underlayer shall be moistened and scarified with pick axes or shades, so as to provide a satisfactory bond with the next layer. The top of embankment shall be brought to the proposed levels and shall be neatly finished. On embankment slopes proper slope protection measures such as turfing /stone pitching shall be laid.

2.05.03 **Preparation of sub-grade**

- a) The preparation of sub-grade includes all operations before the pavement structure could be laid over it and compacted. Thus the preparation of sub-grade shall include site clearance, grading and compaction. The grading operation is started so as to bring the vertical profile of the sub-grade to designed grade and camber.
- b) The surface of the formation to width equal to that of soling course shall first be cut to a depth below the proposed finished level, equal to the combined depth of soling and wearing course with due allowance being made for consolidation.
- c) It shall then be cleaned of all foreign substances. Any ruts or soft yielding places that appear due to improper drainage conditions, traffic hauling or from any other cause, shall be corrected and the sub-grade dressed off parallel to the finished profile.
- d) The contractor shall carryout CBR test in soaked and unsoaked conditions of sub-grade as per IS: 2720 (Part - XVI).
- e) Minimum 500mm depth of the subgrade of the road shall be compacted to a minimum of 97% of max. dry density.

2.05.04 **Preparation of Cut-formation**

The cut formation shall be prepared to receive the sub base/base course as directed by the Engineer. Any unsuitable material encountered shall be removed and replace by good material.

2.05.05 **Sub-base / Base course**

The construction of water bound macadam (WBM) shall be carried out in accordance with IRC-19
The thickness of sub base shall not be less than 150mm and base

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course shall not be less than 150mm.

The sub-base course shall be provided either with moorum or with water bound macadam.

2.05.5.1 Sub-base (Granular Sub-base)

a) Descriptions

This work shall consist of laying and compacting well graded material on prepared sub-grade in accordance with the requirements of these specifications, The material shall be laid in one or more layers as shown on the drawings and according to lines grades and cross sections shown on the drawings or as directed by the Engineer.

2.05.5.2 Materials

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, crushed slag, crushed concrete, brick metal, laterite, kanker etc. or combinations thereof depending upon the grading required. The mixed materials shall be free from organic or other deleterious constituents and conform' to one of the three grading given In Table-2 below.

TABLE -2
Grading for Granular Sub-base Materials

Sieve designation	Percent by weight passing the sieve		
	Grading 1	Grading 2	Grading 3
80mm	100	100	100
63mm	90-100	90-100	90-100
4.75mm	35-70	40-90	50-100
75micron	0-20	0-25	0-30
CBR value (minimum): for fraction of material passing 20mm sieve	30%	25%	20%

Note: The material passing 425 micron sieve for all the three gradings when tested according to IS: 2720 (Part-V) shall have liquid limit and plasticity index not more than 25 percent and 6 percent respectively.

i. Physical Requirements

The fraction of material passing 20 mm sieve shall give a CBR value as specified In Table-2 when tested in accordance with IS:2720 (Part XVI) after preparing the samples at maximum dry density and optimum moisture content corresponding to 1 S:2720

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(Part VII) and soaking the same In water for 4 days.

2.05.5.4 Spreading and Compacting

- Immediately prior to the laying of sub-base, the sub-grade already finished shall be prepared by removing all vegetation and other extraneous matter (for a depth of 20 cm), lightly sprinkled with water, if necessary, and rolled with one pass of 8-10 tonne smooth wheeled roller.
- The sub-base material shall be spread on the sub-grade with the help of a drag spreader, motor grader or other approved means. The thickness of loose layers shall be so regulated that the maximum thickness of the layer after compaction does not exceed 150 mm.
- Moisture content of the loose material shall be checked in accordance with IS: 2720 (Part II) and suitably adjusted by sprinkling additional water from a hose line, truck mounted water tank or other approved means so that at the time of compaction it is from 1 percent above to 2 percent below the -optimum moisture content corresponding to IS:2720 (Part VIII). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means if so directed by the Engineer until the layer is uniformly wet.
- Immediately thereafter, rolling shall be started with 8 to 10 tonne smooth wheeled rollers or other approved plant. Rolling shall commence at the edges and progress towards the centre longitudinally except that on super elevated portions It shall progress from the lower to the upper edge parallel to the centre line of the pavement. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and camber shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material.
- Rolling shall be continued till the density achieved is at least 100% of the maximum dry density for the material determined as per IS: 2720 (Part VII). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction plant and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

2.05.05.5 Water Bound Macadam

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Material

- a) Coarse aggregate shall be either crushed or broken stone. It shall be hard, durable and free from excess of flat, elongated soft and disintegrated particles, dirt and other objectionable matter. The materials shall meet the physical requirements of coarse aggregate as per IRC standards when tested as per IS: 2386
- b) Aggregate conforming to grading No. 1 having aggregate size of 90mm to 45mm shall be used for preparation of sub base. Grading NO.2 (Size 63mm to 45mm) & grading No.3 (Size 53mm to 22.4mm) shall be used for preparation of base. All grading shall be in accordance with IRC standard.
- c) Screenings for sub base course shall conform to Grading type A (13.2mm size) and shall conform to Type B (11.2 mm size) for base course. Screening to fill voids in the coarse aggregate shall generally consist of the same materials, moorum or gravel. Moorum or gravel as screening material may be used provided Liquid limit and Plasticity Index of such material is below 20 & 6 respectively and fraction passing 75 micron sieve does not exceed 10 percent. All grading shall be in accordance with relevant IRC specification.
- d) Binding material to be used for WBM construction shall comprise of a suitable material approved by the Engineer having plasticity index value of less than 6 as determined in accordance with IS:2720 Part (V).
- e) Camber shall be provided in all layers of the pavement including the sub grade.

2.05.5.6 The coarse aggregate shall be uniformly spread upon the prepared base in such quantities that the thickness of the compacted layer is 100mm for grading 1 and 75 mm for grading 2 & 3. The aggregate shall not be dumped in heaps directly on the surface prepared.

2.05.5.7 Immediately following the spreading of the coarse aggregate, rolling shall be started with three wheeled power roller of 8 to 10 tone capacity rollers of approved type. First the edges shall be compacted and then moved inwards parallel to the center line of the road. During rolling

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slight sprinkling of water may be done.

2.05.6 Application of Screenings

After the coarse aggregate has been rolled, screenings to completely fill the interstices shall be applied gradually over the surface. Dry rolling shall be done while the screenings are being spread. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers.

The screening consists of aggregate of smaller size, generally if the same material as the coarse aggregate. After the application of screenings, the surface is sprinkled with water, swept and rolled. Wet screenings are swept into the voids using hand brooms. Additional screening are applied and rolled till the coarse aggregates are well bonded and firmly set.

2.05.7 Sprinkling & Grouting

After the application of screenings, the surface is sprinkled with water, swept and rolled. Wet screenings are swept into the voids using hand brooms. Additional screenings are applied and rolled till the coarse aggregates are well bonded and firmly set.

2.05.8 Application of Binding Material

Binding material consisting of fine grained material is used to prevent gravelling of the stones; plasticity index of binding material shall be less than 6%. After the application of screening and rolling, binding material is applied at a uniform and slow rate at two or more successive thin layers. After each application of binding material, the surface is copiously sprinkled with water and wet slurry swept with brooms to fill the voids. This is followed by rolling with a 6 to 10 tonne roller and water is applied to the wheels to wash down the binding material that sticks to the roller.

2.05.9 Setting and Drying

After final compaction, the WBM course is allowed to set over-night. On the next day the 'hungry' spots are located and are filled with screenings or binding material, lightly sprinkled with water if necessary and rolled. No traffic is allowed till the WBM layer sets and dries out. In the case of WBM base course, the layer is allowed to dry completely without

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permitting traffic to ply and then the bituminous surfacing is laid. Limited construction traffic may be permitted to ply over the WBM layer taking proper care not to damage the layer.

2.05.10 **Edging**

Brick edging shall be provided between the toe of WBM & prepared base. Edging shall be done 225 wide and 115mm deep or as specified with 1st class bricks. Trenches shall first be made along the edges of wearing coat of the road to receive bricks. Bricks shall be laid on edge with its length across the road cutting and running parallel to the road edge, true to line and gradient.

2.05.11 **Shoulders**

Shoulders shall be of 150mm thick granular moorum.

2.05.12 **Tack Coat**

a) **Description**

The tack coat shall consist of application of a single coat of low viscosity liquid bituminous material to an existing Road surface preparation for laying of the carpet.

b) **Materials**

Binder: The binder used for tack coat shall be bitumen of a suitable grade as directed by the Engineer and conforming to 1S:73, 217 or 454, as applicable, or any other approved cutback.

c) **Construction Operations**

i) **Preparation of base**

The surface on which the tack coat is to be applied shall be thoroughly swept and scraped clean of dust and any other extraneous material before the application of the binder.

d) **Application of Binder**

Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer and sprayed on the base at the rate specified below. The rate of spread In terms of straight-run bitumen shall be 5 kg per 10

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square meter -area for an existing bitumen treated surface and 10 kg per 10 square meter area for an untreated water bound macadam surface.. The binder shall be supplied uniformly with the aid of sprayers. The tack coat shall be applied just ahead of the on coming bituminous construction.

2.05.13 Bituminous Macadam Surfacing

Bituminous Macadam shall be used as a binder course. The minimum thickness of this layer shall be 50 mm.

2.05.13.1 Materials

The grade of bitumen used is 80/100 penetration. Road tar Rt-4, cutback and emulsion can also be used in cold mix construction technique. The binder content used shall be 4.0 percent by weight of mix.

For binder course maximum recommended abrasion and impact values of aggregate are 40% and 30% respectively.

The quantity of aggregates required for 10 m² of 50mm thickness bituminous macadam shall be 0.6 to 0.75 m³.

Grading of Aggregate for Bitumen Bound Macadam shall be as follows:

Percent passing Sieve size, mm	Bitumen Bound Macadam compacted thickness, 50 mm	
	I	II
63	-	-
50	100	100
40	-	90-100
25	35-70	50-80
20	-	-
12	0-15	10-30
10	-	-
4.75	-	-
2.36	0 -5	-
0.075	0 -3	0-5

2.06 Asphalt Surfacing

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50mm thick asphaltic concrete shall be provided over prepared base.

- a) Binder : The binder shall conform to IS: 73
- b) Coarse aggregates : This shall consists of angular fragments and clear, hard, tough, durable & uniform quality throughout.
- c) Fine aggregates : The fine aggregates or sand shall be clean, hard, durable, coarse particles & free from dust, organic matter etc.

Aggregates gradation shall be Grading 2 with sieve size 22.4 mm to 90 microns and percentage of binder content by weight of total mix shall be 5.5 to 7.5.

2.06.1 Mix Design for Asphaltic Concrete

Marshall Mix design criteria for Asphaltic concrete shall be as follows:-

Test Property	Medium Traffic
a) Stability, kg (minimum)	340kg (minimum)
b) Flow value, 0.25mm units	2 – 4
c) Maximum Air voids in total mix % For surfacing	3 – 5
d) Compaction blows	50

The job mix formula proposed by the contractor shall be got approved by the Engineer before commencement of asphalting works.

2.06.2 Preparation of Base

The under lying base on which the Asphalt carpet is to be laid shall be prepared as directed by the Engineer. The surface shall be well cleaned by removing caked earth & other foreign matter with wire brushes, sweeping with broom & finally dusting with sacks. Before laying premix carpet the base surface shall be properly leveled for any undulations etc.

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2.06.3 **Preparation of Premix**

The mixing of aggregate with bituminous binder shall be done in mixers. The binder shall be heated in boiler to the temperature appropriate to the grade of bitumen approved by Engineer. The aggregate shall be dry when placed in mixer. The bitumen binder content shall be so fixed as to achieve the requirements of the mix set forth in Cl.2.05.1

2.06.4 **Spreading & Rolling**

The premixed material shall be spread on the road surface with rakes to the required thickness & camber. As soon as sufficient length of bituminous material has been laid, rolling shall commence with 6 to 10 tonne power rollers.

2.07 **Seal Coat**

2.07.01 **Description**

This work shall consist of application of a seal coat for sealing the voids in a bituminous surface laid to the specified levels, grade and camber.

Seal coat shall be of either of the two types below, as specified:

Premixed seal coat comprising of a thin application of fine aggregate premixed with bituminous binder. (Type B)

2.07.2 **Materials**

2.07.2.1 **Binder**

The binder shall be bitumen of a suitable grade as directed by the Engineer and conforming to the requirements of IS: 73, 217 or 454 as applicable or any other approved cutback.

The quantity of straight run bitumen shall be 6.8 kg per 10m² area.

2.07.2.2 **Fine Aggregate for Seal Coat**

The fine aggregate shall be sand or fine grit and shall consist of clean, hard, durable, uncoated dry particles and shall be free from dust, soft or flaky material, organic matter or other deleterious substances. The aggregate shall pass 1.7 mm sieve and be retained on 180 micron sieve. The quantity used for premixing shall be 0.06 cubic meter per 10 square meter area.

2.07.3 **Construction Operations**

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2.07.3.1 Preparation of Base

The seal coat shall be applied immediately after the laying of bituminous course which is required to be sealed. Before application of seal coat materials the surface shall be cleaned free of any dust or other extraneous matter.

2.07.3.2 Construction

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder.

The binder shall be heated in boilers of suitable design, to the temperature appropriate to the grade of 'bitumen approved by the Engineer. Also the aggregates shall be dry and suitably heated to a temperature directed by the Engineer before the same are placed in the mixer. Mixing of binder with aggregates to the specified proportions shall be continued till the latter are thoroughly coated with the former.

The mix shall be immediately transported from the mixing plant to the point of use and spread uniformly on the bituminous surface to be sealed.

As soon as sufficient length has been covered with the premixed material, the surface shall be rolled with 6-10 tonnes smooth wheeled power rollers. Rolling shall be continued till the pre-mixed material completely a seal the voids in the bituminous course and a smooth uniform surface is obtained.

3.0 DRAINS/CULVERTS

3.01 Scope

The scope of work covered under this specification in general shall comprise of construction of surface drain, sub surface drains and culverts. At road crossings 300mm diameter pipes on two perpendicular directions shall be provided for pipe cable crossing.

The contractor shall furnish all labour, materials and equipment's required for the construction of all drains including connection with RCC hume pipes and construction of culverts at location of road crossing, wherever required as per drawings or as directed by engineer.

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3.02 **Materials**

Drains shall be made of reinforced concrete and culverts shall be RCC box culvert.

3.03 **EXCAVATION**

Excavation shall be done along the layout and to the depths and shall include removal of all materials. The bottom of the excavation shall be trimmed to correct levels as per the gradient specified.

3.04 **GENERAL**

1. Surface drains shall be provided along the sides of the Roads or pavements or embankments to collect surface water.
2. Minimum size of drain shall be 300mm wide and 300mm deep.
3. The surface drain should have sufficient capacity and longitudinal slope to carry away all surface water collected.
4. Side drains shall be provided at the edges of right of way where the road is in embankment and at the edges of road way, if in cutting. The out fall should be to the diverted Nallah. Longitudinal bed slope not milder than 1 in 1000 shall be provided.
5. All buildings and paved areas in the power plant area shall be provided with catch drains for collecting the surface water, and rain water through down comer pipes. The drains shall be provided with precast RCC covers with grated openings.
6. The water collected in the drains shall be led to a main drain and disposed off at the nearest stream, valley or water course.
7. Whenever the drains have to cross the roadway, cross drainage such as culverts should be provided.

4.0 **Drains**

The specifications for the construction and materials besides measurement shall be as indicated below.

4.01 **RCC Drains**

The bottom slab and walls shall be of 100mm thick (minimum) in RCC

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grade M20. The inside of drains shall be finished neat with a floating coat of neat cement concrete. Honey combing in concrete shall be finished with plaster in CM 1:4.

4.02 **Box Culvert**

The box culverts shall be designed for class a loading as per IRC. Box culverts shall be RCC grade M20.

5.00 **SUPPLYING, LAYING AND JOINTING OF RCC PIPES**

5.01 **Supply Of Pipes**

At locations where surface drains cannot be provided, under ground pipes shall be provided to drain the water or oil. The reinforced cement concrete pipes to be used shall be of Class NP-2 / NP-3 conforming to IS:458 – latest edition, all as specified on drawings and directed by Engineer. For road or railway crossings higher class of pipe (NP-4) or plain concrete / RCC encasement, as required from designs, shall be provided to take care of higher loads. The pipes supplied shall be in good condition. Contractor shall obtain and submit to Engineer the test certificates from manufacturer / recognized test house.

5.02 **Alignment, Level and Grade**

The work shall be carried out in conformance to the alignment, levels and grades specified on the drawings. The layout and levels shall be made by him at his cost from one reference grid and bench mark given by Engineer. Contractor shall extend all help by providing instruments, materials and manpower to Engineer for checking the layout and levels as and when required by Engineer.

Making of reference layout and level pillars along the pipeline route and maintaining them till completion of the work shall be the responsibility of Contractor at his cost.

5.03 **Laying Of Pipes**

Utmost care shall be exercised in loading, transporting and unloading of the concrete pipes to avoid impact and damage. All pipe sections shall be inspected carefully before being laid. Broken or defective pipes shall not be used.

The pipe laying shall conform to IS:783 – latest edition. Pipes shall be laid on ordinary earth prepared bedding / cement concrete cradle bedding to suit site conditions as per approved construction drawings. Different bedding conditions are given in Appendix-B of IS:783.

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The bedding must be even and uniform projecting rock faces and boulders should be removed before forming the bedding. They should be lowered in the trenches carefully using mechanical means. Pipes shall be laid true to line and grade as specified. Laying of pipes shall always proceed upgrade of slope. The pipes should be laid in position before the concrete has set . Where two or more lines of pipes are to be laid adjacent to each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to a minimum of 450 mm. Normally it is to be ensured that the pipe has a cushion of at least 0.6 m over the crown.

5.04 **Jointing Of Pipes**

Sections of pipes shall be jointed together in such a manner that there shall be as a little unevenness as possible along the inside of the pipe and it should be true to grade and levels and alignments. All the pipes shall be watertight.

The pipes are to be flush jointed with specially shaped ends of the pipe and the jointing space of 1.3 cm shall be filled with cement mortar of 1:2 proportion mixed in sufficient consistency so as to remain the position when forced with a trowel or rammer. The finished joint shall be flush at both inside and outside of the pipe wall.

5.05 **Hydrostatic Testing Of Pipes**

The pipeline as laid shall be subjected to hydrostatic testing as per Clause 15.5 of IS:783.

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STANDARD TECHNICAL SPECIFICATIONS
FOR
DRAINAGE, SANITATION & WATER SUPPLY

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1.0

GENERAL

All pipelines, locations of fittings and fixtures, etc., shall be as per the approved construction drawings and as directed by engineer in charge. Correctness of lines, plumb, orientation, symmetry and levels shall be strictly ensured. All items shall fully secured against movement in any direction and so located as to allow maintenance where desired by Engineer.

All pipelines and fittings fixtures shall be installed leak proof. When the works under scope of this specification connect with others the connection shall be such as to prevent any splashing or emission of foul odour and gases.

2.00

SANITARY APPLIANCES

2.01

Scope

The Contractor shall furnish all labour, materials and equipment required for supply and installation of various sanitary appliances required for the civil works as per drawings and specifications.

2.02

Wash Basins

Wash basins shall be of white vitreous china clay of standard size 630 mm x 450 mm with flat back. Wash basin shall be one piece construction including a combined overflow and a soap holder. Wash basins shall be provided with approved quality chromium plated pillar taps (15 mm) dia (hot and cold) along with chain and plug stop cocks, brackets, complete. The wash basins shall in all respects conform to IS: 2556 (Part- IV. Wash basins shall be provided with 32 mm dia CP bottle trap and waist, 75 mm CI Nahani floor trap and connecting pipes

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2.03 Sink

It shall be made of glazed stoneware. It shall be wall hung by painted cast iron brackets and complete with one brass faucet with nylon washers, waste chain, waste washers, and lead waste pipe with traps, and perforated waste with necessary fittings. All fittings including faucets shall be chromium plated.

2.04 Bathroom Mirror

It shall be made of the best quality 6mm thick glass of size 600mmx450mm beveled edge and produced by a reputed mirror manufacturer. It shall be wall mounted with adjustable revolving brackets. The brackets, screws and other fittings shall be chromium plated.

2.05 Glass Shelves

Glass shelves shall consist of 6mm thick clear glass with guard rails and shall be wall mounted with brackets. All brackets, guard rails and screws shall be chromium plated.

2.06 Towel Rail

Towel rails shall be 20mm dia 800mm long chromium plated MS pipes wall mounted with steel brackets. The brackets, screws etc. shall also be chromium plated.

2.07 Soap Holder

It shall be made of chromium plated strong members. The holders shall be wall mounted with chromium plated screws.

2.08 Liquid Soap Dispenser

It shall be round and easily revolving with removable threaded nozzle. The body bracket for wall mounting and screws shall be chromium plated.

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2.09 Toilet Roll Holder

It shall be made of glazed vitreous china with suitable cover cum cutter of size 150mmx150mm. Wall mounting screws shall be chromium plated.

2.10 Installation

All plumbing fittings and fixtures shall be installed in most workmanlike manner by skilled workers. These shall be perfect in level, plumb, plane, location and symmetry. All items shall be securely anchored to walls and floors. All cuttings in walls and floors shall be made good by the Contractor.

2.11 Lipped Urinals

The urinals shall be with flat back and lipped in front. These shall be of white vitreous china. The urinals shall be of one piece construction. Each urinal shall be provided with not less than two fixing holes of minimum dia of 6.5 mm on each side. Each urinal shall have an integral flushing rim and inlet or supply horn for connecting the flush pipe. The flushing rim and inlet shall be of the self draining type. It shall have a weep hole at the flushing inlet of the urinal. At the bottom of the urinal, an outlet for connecting to an outlet pipe shall be provided. The exterior of the horn shall not be glazed and the surface shall be provided with grooves at right angles to the axis of the outlet to facilitate fixing to the outlet pipe. The inside surface of the urinal shall be smooth throughout to ensure efficient flushing. The bottom of the pan shall have sufficient slope from the front, towards the outlet such that there is efficient draining of the urinal. For every three (3) number urinals there shall be one (1) number of automatic cast iron flushing cisterns conforming to IS: 774, stop cocks, connecting pipe, flush pipe etc. complete for proper functioning of the urinals. A vitreous china screen shall be provided after every urinal.

2.12 Water Closet Indian Type

Indian type WC shall be of Orissa Patten of size 580 mm. Each pan shall have an integral flushing rim of suitable type. It shall also have

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an inlet or supply horn for connecting the flush pipe. The flushing rim and inlet shall be of the self draining type. It shall have a weep hole at the flushing inlet of the pan. The flushing inlet shall be in the front unless otherwise specified or as ordered by the Engineer. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and the surface shall be uniform and smooth to enable easy and quick disposal while flushing. In all cases a pan shall be provided with a 100 mm 'P' trap with approximately 50 mm effective water seal and 50 mm diameter vent horn, where required by the Engineer. Each pan shall be provided with a cast iron flushing cistern of (15 litres capacity) approved manufacture and quality along with telescopic flush pipe, stop cocks, taps, floor traps, connection pipe etc. complete for proper functioning of the pan and shall conform to IS:2556 (Part-III).

2.13 **European Type**

European Type WC pan shall be of white vitreous china and shall be of wash down type. The closet shall be of one piece construction. Each water closet shall have four (4) holes having a minimum diameter of 6.5mm for fixing to floor and shall have an integral flushing rim of suitable type. Each water closet shall have an integral 'P' trap outlet side of the trap. The water closet when sealed at the bottom of the trap. The water closet when sealed at the bottom of the trap in line with the back plate shall be capable of holding not less than 10 litres of water between the normal water level and the highest possible water level of the water closet as installed.

Each water closet shall be provided with a standard low level cistern of approved quality and manufacture, hard rubber seat of approved quality, telescopic flush pipe, connection pipe, stop cock taps, floor traps etc. complete for proper functioning of the water closet. European type water closet shall conform to IS: 2556 (Part-II)

2.14 **General**

The work shall be carried out, complying in all respects with the requirements of relevant Indian Standards and Bye-laws of the local authority. Any damage caused to the building or to electric, sanitary,

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water supply or other installation etc. therein, either due to actual requirements of the work, shall be made good and the building and the installation shall be restored to its original condition by the Contractor. Nothing extra shall be paid for it, except where otherwise specified. For making good the damage to masonry work, concrete work, plastering and many other items shall be as specified in this specification.

All sanitary appliances including sanitary fittings, fixtures, toilet requisites, shall be of size, make and design as specified in the item work and as per sample approved by the Engineer. Samples of all fittings shall be got approved before supply. All sanitary and plumbing work shall also be got approved. On completion of the work the site shall be cleaned and all rubbish disposed off as directed by the Engineer.

2.15

G.I. Pipes

2.15.1

The pipes shall be galvanised mild steel welded pipes and seamless screwed and socketed tubes conforming to the requirements of IS.1239, for medium grade. They shall be of the diameter (nominal bore) specified in the description of the item. The sockets shall be designated by the respective nominal bores of the pipes for which they are intended. The pipes and sockets shall be finished neatly, well galvanised on both inner and outer surfaces, and shall be free from cracks, surface flaws, laminations and other defects. All screws, threads shall be clean and well cut. The ends shall be cut cleanly and square with the axis of the tube.

2.15.2

All screwed tubes and sockets shall have pipe threads conforming to the requirements of IS.554. Screwed tubes shall have taper threads while the sockets shall have parallel threads.

2.15.3

The fittings shall be of malleable cast iron or mild steel tubes complying with all the appropriate requirements as specified for pipes. The fittings shall be designated by the respective nominal bores of the pipes for which they are intended. The fittings shall have screw threads at the ends conforming to the requirements of IS.554. Female threads on fittings shall be parallel and male threads (except on running nipples and collars of unions) shall be tapered.

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- a) The pipes and fittings shall be inspected at site before use to ascertain that they conform to the specification. The defective pipes shall be rejected. Where the pipes have to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the pipes shall then be threaded conforming to the requirements of IS.554 with pipe dies and taps carefully in such a manner as will not result in slackness of joints when the two pieces are screwed together. The taps and dies shall be used only for straightening bent and damaged screw threads and shall not be used for turning of the threads so as to result in a water tight joint. The screw-threads of pipes and fitting shall be protected from damage until they are fitted.
- b) The pipes shall be cleaned and cleared of all foreign matter before being laid. In jointing the pipes, the inside of the socket and the screwed end of the pipes shall be oiled and rubbed over with white lead and a few turns of spun yarn wrapped around the screwed end of the pipe. The end shall then be screwed in the socket, tee, etc., with the pipe wrench. Care should be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during fixing. Burrs from the joint shall be removed after screwing. After lying, the open ends of the pipes shall be temporarily plugged to prevent access of soil or any other foreign matter.
- c) Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anticorrosive paint to prevent corrosion.

- 2.15.4
- a) For internal work the galvanized iron pipes and fittings shall run on the surface of the walls or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern holder bat clamps, keeping the pipes about 1.5 cm. clear of the wall. Pipes and fittings shall be fixed truly

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vertical/horizontal. When it is found necessary to conceal the pipes, chasing may be adopted or pipes fixed in the ducts of recesses etc. provided there is sufficient space to work on the pipes with the usual tools. The pipes shall not ordinarily be buried in walls or solid floors. Where unavoidable, pipes may be buried for short distances provided adequate protection is given against damage, but the joints in pipes shall not be buried. Where directed by the Engineer, a M.S. pipe sleeve shall be fixed at a place where a pipe is passing through a wall or floor for reception of the pipe and to allow freedom for expansion/contraction and other movements/maintenance. In case the pipe is embedded in walls or floors it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors the pipes shall be laid in layer of sand filling or as directed by the Engineer.

- b) G.I. Pipes with socket and spigot ends shall be provided with lead caulked joints wherever specified and the joints shall conform to the requirements of IS.3114.

- 2.15.5 a) The work of excavation and backfilling shall be done true to line and gradient in accordance with general specifications for earth work in trenches for pipes laid underground.
- b) The pipes shall be laid on a layer of 7.5 cm sand and filling up to 15 cm above the pipes. The remaining portion of the trench shall then be filled with excavated earth. The surplus earth shall be got rid of as directed. When excavation is done in rock the bottom shall be cut deep enough to permit the pipes to be laid on a cushion of sand 7.5 cm minimum.

2.15.6 The pipes and fittings after they are laid and jointed shall be subjected to hydrostatic pressure test as specified by the Engineer and shall satisfactorily pass the test. Pipe line system shall be tested

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in sections as the work proceeds, keeping the joints exposed for inspection. Pipes shall be slowly and carefully charged with water allowing all air to escape. All draw off taps shall then be closed and water pressure gradually rose to test pressure. Care shall be taken to ensure that pressure gauge is accurate and preferably should have been recalibrated before the test. Pump used having been stopped; the section of the pipeline shall maintain the test pressure for at least half an hour. Any joints or pipes found leaking shall be removed and replaced by the Contractor without extra cost.

2.15.7 The G.I. Pipe line shall be cut to the required length at the position where the meter and stop cock is required to be fixed. The ends of the pipes shall be threaded. The meter and stop cock shall be fixed in position by means of connecting pipe. G.I. nuts, sockets, etc. The stop cock shall be fixed near the inlet of the water meter. The paper disc inserted in the ripples of the meter shall be removed and meter installed exactly horizontally or vertically and with the arrow cast on the body of the meter pointing in the direction of flow Care shall be taken that the factory seal of the meter is not disturbed. Whenever the meter is to be fixed to a newly fitted pipe line, the pipe line will have to be completely washed before fixing the meter. For this purpose, a connecting piece of pipe equal to the length of the meter is to be fixed on the new pipe line. The water shall be allowed to flow completely to wash the pipe line and then the meter installed as described above by replacing the connecting piece.

2.15.8 G.I. pipes with fittings completely fixed in position shall be measured and paid for based on the finished centre line lengths.

3.00 **PIPING AND DRAINAGE**

3.01 **Scope**

This section covers the layout and construction of drains for roof water, surface water and sewage together with all fittings and fixtures and inclusive of ancillary works, such as connections, manholes and inspection chambers used within the building and from the building to

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the connection to a public sewer or to treatment work, septic tank and soak pit dispersion trenches.

3.02 **General**

All pipe lines, locations of fittings and fixtures, etc. shall be as per drawings or as directed by the Engineer. Correctness of lines, plumb, orientation, symmetry and levels shall be strictly ensured. All items shall be fully secured against movement in any direction and so located as to allow easy maintenance.

All pipe lines, fittings and fixtures shall be installed leak proof. When the works under scope of this specification linked up with works executed by other, the connections shall be such as to prevent any splashing or spilling or emission of foul odour and gases.

3.03 **Rain Water Pipes**

Rainwater downtak pipes shall be minimum 100 mm dia UPVC pipes. In case where specifically desired MS pipes may also be used. MS pipes shall be painted outside with two coats of anticorrosive paints under a coat of primer. Rain water pipes shall be adequately provided to drain out the rainwater without overflow. Minimum 100mm diameter pipe shall be provided to drain out 40 Sqm. of roof surface area and minimum 150mm diameter to drain out 80 Sqm. of roof surface area. All vertical down spout pipes and pipefitting's shall run inside the walls. All vertical down spout pipes shall be connected to water proof roofing by means of lead funnels protected at the outside by a cover net of brass wire or by 90⁰ bends (elbow).

All covers for water collecting pits, both inside and outside the buildings, shall be of cast iron, with proper holes, and designed to withstand any possible transient load. Such cast iron covers shall be of commercial size and as far as possible the closest to far indoor pits minimum 250mm x 250mm and for outdoor pits 600 x 600mm.

Cast iron pipes shall be straight and perfect in every detail, of uniform thickness and with smooth internal surface free from any

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casting faults, and shall comply with IS:1230. Pipes to be embedded in masonry shall be fixed in the masonry work as it proceeds. Care shall be taken to keep the pipes absolutely vertical or to the lines as directed by the Engineer. Pipes shall have a surrounding of 12mm minimum thickness of mortar at every position of the external surface. The mortar shall be of the same mix as is used in the masonry. The joints shall be caulked in with lead as soon as the next length of pipe is placed in position. The open end (socket end) of the pipe shall be kept closed till the next length of pipe is fitted and jointed to prevent any brick bats or concrete or pieces of wood falling in and choking the pipe. The spigot end shall butt the shoulder of the socket and leave no gap in between. The annular space between the socket and the spigot will be first well packed in with spun yarn leaving 25mm from the lip of the socket for the lead. The joints shall then be lead caulked as described in IS:3114. Cast iron pipe fittings shall be of standard size, and shall ring clearly when struck all over with a light hand hammer. The thickness of fittings and details of spigots and sockets shall be same as those of the corresponding size of straight pipes.

3.04 Gutters

The gutters shall be made of GI aluminum (INDAL). All gutters shall be supplied by reputable specialized firms. Each section shall be sufficiently rigid, edges and corners straight and the slopes perfectly uniform, GI gutters shall have the edges strengthened by suitable means.

Unless noted otherwise the gutters shall have a minimum fall of 1 in 120. adequate number of string supports shall be provided so that there is no reflection even when the gutter is full. Each joint must have a support. Unless otherwise specified the supports shall be fabricated MS brackets. All junctions shall be thoroughly watertight. The joints may be made by riveting, bolting or soldering. All joints between successive lengths of gutters shall have an overlap of at least 5cm. The drop in the overlap shall always be in the direction of the fall of the gutter. Ends of gutters shall be closed watertight.

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Junction with rainwater down comers shall be made fully watertight and secured.

3.05 Soil and Drainage Pipes

a. *Gradients*

If not specified the minimum gradients of soil and drainage pipe line shall be as follows:

100m nominal	1 in 35
150m nominal	1 in 65
230mm nominal dia	1 in 120
300mm nominal dia	1 in 200

b. *Relation With Water Supply Pipe Lines*

Unless specifically cleared by the Engineer, under no circumstances shall special drainage and soil pipes be allowed to come close to water supply pipelines.

c. *Support and Protection of Pipelines*

All pipes shall be laid with sockets leading uphill. Preferably the pipe shall rest on solid and even foundations for the full length of the barrel. However, the pipe manufacturer's instruction as approved by the engineer shall be followed in the matter of support and jointing.

To achieve full and continuous support, concrete for bedding and packing is the best. Where pipes are not bedded on concrete, the floor shall be left slightly high and carefully placed so that the pipe barrels rest on undisturbed ground. If anywhere the excavation has been carried too low packing shall be done in concrete. Where laid on rock or very hard ground which cannot be easily excavated to a smooth surface, the pipes shall be laid on a cradle of fine concrete floor of gravel and crushed stone over laid with concrete or on

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a well consolidated gravel and crushed stone bed as desired by the Engineer. PVC or similar pipes shall be laid directly on stable soil and packed with selected soil.

The minimum support and protection for glazed stoneware pipes shall be as follows:

- i. When cover is less than 2 metre below ground level and where pipes are unavoidably exposed above ground level and where pipes are unavoidably exposed above ground surface, the pipes shall be completely.
- ii. Where pipes are laid on soft soil with the maximum water table laying at the invert of the pipe, the sewer shall be bedded on concrete.
- iii. Where the pipes have to be laid on soft soil with the maximum water table rising above the invert of the pipe, but below the top of the barrel, the pipe sewer shall be hunched.
- iv. Where maximum water table is likely to rise above the top of the barrel or wherever the pipe is laid on soft soil the pipe sewers shall be completely encased or surrounded with concrete.

Vitrified clay pipes shall be laid on a bed of 150mm thick cement concrete (1:3:6) nominal mix by volume.

Cast iron pipes and concrete pipes may be supported on suitable concrete or brick support, where specified. The supports shall be unyielding and strong enough. At least one support shall be located close to ends. Spacing of intermediate supports shall be as decided by the Engineer. Pipes shall be secured to the supports by approved means.

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Anchoring of pipes where necessary shall be achieved by suitable concrete encasing designed for the expected thrust.

d. Entry into Structures

For entry of the pipe lines into any building of structure suitable conduits under the structure or sleeves shall be used. The conduits and sleeves shall be such as to allow easy repairs and replacement of the pipes. When openings or chases are required to be made in the structure for entry of pipe lines, locations and sizes shall be marked and checked by the Engineer. After laying of the pipeline the openings and chases shall be mended.

e. Ducts

Where solid, waste and ventilating pipes are accommodated in ducts, access to cleaning areas shall be provided. Connection to drain shall be through a gully with sealed cover to guard against ingress of sewer gas, vermin or backflow.

f. Traps and Ventilating Pipes

Pipes are carrying off the waste, from water closets and waste water and overflow water from baths, wash basins, sinks to drains shall be trapped immediately beneath such fixtures. Traps shall have minimum water seal of 50mm and shall be ventilated whenever such ventilation is necessary to maintain water seal of the trap.

Ventilating pipes shall be carried up vertically from the drain to a height of at least 600 mm above the outer covering of the roof of the building or as shown on drawings. All vertical ventilating, anti-syphonage and similar pipe shall be covered on top with a cowl. The cowl shall be made of CI unless desired otherwise by the Engineer.

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g. *Manhole and Inspection Chambers*

The maximum distance between manholes shall be 30 meter unless specially permitted otherwise. In addition, at every change of alignment gradient or diameter there shall be a manhole or inspection chamber. The distance between manhole or inspection chamber and gully chamber shall not exceed 6 metres unless desired otherwise. Manhole shall be constructed so as to be watertight under test. The bending at the sides shall be carried out in such a manner as to provide no lodgment for any splashing in case of accidental flashing of the chamber. The channel or drain at the bottom of chamber shall be plastered with 1:2 cement, sand mortar and finished smooth to the grade. The channels and drains shall be shaped and laid to provide smooth flow.

Connecting to existing sewer lines shall be through a manhole.

Manholes shall be provided with standard C.I covers. The covers shall be close fittings so as to prevent gases from coming out. Suitable heavy duty covers shall be used where necessary as decided by the Engineer.

h. *Cutting of Pipes*

Manufacturer's instructions shall be followed for cutting of pipes where necessary. Suitable and approved tools shall be used for the cutting so as to leave surface clean and square to the axis of the pipe.

Jointing

Jointing of laid pipes shall be so planned as to avoid completely any movement or strain to the joints already made. If any joint is suspected to be damaged it shall be opened out and redone.

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All joints between pipes, pipes and fittings and manholes shall be gas tight when above ground and water tight when underground. Method of jointing shall be as per instruction of the pipe and fittings manufacturer and as approved by the Engineer. However, in the absence of any instruction available from the manufacturer the methods as detailed hereunder shall be used.

i. *Cast Iron Pipe*

Socket and spigot pipes shall be jointed by the cast lead joints. The spigot shall be centered in the socket of the next pipe by tightly caulking in sufficient turns of tarred gasket or hemp yarn to have unfilled half the depth of socket. When the gasket or hemp yarn has been caulked tightly a jointing shall be placed round the barrel and tightened against the face of the socket to prevent airlock. Molten lead shall then be poured in to fill the remainder of the socket and caulked with suitable tools right round the joint to make up for shrinkage of the molten metal on cooling and shall be finished 3mm behind the socket face.

ii. *Concrete Pipes*

Care shall be taken to place the collar centrally over the joint.

iii. *Glazed Stoneware*

Tarred gasket or hemp yarn *Pipes* soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the

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gasket caulked tightly so as not to fill more than $\frac{1}{4}$ of the total depth of the socket. The remainder of the socket shall be filled with a stiff mixture of cement mortar of 1:1 proportion. Then the socket is filled, a fillet shall be formed round the joint with a trowel, forming an angle of 45 deg. With the barrel of the pipe. The newly made joints shall be protected, until set and shall be covered with damp cloth or other suitable materials.

3.06 Trenches and Other Excavations

Width of the trench at the bottom shall be such as to provide 200mm clearance on either side of the pipe for facility of laying and jointing.

Excavated material shall be stacked sufficiently away from the edge of the trench and the side of the spoil bank shall not be allowed to endanger the stability of the excavation. Spoil may be carted away and used for filling the trench.

Turf, top soil or other surface material shall be set aside, turf being carefully rolled and stacked for use in reinstatement.

All excavation shall be properly timbered, where necessary,

Efficient arrangements for dewatering during excavation and keeping it dry till backfilling shall be made to the satisfaction of the Engineer. Sumps for dewatering shall be located away from the pipe layout. Where the excavation proceeds through roads necessary permissions shall be secured by the Contractors from the appropriate authorities.

Where the excavation proceeds through roads necessary permissions shall be secured by the Contractors from the appropriate authorities.

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Special care shall be taken not to damage underground services, cables etc. These when exposed shall be kept adequately supported till the trench is backfilled.

The backfilling shall be done only after the pipeline has been tested and approved by the Engineer. Special care shall be taken under and sides of the pipe during hand packing with selected material. At least 300mm over the pipe shall also be filled with soft earth or sand consolidation shall be done 150mm layers. The surface water shall be prevented from getting into the filled up trench. Traffic shall not be inconvenienced by heaping up unduly the backfilling material to compensate future settlement. All future settlements shall be made good regularly to minimize inconvenience of traffic where applicable.

4.00 **Fixtures**

4.01 The Tendered shall mention in his bid the type and make of the fixtures he intends to use enclosing manufacturer's current catalogues. In the absence of any such agreement, the Engineer shall be at liberty to choose any type and make.

4.02 All fixtures and fittings shall be of approved quality and type manufactured by well known manufacturers. All items brought to the site must bear identification marks of the type of the manufacturer. Procurements shall be made well in advance and inspected and approved immediately by the Engineer. All fixtures shall be adequately protected, covered and plugged till handed over.

4.03 All fittings, gratings, fasteners, unless specified otherwise shall be chromium plated. The connecting lead pipes and bends shall weigh at least 3kg per 25mm dia per meter length. Where PVC or similar pipes are allowed the Contractor shall produce the test report and convince the Engineer about their durability.

5.00 **SEPTIC TANK & EFFLUENT DISPOSAL**

a. **Septic Tank**

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Septic tank shall consist of the tank with inlet and outlets complete with all necessary earthwork and backfilling. The details of septic tank shall be as shown on drawings. This items shall also include ventilating pipe of at least 100mm die whose top shall be provided with a suitable mosquito proof wire mesh and cowl. Ventilating pipe shall extend to a height of about 2 meter when the septic tank is at least 15 meter away from the nearest building and to a height 2 meter above the top of building when it is located closer than 15 meter. Ventilating pipes can be connected to the normal soil ventilating system of the building where allowed.

b. Effluent Disposal

The effluent from the septic tank shall be disposed.

c. Soak Pit

The soak pit shall be complete as shown on drawing. It shall consist of a 900 mm die pit 1000 mm in depth below the invert level of the inlet pipe. The pit shall be lined with stone, brick or concrete blocks set in cement mortar (1:6) and filled with brick bats. Inlet pipe shall be taken down to a depth 900 mm from the top as an anti-mosquito measure.

d. Open Jointed SW Pipe/Dispersion Trenches

Minimum die of the SW pipes shall be 150mm nominal. The trench for laying the pipes shall be minimum 600x600mm. The joints of the pipes shall be left unsealed. The entire length of the pipe within the trench shall be buried in a 250mm layer gravel or crushed stone of uniform size. On top of gravel / crushed stone a layer of 150mm bed of well graded coarse aggregate shall be laid. Ordinary soil is used for filling the top of trench.

e. Commissioning Septic Tank.

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After the septic tank has been proved watertight and the sewage system is checked the tank shall be filled with water to its outlet level before the sewage is let into the tank. It shall be seeded with well digested sludge obtained from septic tank or sludge digestion tank. In the absence of digested sludge a small quantity of decaying organic matter such as digested cow-dung may be introduced.

6.00

OVER HEAD WATER STORAGE TANKS

RCC Tank

Unless otherwise mentioned water storage tanks for toilets shall be reinforced cement concrete tanks of adequate size and capacity. M-20 grade concrete shall be used for construction of tank and shall be designed as 'untracked' section as per IS: 3370. Water proofing admixture shall be added as required. The outlet pipe shall be 50 mm above the bottom of the tank and there shall be 150 mm free board at the top of the tank. Overflow vent pipe shall be provided.

All tanks shall be supplied with mosquito proof covered top with manhole not less than 450 mm diameter. Tanks deeper than 1.00 m shall be provided with MS internal access ladder adjacent to the manhole. Water level indicator shall be provided.

Polyethylene water tank

PVC tanks shall meet the requirements IS: 12701. Virgin HDPE granules of approval grade, suitable for drinking water shall be used for making the tank. Carbon black shall be added with the granules. Tanks shall be single piece, seamless construction, mould by rotational moulding. Shape of tank shall be cylindrical – vertical type with corrugation along the length and bottom of the tank. Tank shall have closed top provided with lid. However, for storage inside, the rectangular loft tank of approved colour shall be provided.

Tank shall be provided with all fittings for inlet, overflow, outlet pipes and ball valves including mosquito proof coupling.

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Tank shall be leak proof. Tank shall be installed with proper support and anchorage for installation and it shall be carried out according to the recommendation of clause No. 13 of IS: 12701 – 1989.

7.00 **TESTING OF PIPELINES FOR DRAINAGE & SANITATION**

Comprehensive test of all pipe lines shall be made by simulating conditions of use. The method of actual test shall be decided by the Engineer. All test date shall be recorded and submitted to the Engineer for review and instruction. The Engineer's discretion regarding tolerance shall be final.

General guidance for the test is given below:-

Smoke Test

All soil pipes, waste pipes, vent pipes & all other pipes when above ground shall be approved gas tight by a smoke test conducted under a pressure of 25mm of water and maintained for 15 minutes after all rap seals have been filled with water. The smoke is produced by burning oily waste or tar paper of similar material in the combustion chamber of a smoke machine. Chemical smoke is not satisfactory.

For Straightness

It shall be checked by inserting at the high end of the sewer or drain a smooth ball of a diameter 1.3 mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball will roll down the invert of the pipe and emerge at the lower end; and

By means of mirror at one end of the line and lamp at the other end. If the pipeline is straight, the full circle of light may be observed. The mirror will also indicate obstruction in the barrel if the pipeline is not straight.

Testing of Water Mains after Laying

After laying and jointing, the main shall be slowly and carefully charged with water, so that all air is expelled from the main, by

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providing 25mm inlet with a stop-cock, allowed to stand full of water for a few days if time permits, and then tested under pressure. The test pressure shall be 5KG/sq. Or double the maximum working pressure, whichever is greater. The pressure shall be applied by means of a manually operated test pump, or in the case of long mains or mains of a large diameter by a power driven test pump provided that the pump is not left unattended. In either case due precaution shall be taken to ensure that the required test pressure is not exceeded. Pressure gauges shall be accurate and shall preferably have been recalibrated before the test. The pump having been stopped, the test pressure shall maintain itself without measurable loss for at least five minutes. The end of the mains shall be closed by fitting a watertight expanding plug and plug shall be secured by struts to resist end thrust of the water pressure in the mains.

Testing of Service Pipes and Fittings

The service pipes shall be slowly and carefully charged with water allowing all air to escape avoiding all shock or water hammer.

Fixture etc.

All fixture and fittings shall be connected by Water tight joints. No dripping shall be accepted.

8.00 TESTING AND ACCEPTANCE

All pipes, fittings and fixtures shall be inspected, before delivery at the site to see whether they conform to accepted standards. The pipes shall again be inspected on site before laying by sounding to disclose cracks. All defective items shall be clearly marked and forthwith removed from the site.

9.00 Measurement

(Applicable for "Item Rate" contracts only)

This shall be calculated by the number of appliances the price being intended to cover supply and installation including any required hardware, and accessories. All G.I, cast-iron and stone ware pipes

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required for water supply and disposal to septic tank etc. shall be paid for separately.

10.00

APPLICABLE CODES AND SPECIFICATIONS

The following codes, standards and specifications are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

Pipes & Sanitary Applications

IS: 1536-1989 : Centrifugally cast (spun) iron
pressure pipes

For water, gas and sewage.

IS: 1626 : Specification for asbestos cement building
Pipes and pipe fitting, gutters and gutter
Fittings (spigot and socket types)

IS: 1726-1991 : Specification for cast iron manhole covers
And frames.

IS: 1703-1989 : Specification for copper alloy float
valves
(Horizontal plunger type) including water
Supply fittings.

IS: 1729-1979 : Sand cast iron spigot and socket,
soil waste
And ventilating pipes, fittings and
Accessories.

IS: 2526 : Vitreous sanitary appliances
(Part I to XV)

IS: 2963-1979 : Specification for copper alloy waste
fittings for wash basins and sinks.

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its
IS: 3311-1979 : Specification for waste plug and
Accessories for sinks and wash basins.

IS: 5329-1983 : Code of practice for sanitary pipe work
Above ground for buildings.

bottle
IS: 5434-1969 : Specification for non-ferrous alloy
traps for marine use.
glazed
IS: 3006-1979 : Specification for chemically resistant
Stoneware pipes and fittings.

IS:1172 : Code of Basic Requirements for Water Supply,
Drainage and Sanitation.

IS:1200 (Part –XVI) : Laying of Water and Sewer Lines Including
Appurtenant Items.

IS:1239 (Part 1&ii) : Mild Steel Tubes and Mild Steel Tubular and
other wrought Steel pipe fittings

IS:1537 : Vertically Cast Iron Pressure Pipes for Water,
Gas and Sewage

IS:3486 : Vertically cast iron pressure pipe for water, gas &
sewage

IS:1742 : Code of Practice for Building Drainage

IS:2470 : Code of Practice for designs and construction of
septic tanks for small and large installations.

IS: 3076 Low density polyethylene pipes for
potable

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Water supplies.

IS: 4984:		High density polyethylene pipes for potable Water supplies.
IS: 1538		Cast Iron fittings for pressure pipes for water, Gas and sewage
IS: 1230 IS: 3889	:	Cast Iron rain water pipes and fittings. centrifugally cast (spun) iron spigot & soil Waste and ventilating pipes, fittings and accessories.
IS: 458	:	Concrete pipes (with and without reinforcement)
IS: 783	:	Code of Practice for lying of concrete pipes.
IS: 784	:	Pre stressed concrete pipes.
IS: 651	:	Salt glazed, stoneware pipes & fittings.
IS: 4127	:	Code of practice for lying of glazed Stoneware pipes.
IS: 5961	:	Cast Iron gratings for drainage purposes.
IS: 5219 (Part 1)	:	'P & S' traps.
IS: 771	:	Glazed earthen-ware sanitary appliance.

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IS: 772	:	General requirements of enameled cast iron Sanitary appliances.
IS: 774	:	Flushing cistern for water closets & urinals (valve less symphonic type.)
IS: 775	:	cast Iron brackets & supports for wash basins and sinks.
IS: 2548	:	Plastic water closet seats & covers.
IS: 2527	:	Code of practice for fixing rain water gutters and down pipes roof drainage.

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- b) IS:801 - Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building construction
- c) IS:806 - Code of Practice for Use of Steel Tubes in General Building Construction.
- d) IS:7205 - Safety Code for Erection of Structural Steel Work.
- e) IS:7215 - Tolerances for Fabrication of Steel Structures.
- f) IS:4000 - Code of Practice for High strength bolts in steel structures.
- g) AISC - Specifications for Design, Fabrication and Erection of Buildings.

2.0 **ERECTION SCHEME**

2.1 Each bid shall be accompanied by a broad erection scheme with dates and estimated completion time for various parts of the work prepared by BIDDER after a thorough study of the bid drawings and the site conditions. This erection scheme shall describe the methods proposed to be employed by BIDDER for transporting his equipments, tools, tackles, gas cylinders, electrodes and all that is necessary to Site, unloading, transporting within the site, handling, assembling, hoisting and erecting of the structural and miscellaneous steel components and the type, capacity and quantity of equipment that BIDDER scheme shall also indicate the strength and trade wise composition of the work force and supervisory personnel that will be deployed by BIDDER for the various operations.

3.0 **ERECTION PROGRAMME**

3.1 Within three weeks of the acceptance of his bid, the successful BIDDER shall submit, a detailed erection programme. This programme shall be accompanied by a layout plan identifying the areas proposed for unloading, main storage, subsidiary storage, assembly and the transportation of equipment and fabricated material between the storage and work areas. The layout shall clearly indicate the points at which proposed erection begins the direction in which it is proposed to progress, the deployment of equipment, access route for cranes to reach work areas etc. The locations and extent of site offices and

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stores, labor quarters if any, layout of electrical cables and water pipes from the tap off points shall also be indicated in detail on the above layout. Full details of the method of handling, transport, hoisting and erection programme along with complete details of the quantity and capacity of the various items of erection equipment that will be used. A site organization chart showing the number of supervisory personnel, and the number and composition of the various gangs shall also accompany the erection programme.

- 3.2 Any modifications to the erection programme directed by ENGINEER for the reasons of inadequacy of the quantity and/or capacity of the erection equipment, erection personnel and supervisors, temporary bracing, guying etc., or safety of the erection methods, or suitability of the erected portions of structures, or unsuitability of the erection sequence due to interference with the work of other agencies shall be incorporated by CONTRACTOR with the revised programme. Approval by ENGINEER shall not relieve CONTRACTOR from the responsibility for the safe, sound, accurate and timely erection of structural steel work as required by ENGINEER/PURCHASER. CONTRACTOR shall also make no extra claims for bringing additional equipment to site for erection, if so directed by ENGINEER. CONTRACTOR shall be deemed to have visualized all erection problems while bidding for the work and no additional compensation shall be claimed on this account.

4.0 **SITE OPERATIONS**

- 4.1 An experienced and qualified Superintendent shall be in full time charge of the job.
- 4.2 CONTRACTOR shall complete all preliminary works at site well before the arrival of structural steel, such as establishment of a well equipped and adequately staffed site office, stores, unloading gantry, unloading and pre- assembly yard, labour quarters if any, electrical and water connections, electrical winches, derricks, cranes, compressors, all tools and tackles, rivet guns, welding sets, torque wrenches, spud wrenches, staging, etc. as well as experienced erection and supervisory personnel as part of this contract and any other work immediately after the arrival of the first batch of steel at site.
- 4.3 CONTRACTOR shall furnish at his own expense, the necessary non-inflammable staging and hoisting materials or equipment required for the erection work and shall remove and take them away after completion of the job. CONTRACTOR shall also provide necessary passageways, fences, safety belts, helmets, light and other fittings to

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the satisfaction of PURCHASER/ENGINEER and to meet the rules of local authorities and for protection to his men and materials. A licensed electrician shall be kept on the job for the entire duration of the work to maintain CONTRACOR'S electrical equipment and connections.

4.4 CONTRACTOR shall protect all existing plant, structures, piping, conduits, equipment and facilities against damage during erection. Any damage caused by CONTRACTOR shall be rectified entirely at CONTRACTOR'S cost, to the satisfaction of PURCHASER/ENGINEER. If work has to be carried out adjacent to existing switchyards or electrical installations which are live, CONTRACTOR must ensure suitable safety precautions in consultation with ENGINEER.

4.5 If a portion of the work of the project area cannot be made available to CONTRACTOR for his activities due to operations being carried out by other agencies, he shall suitably modify his sequence of operations so as to continue work without interruption. CONTRACTOR shall work in coordination with other agencies working on the project site and plan his work suitably so as not to hinder the progress of construction at site.

5.0 **ANCHOR BOLTS AND FOUNDATIONS**

5.1 CONTRACTOR shall carefully check the location and layout of anchor bolts prior to concreting and take all measures to see that the bolts remain in proper position, alignment & level. In short all measures shall be taken to ensure that the structures can be properly erected as shown on the drawings.

5.2 Leveling of column bases to the required elevation may be done either by providing shims or three nuts on the upper threaded portion of the anchor bolts. All shim stock required for keeping the specified thickness of grout and in connection with erection of structures on foundation, crane brackets or at any other locations shall be of good M.S. plates and shall be supplied by CONTRACTOR at his cost.

5.3 A certain amount of cleaning of foundations and preparing the area is considered normal and shall be carried out by CONTRACOR at no extra cost.

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5.4 Where beams bear in pockets or on walls, bearing plates shall be set and leveled as part of the work. All grating under column base plates or beam bearing plates will be carried out by the contraction.

6.0 **ASSEMBLY AND CONNECTIONS**

6.1 Field connections may be effected either by bolting, welding or by use of high strength friction grip bolts as specified and as shown on the design and fabrication/erection drawings.

6.2 All field connection work shall be carried out in accordance with good engineering practice. All bolts nuts washers, electrodes required for field connections shall be supplied free of cost by the Contractor.

6.3 All assembling shall be carried on a level platform.

6.4 Drifts shall be used only for drawing the work to proper position and must not be used to such an extent as to damage the holes. Size of drifts larger than the nominal diameter of hole shall not be used any damaged holes or burrs must be rectified to the satisfaction of ENGINEER.

6.5 Any error in the shop, which prevents proper fit on a moderate amount of reaming and slight chipping or cutting, shall be immediately reported to ENGINEER.

7.0 **ERECTION**

7.1 All structural steel shall be erected as shown on the drawings. Proper size steel cable slings, etc. shall be used for hoisting Guys shall not be anchored to existing structures, foundations, etc. unless so permitted by ENGINEER in writing. Care shall be taken to see that ropes in use are always in good condition.

7.2 Steel columns in the basement, if any are to be lowered and erected carefully with the help of a crane and/or derrick without damaging the basement walls or floor.

7.3 Structural steel frames shall be erected plumb and true. Frames shall be lifted at such points that they are not liable to buckle and deform. Trusses shall be lifted only at node points. In the case of trusses, roof girders all of the purlins and wind bracing shall be placed simultaneously and the columns shall be erected truly plumb on screed bars over the pedestals. All steel columns and beams shall be checked for plumb and level individually before and after connections are made. Temporary bracings shall be introduced wherever

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necessary to take care of all loads to which the structure may be subjected, including erection equipment and the operation thereof. Such bracings shall be left in place as long as may be required for safety and stability.

- 7.4 Chequered plates shall be fixed to supporting members by tack welding or by countersunk bolts as shown/ specified in relevant drawings and/or as directed by Engineer. The edges shall be made smooth and no burrs or jagged ends shall be left. While splicing, care should be taken so that there is continuity in pattern between the two portions. Care should also be taken to avoid distortion of the plate while welding. The erection of chequered plates shall include:
- Welding of stiffening angles/vertical stiffening ribs.
 - Cutting to size and making holes to required shape wherever necessary to allow service piping and/or cables to pass through.
 - Splicing as shown in relevant drawings.
 - Smoothing of edges
 - Fixing of chequered plates by tack welding or by counter sunk bolts.
 - Providing lifting hooks for case of lifting.
- 7.5 As erection progress, the work shall be securely bolted to take care of all dead load, wind, seismic and erection stresses.
- 7.6 No welding or final bolting shall be done until the structure has been properly aligned and approved by ENGINEER. No cutting, heating or enlarging or the holes shall be carried out without the prior written approval of ENGINEER.
- 8.0 **INSPECTION**
- 8.1 ENGINEER/PURCHASER or their authorized representatives shall have free access to all parts of the job during erection and all erection shall be subjected to their approval. In case of faulty erection, all dismantling and re-erection required will be at CONTRACTORS's cost. No paint shall be applied to field welds or bolts until these have been approved by ENGINEER.

9.0 TOLERANCES

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Tolerance mentioned below shall be achieved after the entire structure or part thereof is in line, level and plumb. The tolerances specified below do not apply to steel structures where the deviations from true positions are intimately linked with an directly influence technological process. In such cases the tolerances on erected steel structures shall be as per recommendations of process technologists/suppliers which will be indicated in the drawings.

9.1 Columns

9.1.1 Deviation of column axes at foundation top level with respect to true axes.

a)	In longitudinal direction	± 5 mm
b)	In lateral direction	± 5 mm

9.1.2 Deviation in the level of bearing
Surface of columns at foundation
Top with respect to true level ± 5 mm

9.1.3 Out of plumpness (verticality) of column axis from true vertical axis, as measured at column top.

a)	For columns up to and including 15 meters in height	$\pm \frac{1}{1000}$ of column height in mm or ± 15 mm whichever is less

b)	For columns exceeding 15m in height	$\pm \frac{1}{1000}$ of column height in mms or ± 20 mm whichever is less

9.1.4	Deviation in straightness in longitudinal and transverse planes of column at any point	$\pm \frac{1}{1000}$ of column height in mm or ± 10 mm whichever is less

9.1.5	Difference in erected position of adjacent pairs of columns	± 10 mms

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along length or across width of building prior to connecting trusses/beams with respect to true distance

9.1.6	Deviation in any bearing or seating level with respect to true level	± 5 mms
9.1.7	Deviation in differences in bearing levels of a member on adjacent pair of columns both cross and along the building	± 10 mms

9.2 Trusses and Beams

9.2.1	Shift at the centre of span of top chord member with respect to the vertical plane passing through the centre of bottom chord	$\pm \frac{1}{250}$ of height of truss in mm or ± 10 mm whichever is less
9.2.2	Lateral shift of top chord of truss at the centre of span from the vertical plane passing through the centre of supports of the truss	$\pm \frac{1}{1500}$ of span of truss in mm or ± 10 mm whichever is less
9.2.3	Lateral shift in location of truss from its true vertical position	± 10 mm
9.2.4	Lateral shift in location of purlin true position	± 2 mm
9.2.5	Deviation in difference of levels of trusses or difference	i. For trusses ± 20 mm bearing ii. For beams beams from the true Depth<1800 mms- ± 6 mms Depth<1800mms- ± 10 mms

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9.2.6 Deviation in sag in chords and of truss between node points $\pm \frac{1}{1500}$ of length diagonals in mm or 10 mm whichever is smaller

9.2.7 Deviation in sweep of trusses, beams etc. in the horizontal plane $\pm \frac{1}{1000}$ of span in mm subject to a maximum of 10mm

10.0 PAINTING

10.1 After steel has been erected, all bare and abraded spots, field welds, bolt heads and nuts shall be spot painted with primer specified elsewhere in this specification. Before paint is applied, the surface shall be dry and free from dust, dirt, scale and grease. All surfaces inaccessible after erection shall receive two coats of the approved paint before erection.

11.0 ERECTION BOLTS

11.1 Erection bolts installed may be left in position of completion of erection however no additional payment shall be made either for supply or use of such bolts. If erection bolts are removed after erection is complete, holes shall be plug welded and ground smooth. No extra payment shall be made for such plug welding.

12.0 WITHHOLDING PAYMENTS

12.1 Purchaser may withhold the whole or part of any payment for erection claimed by Contractor which in the opinion of Purchaser is necessary to protect himself from loss on account of

- Defective work not remedied or guarantees not met
- Claims filed against the Contractor
- Failure by contractor to make due payments for materials or labor employed by him.
- Damage to another Contractor

12.2 When the grounds for with holding payments are removed, payments of the amount due to Contractor shall however be made by Purchaser.

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13.0 COMPLETED OR PARTLY COMPLETED WORK

- 13.1 Purchaser shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed to be an acceptance of any work not in accordance with the contract.

14.0 CLEAN UP OF WORK SITE

- 14.1 During erection, the contractor shall without any additional payment, at all times keep the working and storage areas used by him, free from accumulation of waste materials or rubbish. Before completion of erection, he shall remove or dispose of in a satisfactory manner all temporary structures, waste and debris and leave the premises in a condition satisfactory to Purchaser/Engineer.

TENDER NO: PSER:SCT:BRM-C1953:19

VOLUME -III

PRICE SCHEDULE-REV-00

FOR

**BALANCE CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW
BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9
BEGUSARAI, BIHAR, BARAUNI**

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-00	
JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.	
TENDER NO. PSER:SCT:BRM-C1953:19	
SL. No.	PREAMBLE
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 anywhere 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
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.
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
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, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.			
TENDER NO. PSER:SCT:BRM-C1953:19			
SCH-1 : TOTAL PRICE			
SL NO	DESCRIPTION	PRICE SCHEDULE REF	TOTAL QUOTED PRICE (IN INR)
1.0	JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.	SCH 2 - BREAK UP OF TOTAL PRICE	<u>IN FIGURES:-</u>
			<u>IN WORDS:-</u>
2.0	NON-SCHEDULE ITEM Quote % above or % below or at par for items not covered as above of this schedule. The rate shall be derived from Delhi Schedule of Rates 2016.		
1a)	Rate of complete item		% above/ % below/ at par of DSR Rate Schedule 2016
1b)	Rate of supply of material at site only		% above/ % below/ at par of DSR Rate Schedule 2016
1c)	Rate for execution complete excluding supply of materials.		% above/ % below/ at par of DSR Rate Schedule 2016
NOTE			
1.0	Bidder shall quote total price for total price of SCH-1- Part only at sl 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 reckoned & will stand null & void.		
2.0	Bidder to note that total price at sl no 1.0 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 to note that SCH-2 Civil covers Supply & Service of respective items, unless specified otherwise in the description of items.		
4.0	Bidder's quoted total price at Sl. no 1 above respectively shall be apportioned into amount of various items of works based on allocated percentages against respective item, in respective schedules/ parts. 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.		
5.0	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 after rounded off .		
6.0	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 Sl No.9 below.		
7.0	Unit rates of each item of works of respective schedules/ parts will be derived by dividing derived amount by corresponding quantities. In deriving the unit rates of each item in this manner, figures only upto 4 decimal places will be taken into account. Any adjustment, if required, due to such methodology, will be effected in final bill.		
8.0	Successful bidder shall draw a schedule of quantities of various items of work of Sch-2 and obtain BHEL's approval/ clearance in writing before procurement, supply, etc.		
9.0	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.		
10.0	Price format shall not be changed by bidder in any case and it may lead to cancellation of their offer.		
11.0	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.		
12.0	For payment of non schedule items, the rate shall be derived from CPWD Schedule - 2016.		

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
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 500 m, spreading/levelling of disposed materials etc all complete for following depths below ground level.			
a	Depth from ground level but not exceeding 2 m	CUM	34104.00	0.5118490%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	1407.00	0.0268020%
c	Depth exceeding 4 m but not exceeding 6 m	CUM	1450.00	0.0349450%
d	Depth exceeding 6 m but not exceeding 8 m	CUM	3942.00	0.1200330%
e	Depth exceeding 8 m but not exceeding 10 m	CUM	7252.00	0.2668710%
f	Depth exceeding 10 m but not exceeding 15 m	CUM	2734.00	0.1159980%
g	Depth exceeding 15 m but not exceeding 20 m	CUM	430.00	0.0420900%
h	Depth exceeding 20 m but not exceeding 22 m	CUM	50.00	0.0087140%
102	Dewatering using of ground water by well point method as per IS-9759 in wagon tippler and associated structures including all accessories such as discharge pipes etc, necessary manpower, electricians, technicians, pump operators for round the clock operation.The pumps are to be of electrically operated 60 HP or as directed by the engineer incharge	per pump set per month	560.00	6.8692640%
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 500 m, spreading / levelling of disposed materials etc all complete for following depths below ground level.			
a	Depth from ground level but not exceeding 2 m	CUM	2.00	0.0000370%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	1.00	0.0000230%
c	Depth exceeding 4 m but not exceeding 6 m	CUM	1.00	0.0000270%
d	Depth exceeding 6 m but not exceeding 8 m	CUM	1.00	0.0000330%
e	Depth exceeding 8m but not exceeding 10 m	CUM	1.00	0.0000380%
f	Depth exceeding 10 m but not exceeding 15 m	CUM	2584.00	0.1082500%
107	Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250 mm thickness using/with selected materials from compulsorily excavated soil available within a lead upto 500m and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following.			
a	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	17599.00	0.2184190%
b	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	4600.50	0.0511210%
c	Each layer compacted so as to achieve at least 85% maximum dry density as per IS-2720 (Part-VII)	CUM	1.00	0.0000110%
108	Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250 mm thickness using/with selected materials directly from excavation and compacted as specified including watering, ramming/compaction by manual/mechanical means, dressing etc all complete for the following			
a	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	5869.00	0.0237150%
b	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	4496.00	0.0162210%
c	Each layer compacted so as to achieve at least 85% maximum dry density as per IS-2720 (Part-VII)	CUM	1.00	0.0000040%

VOLUME-III				
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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
109	Extra over ST No. 101 and 107 for carriage of all types of excavated earth/selected materials beyond the initial lead of 500 m (initial lead, loading and unloading included in item 101 and 107) all complete as per specifications, drawings and instructions of the engineer for the following leads			
a	Carriage beyond initial lead of 500 m but not exceeding 1 Km	CUM	5697.50	0.0057560%
b	Carriage beyond 1 Km and not exceeding 2 Km	CUM	3791.00	0.0114890%
c	Carriage beyond 2 Km and not exceeding 3 Km	CUM	10001.00	0.0505140%
d	Carriage beyond 3 Km and not exceeding 4 Km	CUM	1.00	0.0000070%
e	Carriage beyond 4 Km and not exceeding 5 Km	CUM	25000.00	0.2272920%
110	Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250 mm thickness using/with approved borrowed soil (borrowed soil to be arranged by the bidder) and compacted as specified including supplying borrowed soil, royalty (if any), watering, ramming/compaction by manual/mechanical means, dressing etc all complete for the following.			
a	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	60.00	0.0020090%
b	Each layer compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	92.00	0.0029180%
c	Each layer compacted so as to achieve at least 85% maximum dry density as per IS-2720 (Part-VII)	CUM	1.00	0.0000300%
111	Supplying and filling sand upto any depth under floors, around foundations, plinths etc. in layers not exceeding 250 mm thickness and compacted so as to achieve at least 85% 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	846.00	0.3119350%
200 CONCRETE WORKS				
	Providing and placing concrete work including cost of labour, materials 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 FREE OF COST BY BHEL AS PER TCC)			
201	Concrete of grade M-7.5 as filling course at any level below finished floor level, under and around foundations/ floors, mass dumps etc with 40 mm Nominal size graded aggregate.	CUM	390.50	0.2852070%
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	526.00	0.3841720%
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	3.00	0.0021910%
204	Concrete under floors, paving, plinth protection, pipe encasing etc complete with 20 mm nominal size graded aggregate at any depth below finished floor level for the following grades.			
a	M15 Grade	CUM	649.00	0.4740070%
b	M20 Grade	CUM	1.00	0.0006950%
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, under floors etc at any 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.			

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
a	M25 Grade	CUM	3163.00	2.3434640%
b	M30 Grade	CUM	2939.00	2.1864100%
206	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 superstructure at any 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	673.00	0.4978480%
b	M30 Grade	CUM	1029.00	0.7643160%
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 (Inclusive of chicken wire mesh)			
a	M20 Grade	CUM	1.00	0.0007300%
b	M25 grade	CUM	1.00	0.0007300%
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, drains etc complete as per following.			
a	1:2:4 (1 part cement, 2 part sand, 4 parts of aggregate by volume)	CUM	60.00	0.0438220%
b	1:1.5:3 (1 part cement, 1.5 part sand, 3 parts of aggregate by volume)	CUM	11.00	0.0080340%
213	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, chajjas, beams, columns, wall panels, 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.			
a	M 25 grade	CUM	27.00	0.0293360%
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, below plinth level.			
a	M 25 grade	CUM	51.00	0.0481850%
b	M 30 grade	CUM	9484.00	8.7484600%
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	110.00	0.0120960%
b	Reinforced cement concrete of all grades	CUM	1410.00	0.2346130%
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.	CUDM	15.00	0.0001470%
217	Extra over and above St No 215 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	28361.00	0.0204640%
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.	CUDM	1400.00	0.0513170%
219	Providing and applying curing compound of approved make where ever required as per manufacturer's specification.	SQM	500.00	0.0077930%
220	Providing & laying Plum cement concrete 1:3:6 with 75% graded metal of maximum size 40 mm and 25%plums of maximum size 150 mm.	CUM	5.00	0.0035020%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
300 FORM WORKS				
	Providing, fixing and removing formwork at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.			
301A	Ordinary form work / steel shuttering below ground level	SQM	5200.00	0.3145980%
301	Fairface form work with good quality water proof ply wood of required thickness and smooth surface below finished ground floor level for foundations, footings, base of columns, walls, columns, pilasters, beams, mass concrete, trenches etc.	SQM	48095.00	3.7479770%
302	Fairface form work with good quality water proof ply wood of required thickness and smooth surface above finished ground floor level for columns, beams, suspended floors, roofs, lintels, cantilevers, staircases, landings, balconies, domes, arches, circular overhead tanks etc. for all heights.	SQM	4214.00	0.3958940%
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	10.00	0.0003850%
b	Pockets of depths more than 150mm and upto 300 mm depth	Each	40.00	0.0027250%
c	Pockets of depths more than 300mm and upto 600 mm depth	Each	10.00	0.0012610%
d	Pockets of depths more than 600mm and upto 1000 mm depth	Each	10.00	0.0020170%
e	Pockets of depths more than 1000mm and upto 1500 mm depth	Each	10.00	0.0029500%
A305	Providing and fixing curved shuttering including staging , propping etc. at all locations and heights and levels above or below ground complete as per specification and engineer in charge			
a	Fair face shuttering	SQM	1.00	0.0000940%
400 REINFORCEMENT				
401	Providing, transportation, straightening, cutting, bending, placing in position at any level, binding of mild steel reinforcements conforming to grade 1 of IS:432 part 1 in concrete including cost of reinforcement, binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer.	MT	677.00	8.0522880%
402	Transportation, straightening, cutting, bending, placing in position at any level, binding of at any level, binding in position of steel reinforcements of TMT steel of grade Fe-500/500D/ 500EQR conforming to IS:1786 including cost of binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer. (Reinforcement shall be provided by M/S BHEL Free of cost)	MT	3647.40	5.5931500%
500 & 600 WATER PROOFING & PRESSURE GROUTING WORKS				
	Water proofing works including all labour, material, equipment, transportation, handling, curing, sampling, testing etc at any level as per specification, drawings and as directed by engineer-in-charge.			
501	Providing screed/ grading plaster of average 20 mm thickness in ratio 1:6 nominal by volume including finishing smooth and even etc all complete at all levels above or below grade level.	Sqm	987.00	0.0200840%
502	Providing and laying foam concrete block insulation over roofs including minimum 15 mm cement sand plaster finished smooth over foam concrete and providing of expansion joints at intervals as per the recommendation of manufacturer. Thermal conductivity of the foam concrete shall not exceed 0.125 KCL/SQMH deg C and weight shall be from 0.3 to 0.5 gm/cu cm, all complete with fillets as per specification.BHEL will supply cement free of cost as per TCC.			
a	Average 75 mm thickness	Sqm	2160.00	0.0467570%
b	Average 100mm thickness	Sqm	977.00	0.0280580%
503	Providing and applying bitumen felt water proofing for normal treatment having bonding materials consisting of blown type conforming to IS: 702 or residual bitumen conforming to IS: 73 or a mixture of the two with one layer of felt consisting of five courses and with a minimum overlap of 75 to 100 mm of felt including preparation of surfaces etc all complete. (For description of layers refer specification)			
a	With hessian base felt	Sqm	977.00	0.1114070%
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	977.00	0.1316880%
510	Providing and applying water proofing with blown bitumen bonding material conforming to IS:702 of 65/25 grade in Basements, ducts, pits,tunnels etc below the ground level on the concrete surfaces exposed to soil / ash and up to 150 mm above ground level on outside of walls and top of RCC slab including preparation of surface, brick lining single brick thick with 1:4 cement mortar etc. all complete with following number of layers of bitumen felts:			
a	2 Layers of felt for depth up to 5m below ground level for floors	SQM	10.00	0.0002400%
b	3 Layers of felt for depth beyond 5m below ground level for walls	SQM	10.00	0.0003550%

VOLUME-III				
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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
511	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, water tightness test etc. all complete wherever specified in the drawing.	SQM	10.00	0.0008180%
512	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	254.00	0.0411270%
513	Providing swellable supercast SW-20 or equivalent water bar at concrete raft and wall with adhesive over PCC for water retaining strcutures .Cost shall include supply, laying and supervision and handing over to finishing agency.	RM	900.00	0.3090200%
514	providing top layer water proofing treatment with RENDROX -HX -TRA followed by NITO Coat CM-210 or equivalent with geotextile sandwich material .Cost shall include supply, laying and supervision and handing over to finishing agency.	SQM	1100.00	0.1064790%
509	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	10.00	0.0002810%
512	Anti termite chemical treatment of soil with Chloropyrifos emulsifiable concentrates (1%) conforming to IS :8944 all complete.	SQM	2160.00	0.0682650%
513A	Providing Roof water proofing treatment with high solid content liquid applied elastomeric water proofing membrane of thickness 1.5mm, application of polymerixed mastic over the roof to achieve smooth surface and priming coat and a wearing coarse on top of the membrane with 25mm thick PCC 1:2:4 reinforced with 0.56mm dia galvanized chicken wire mesh cas in panels of minimum 1.2m X 1.2m sixe including sealing of joints using sealing compound/ elastomeric water proofing membrane all complete as per specification, approved drawings and direction of Engineer-in charge	SQM	150.00	0.0271160%
600 JOINTS AND FILLERS				
	Joints & fillers including all labour, material, equipment, transportation, handling etc at any level as per specification, drawings and as directed by engineer - in - charge.			
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 coal tar pitch/bitumin etc. all complete.			
a	12 mm wide joints.	SQM	10.00	0.0008080%
c	25 mm wide joints	SQM	10.00	0.0015250%
d	50 mm wide joints	SQM	10.00	0.0030510%
A601	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 manufacturer's recommendation etc. all complete.			
a	12 mm wide joints.	SQM	10.00	0.0008150%
c	25 mm wide joints	SQM	10.00	0.0015340%
d	50 mm wide joints	SQM	10.00	0.0030510%
602	Providing and applying polysulphide based sealant conforming to IS:12118 in expansion joints in concrete including cleaning of joints, raking out groove, application of primer, scaffolding etc. all complete for following size grooves			
a	12mm X 25mm	RM	30.00	0.0012390%
c	25mmX25mm	RM	10.00	0.0008600%
d	50mmX25mm	RM	10.00	0.0016540%
603	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	10.00	0.0000870%
b	12mm X 25mm	RM	30.00	0.0002250%
609	Providing and sealing of joints with premium grade silicon sealant (Silpruf of GE silicon 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	10.00	0.0004940%
606	Providing and fixing PVC water stops in joints conforming to IS 12200 & IS 15058 all complete for the following:			
a	150 mm wide and 8 mm thick	RM	10.00	0.0003200%
b	230 mm wide and 8 mm thick	RM	10.00	0.0002310%
c	Serrated with central bulb (225 mm wide,6 mm thick).	RM	100.00	0.0035500%
607A	PROVIDING COPPER WATER STOP IN EXPANSION JOINT FOR DEEP UNDERGROUND STRUCTURE			
a	150 mm wide and 8 mm thick	RM	108.00	0.0242200%

VOLUME-III				
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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
b	250 mm wide and 8 mm thick	RM	108.00	0.0403670%
607B	Providing and fixing 22G Copper plate and 600mm wide unless specified otherwise in water retaining structures including galvanising as per relevant I.S. codes and as per specifications.	SQM	5.00	0.0057260%
700 MS	EMBEDMENTS			
	Embedments including all labour, material, equipment, transportation, handling etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
701	Supply,Fabrication 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	14.00	0.1830010%
702	Supply, Transportation,erection, installation and alignment of mild steel foundation bolt assembly conforming to IS:2062 and grade1 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, etc. all complete with protective coating as per specification.	MT	11.00	0.1699830%
703A	Transporting, fabricating and fixing of mild steel embedments, inserts, pipe sleeves, ms flats, angle pieces, rungs of various diameters, plates/ angle/ channel/ joist of dimensions as required etc. including welding, bolting, cutting, drilling, scaffolding, setting etc. all complete.Structural steel like plates, angles,beams etc shall be supplied by BHEL	MT	15.50	0.0432000%
703B	Assembly,welding, Fixing of embedments, inserts, pipe sleeves, angle pieces, anchor bolts of various diameters, plates of dimensions as required etc. including scaffolding, setting in position, transportation from BHEL site stores to work spot etc. all complete. Fabricated material will be supplied by BHEL free of cost as per TCC.	MT	6.00	0.0169840%
704	Supplying, 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. Contractor to supply all materials.			
a	MS pipes of all diameters	Quintal	2.00	0.0027710%
705	Expansion fasteners (mechanical galvanised) of HILTI make or equivalent of safe tensile capacity as specified below for brick work with expansion sleeve of A6 polyamide:			
i	Upto 250 kg	Each	5.00	0.0004160%
ii	Beyond 250 Kg and upto 500 kg	Each	5.00	0.0006540%
iii	Beyond 500 Kg and upto 750 kg	Each	5.00	0.0013070%
e	Expansion fasteners (mechanical galvanised) of HILTI make or equivalent of safe tensile capacity as specified below for concrete work with expansion sleeve of stainless steel:			
i	Upto 250 kg	Each	2.00	0.0002610%
ii	Beyond 250 Kg and upto 500 kg	Each	2.00	0.0003560%
iii	Beyond 500 Kg and upto 750 kg	Each	2.00	0.0004280%
800	GROUTING			
	Grouting including all labour, material, equipment, roughening surface, cleaning, ramming, curing etc. at any level unless otherwise specified as per specification, drawings and as directed by engineer - in - charge.			
801	Providing & grouting with cement slurry mix of approved ratio using pressure pump for water retaining concrete structures as perapproved procedure including cost of nipples/ nozzles, cement, admixture, curing, pressure pumps, slurry agitator etc. all complete. Costshall include fixing of nipples at minimum 500 mm centre to centre spacing, cutting of nipples after completing of grouting, making good ofthe nipple hole with appropriate non-shrink cement paste, water tightness test etc. all complete wherever specified in the drawing.(Cement will be supplied by BHEL free of cost as per TCC):	SQM	4.00	0.0003270%
802	Providing & grouting of pocket holes, pipe sleeves under base plates, machinery, pipe supporting structures etc. with mix 1:1 (1cement :1 sand) using non shrink admixture etc. all Complete.(Cement will be supplied by BHEL free of cost as per TCC)	CUM	4.00	0.0104640%
803	Providing & grouting of pocket holes, pipe sleeves and under base plate of structural steel work/ machinery/ pipe supporting structuresincluding 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 allmaterial and cleaning the pocket by compressed air shall be in the scope of the contractor). (Cement will be supplied by BHEL free of cost as per TCC):	CUM	9.00	0.0244580%
804	Providing & grouting(Non shrink precision) 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 / MasterFlow 718 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	0.96	0.0058190%
805	Providing & grouting (Non shrink precision) of pocket holes, pipe sleeves and under base plates of structural steel work/ machinery/ pipesupporting structures including roughening of surface, cleaning, ramming, curing, etc. all complete with Conbextra GP-2 / MasterFlow 928or 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	1.00	0.0068310%
	900 DOORS, WINDOWS, VENTILATORS, LOUVERS			

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
	Doors, windows, ventilators, louvers, roof ventilators, rolling shutters, partitions including all labour, material, equipments, transportation, handling, preparation of working drawings etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
A903	Providing, fitting and fixing solid core flush door shutter as per IS 2202 part II, 35mm thick homogenous ply board bonded with BWP type phenolformaldehyde synthetic resin, ply 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 handles 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	103.78	0.1127150%
904	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.	SQM	22.78	0.0375160%
904B	Providing and fixing 45mm thick insulated hollow metal flush type with formed hollow metal frames & shutters. The doors shall be constructed from 1.2mm steel sheets with an internally reinforced, insulated core. Frames shall be constructed with 1.6mm steel, with all joints mitered, welded and ground smooth. Scope also includes galvanizing, priming and field painting of both door & frame and also all the fittings, fixtures, approved quality of lock on interior and exterior side of the door. as per specification all complete including test certificates	Sqm	217.00	0.2733440%
906	Providing and fixing anodized extruded aluminium doors (single or double shutter) conforming to IS:1948, IS:1949 fabricated from extruded sections of HINDALCO/JINDAL or equivalent make having minimum 3mm 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 bimetallic protection etc. Glazing shall be clear float 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. Aluminium section shall be smooth, free of stains, straight, mitred & jointed mechanically wherever required. (Glazing shall be paid separately)	SQM	301.89	0.4160460%
906A	Providing & fixing electro colored 15 micron anodised Al work of Indal, Hindalco or other equivalent approved make for doors, windows, ventilators, partitions, railing etc with extruded standard tubular & other sections including all fittings & fixtures & accessories of approved make conforming to IS733 and IS1285, anodised and electro color dyed to required shade according to IS 1868 (min anodic coating of grade AC15), fixed with rawl plugs, expansion fasteners, screws or with fixing clips, including necessary filling of gaps at junctions, at top, bottom & sides with required PVC/ neoprene felt for bi-metallc protection etc including preparation of working drawings, Al cleat angle, Al 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 hinges/pivots, and making provision for fixing of fitting wherever required including cost of PVC/neoprene gasket, all complete as per drawing, specification & instructions of engineer (glazing & panelling shall be paid seperately). Payment terms - a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%.	Kg	110.89	0.0097460%
906B	Fixing electro colored 15 micron anodised Al work of Indal, Hindalco or other equivalent approved make for doors, windows, ventilators, partitions, railing etc with extruded standard tubular & other sections including all fittings & fixtures & accessories of approved make conforming to IS733 and IS1285, anodised and electro color dyed to required shade according to IS 1868 (min anodic coating of grade AC15), fixed with rawl plugs, expansion fasteners, screws or with fixing clips, including necessary filling of gaps at junctions, at top, bottom & sides with required PVC/ neoprene felt for bi-metallc protection etc including preparation of working drawings, Al cleat angle, Al 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 hinges/pivots, and making provision for fixing of fitting wherever required including cost of PVC/neoprene gasket, all complete as per drawing, specification & instructions of engineer (glazing & panelling shall be paid seperately). Aluminium sections shall be provided by BHEL on weighthment basis.	Kg	100.00	0.0026370%
906C	Supplying and fixing of Overhead hydraulic door closer as p[er IS 3564 of approved quality and make all complete as per specifications, approved drawings and direction of Engineer-in-charge	NOS	86.00	0.0211610%
906D	Providing and fixing floor mounted hydraulic door closer of approved make & quality as per IS 6315 as directed by engineer	NOS	12.00	0.0073130%
907	Providing and fixing automatically closing fire proof steel door satisfying LPA regulations (single or double shutter) with panic device shall be minimum 44mm 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 centres to centers including all fittings, vision glass, shop painting with approved post office/signal red color fire resistant paint and mineral wool insulation (64 kg/cum density) complete and shall be fire proof as per IS:3614, LPA requirements and as per specification. Minimum ratings shall be 2 Hrs. All hardware fittings shall be fire rated. Payment terms - a) On receipt of materials at site - 65%; b) On completion of erection & fixing - 35%.	SQM	1.89	0.0027150%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
908	Providing and fixing steel windows/ventilators with steel sections as per IS-1038 , IS-1361, IS- 7452 latest revision including all fittings , metal beadings , hold fast , shop and final painting , glazing etc. all complete. (glazing shall be paid seperately			
a	Openable type	SQM	224.35	0.0988450%
b	Fixed Type	SQM	170.35	0.0502490%
909	Providing and fixing anodised aluminium work of Jindal, Hindalco or other equivalent approved make for door frames, windows,ventilators, partitions, railing etc with extruded standard tubular and other sections 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 (minimumanodic 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-mettalic protection etc.including preperation of workingdrawings, aluminium cleat angle, aluminium snap-on-beading for glazing/panelling, stair case tread nosing, with all fittings and fixtures (liketower bolts, handles, door stopper with rubber shoes, 'L' drops, stays, floor springs, hydraulic door closures etc.), CP brass/stainless steel screws, providing and fixing hinges/pivots, and making provision for fixing of fitting wherever required including cost of PVC/neoprenegasket, all complete as per drawing, specification and instructions of engineer in charge (Glazing and panelling shall be paid seperately).Weight of aluminium section only shall be measure	Kg	3732.00	0.4093160%
912	Providing and fixing pressed steel frames fabricated from 16 gauge M.S sheet mortised, filled with concrete/cement sand mortar 1:6,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	130.00	0.0031520%
913A	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 fabricated from 3mm thick galvanised steel plate and securely rivetted with stiffening angles.(partly coiled and lath/full lath). Payments: a) on receipt of materials at site-70%, b) on fixing-30%.			
b	Mechanically operated.	SQM	27.00	0.0399700%
c	Electrically operated	SQM	48.00	0.0787180%
913B	Supplying and fixing rolling shutters of approved make, made of requird size M.S. laths 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 complete including the cost of providing and fixing necessary 27.5 cm long wire springs grade No. 2 and M.S. top cover of required thickness for rolling shuters.			
	80x1.20 mm MS laths with 1.20 mm thick top cover.	SQM	29.00	0.0254010%
913C	extra for providing mechanical device chain and crank operations for operating rolling shutters both inside and outside (specifications same as item no. 57).			
(a)	exceeding 10 SQM and upto 16.8 SQM	SQM	10.00	0.0020350%
(b)	exceeding 16.8 SQM and upto 35 SQM	SQM	10.00	0.0030540%
913D	extra for providing electrical operated rolling shutters with all mechanism, provision shall be made for emergency mechanical operations.			
(a)	exceeding 35 SQM	SQM	10.00	0.0050890%
(b)	providing and fixing ball bearing for rolling shutters	NOS	10.00	0.0015260%
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 engineer in charge.	SQM	9.00	0.0033130%
915	Providing, fitting and fixing of glazing (including poly carbonate sheet) of superior (selected) quality, first grade class, at various elevations, where required, cleaning after fixing, gaskets, clips, hardware, with all labour and material etc complete as per specification, drawing and instructions of engineer.			
a	4 mm thick clear float glass	SQM	588.00	0.1378900%
b	5.5 mm thick clear float glass	SQM	51.00	0.0134830%
c	6mm thick clear float glass	SQM	131.00	0.0377820%
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	171.00	0.0480470%
920	Providing & fixing Roof skylight structure for atrium with 6mm thick Polycarbonate sheet multi (twin) wall fire retardant and ultra violet resistant with sealed open edges for sky light for approved shape like dome, pyramidal etc. Joints are properly sealed with sealent, screws with pvc cap, self tapping screws, epdm rubber gasket.etc all complete as per detailed drawing and specification.	SQM	27.48	0.0114250%
921	Providing and fixing openable steel window / Ventilator confirming to IS: 1361 in conveyor galleries with wire mesh of approved quality including all fittings and fixtures and required clips, pins etc for fixing of glass panes all complete as per specifications, approved drawing and direction of Engineer-in-charge but excluding cost of supplying and fixing of glass.	SQM	250.00	0.1479070%
922	Providing and fixing following fixtures for MS door and windows and louvers			

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
a	ISI Marked oxidised MSTower bolts (upto 250 mm long) black finish barrel type with necessary screws etc complete	NOS	10.00	0.0000920%
b	Oxidised MS Peg stay with necessary screws etc complete.	NOS	10.00	0.0000450%
c	ISI marked oxidised MS Handles (125 mm long) confirming to IS:4992 with necessary screws etc complete	NOS	15.00	0.0000620%
1000 BRICKWORK				
	Brickwork masonry including all labour, material, equipment, transportation, handling, scaffolding etc. at all levels as per specification, drawings and as directed by engineer - in - charge.(Cement will be supplied by BHEL free of cost as per TCC)			
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			
a	Using fly ash lime bricks confirming to IS 12894-2002 with minimum crushing strength of 50 kg/cm ²	CUM	10.00	0.0090790%
b	Using burnt clay bricks of class 7.5 of nominal dimension.	CUM	333.00	0.4161650%
1002	Providing brick work in cement mortar 1:6 (1 part 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.		55.00	
a	Using fly ash lime bricks confirming to IS 12894 with minimum crushing strength of 50 kg/cm ²	CUM	1.00	0.0010670%
b	Using burnt clay bricks of class 7.5 of nominal dimension.	CUM	112.00	0.1567000%
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 complete excluding plastering and painting as per specification		0.00	
a	Using fly ash lime bricks confirming to IS 12894 with minimum crushing strength of 50 kg/cm ²	SQM	1.00	0.0001300%
b	Using burnt clay bricks of class 7.5 of nominal dimension.	SQM	213.00	0.0359640%
1004	Providing brick soling including spreading of earth, ramming, watering including 25mm thick cushion of sand complete but excluding excavation and disposal of surplus earth (excavation and disposal of surplus earth shall be measured under applicable item). Using brick on edge.			
a	Using fly ash lime bricks confirming to IS 12894 with minimum crushing strength of 50 kg/cm ²	SQM	1.00	0.0001010%
b	Using burnt clay bricks of class 7.5 of nominal dimension.	SQM	39.00	0.0054420%
1005	Providing brick soling including spreading of earth, ramming, watering including 25mm thick cushion of sand complete but excluding excavation and disposal of surplus earth (excavation and disposal of surplus earth shall be measured under applicable item.).- Using flat bricks.			
b	Using burnt clay bricks of class designation 7.5	SQM	65.00	0.0044660%
1006	Breaking of existing brick work at all levels including plastering, removing the rubbish up to a distance of 500 m including transportation, loading, unloading etc. all complete as directed by the engineer.	CUM	70.00	0.0141830%
1007	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. Encased member shall be wrapped with chicken wire mesh with 50mm lap etc. complete as per specification	CUM	15.00	0.0195380%
1008	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	20.00	0.0007650%
1009	Making openings in existing brick wall or partition wall including making good the broken edges/surface with cement mortar etc. complete	CUM	35.00	0.0085260%
1011	Filling existing brick wall/ partition wall opening at all level including making good the broken edges/surface with cement mortar, painting, finishing to match with existing finishing, scaffolding/supporting at any level, removal of debris upto a lead of 1 km including loading, unloading, transportation etc. all complete	SQM	25.00	0.0042210%
1012	Providing and filling brick bats in soak pits all complete.	CUM	25.00	0.0056530%
1100 DAMP PROOF COURSE				
	Damp proof course including all labour, material, equipment, transportation, handling, shuttering, centering, curing etc at any level as per specification, drawings and as directed by engineer - in - charge.(Cement will be supplied by BHEL free of cost as per TCC)			
1101	Damp proof course 40mm thk 1:1.5:3 concrete (10mm down aggregate) with 2% of approved admixture of water proofing compound. Hot bitumen @ 1.7 kg/SQM shall be applied before & after the DPC as per specification	SQM	30.00	0.0016410%
A1101	Providing Damp Proof Course 50mm thick 1:1.5:3 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 DPC.	SQM	60.00	0.0037580%
1200 CEMENT MORTAR PLASTER				
	Cement mortar plaster including making grooves wherever required including all labour, material, scaffolding, curing etc at any level as per specification, drawings and as directed by engineer-in-charge.			
1201	Providing 20mm thick plaster in two layers(bottom layer 12mm thick with 1:3 cement sand mortar and top layer 8mm thick with 1:1 cement sand mortar with fine sand) outside the building/boundary walls etc., finished to a smooth finish including providing 3mmx3mm size grooves at junctions of two dissimilar materials all complete	SQM	532.00	0.0410320%

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SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
1201A	Providing 18mm thick plaster in cement mortar 1:6 . the brick walls finished to a smooth finish as per specification including providing 3mmx3mm size grooves at junctionsof two dissimilar materials.	SQM	2767.00	0.1920690%
1202	Providing 12mm thick plaster inside the building/boundary wall etc. in cement mortar 1:6 on walls finished to a smooth finish as perspecification all complete.	SQM	1347.00	0.0785330%
1203	Providing 15mm thick plaster in cement mortar 1:6 on walls with rough finish all complete.	SQM	11.00	0.0008020%
1204	Providing 6 mm thick plaster on ceiling in cement mortar 1:4 finished to a smooth all complete.	SQM	1364.00	0.0769650%
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	647.00	0.0140990%
1300 FINISHES TO CONCRETE / PLASTERED SURFACES				
	Finishes, painting to concrete, plastered surfaces including all labour, material, equipment, surface preparation, scaffolding etc. at any level as per specification, drawings and as directed by engineer-in-charge. (PAINTS OF REPUTED BRAND OF REPUTED MANUFACTURER LIKE ICI/BURGER/ASIAN PAINTS OR EQUIVALENT)			
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 specifications.	SQM	3951.00	0.0179610%
1303	Providing & applying 2 or more coats of oil bound destemper as per IS 428 of approved brand, shade & manufacture to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guideline including plaster of paris punning minimum 2 mm.	SQM	10083.00	0.1303770%
1304	Two or more coats of acrylic washable distemper of approved brand and manufacture to give an even shade including a priming coat with distemper primer complete.	SQM	261.00	0.0034310%
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	2839.00	0.0539580%
1306	Providing and applying 2 or more coats of acid/alkali resistant paint of approved brand and colour to floors, walls and ceilingincluding 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 by engineer, at all heights above or below grade level, complete as per specifications.	SQM	195.00	0.0098070%
1307	Two or more coats of fire resistant transparent paint 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.	SQM	10.00	0.0006610%
1309	Two or more coats of synthetic enamel paint of approved make made from synthetic resins and drying oil with rutile titanium dioxide and other selected pigments to give smooth, hard, durable & glossy finish to all interior and exterior surfaces complete	SQM	10.00	0.0001170%
1310	Two or more coats of cement paint (for external use) of approved brand and manufacture to give an even shade including priming coat complete.	SQM	20302.00	0.2469840%
1312	Providing and applying 2 mm thick plaster of paris punning 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	4385.00	0.0704950%
A1312	Providing and applying 1.5 mm thick plaster of paris punning 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	5.00	0.0000600%
1313	Providing and applying ready made Epoxy Paint over areas other than steel structure 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, splash, spillage & acidic environment. The epoxy paint coating shall be of 150micron thickness over epoxy primer.	SQM	482.00	0.0217650%
A1313	Providing and applying ready made Epoxy Paint over areas other than steel structure with suitable pigments of approved shade as perspecification and direction of Engineer. The epoxy paint shall be a two pack material and shall be resistant to water, splash, spillage & acidic environment. The epoxy paint coating shall be of 250 micron thickness over epoxy primer	SQM	5.00	0.0003760%
B1313	Providing and applying ready made Epoxy oil resistant Paint over areas with suitable pigments of approved shade as per specificationand direction of Engineer. The epoxy paint shall be a two pack material and shall be resistant to water, splash, spillage & acidic environment. The epoxy paint coating shall be of 250 micron thickness over epoxy primer.	SQM	5.00	0.0003760%
1315	Providing and applying two or more coats of Acrylic based weather coat paint of approved brand and manufacture and required shadeover one coat of primer after necessary cleaning/ washing, preparing the surface using coir brush/ wire brush, sand paper, including fillingof cracks with putty wherever required etc. all complete to give smooth, hard, durable & glossy finish over a coat of primer over preparedplaster surface as per manufacturers guidelines. The final finished coating shall be fungus resistant, UV resistant, water repellent andextremely durable with color fastness as per specification	SQM	5.00	0.0000850%
1400 FLOORING AND SKIRTING				
	Flooring and skirting at any level including base layer, labour, material, equipments, transportation, handling, curing, polishing etc. at any level as per specification, drawings and as directed by engineer - in - charge.(Cement will be supplied by BHEL free of cost as per TCC)			

VOLUME-III				
JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.				
TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
1401	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 cement concrete mix 1:2:4 (1 cement: 2 sand : 4 stone aggregates 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	1733.00	0.1503060%
1401A	Providing and laying 40 mm thick heavy duty cement concrete flooring with metallic hardener pigmented topping of 12 mm thick uniform graded treated iron particles over underbed of 1 part cement, 1.5 part sand and 3 parts chips (10 mm down, well graded) by volume (only sufficient water added to give workable consistency) in flooring complete as per specification	SQM	728.00	0.0833540%
1401B	Providing and laying 50 mm thick heavy duty cement concrete in flooring with nonmetallic hardener as per sepcification . Hadenershall of hard granules of mineral origin. Under layer of 38mm thick cement concrete mix 1:2:4 (1 cement: 2 sand : 4 stone aggregates 12.5mm well graded) and top layer of 12mm thick nonmetallic concrete of mix 1:2 (1 cement hardner mix with approved quality nonmetallichardening 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 suitable aluminium dividing strips):	SQM	1008.00	0.1153670%
1401C	Providing and laying 40mm thick heavy duty I.P.S flooring with non - metallic hardener pigmented topping including an under layer of cement concrete mix 1:2:4 (1 part cement,2 parts sand and 4 parts stone chips 12.5 mm well graded).	SQM	628.00	0.0575010%
1402	Providing and laying 25 mm thick heavy duty cement concrete mix 1:2:4 (1 cement: 2 sand : 4 stone aggregates) flooring with metallic hardener pigmented topping of 10 mm thick uniform graded treated iron particles in skirting and dado complete as per specification.Under layer of 15mm thick cement concrete mix 1:2:4 (1 cement:2sand:4 stone aggregate 12.5 mm well graded) and top layer of 10 mm thick metallic concrete mix of 1:2 (1 cement hardener mix with approved quality metallic hardening compund : 2stone aggregate 6 mm nominal size) by volume including cement slurry,rounding of edges, aluminium strips etc all complete as per specification.(quoted rate shall be inclusive of providing glass joint strips)	SQM	150.00	0.0098710%
A1402	Providing and laying 25 mm thick heavy duty cement concrete mix 1:2:4 (1 cement: 2 sand : 4 stone aggregates) in skirting and dado complete as per specification.	SQM	200.00	0.0085570%
1404	Providing and laying interlocking M30 Grade concrete blocks in paving with approved colour and pattern and should be laid on the subbase and bedding of sand minimum 50mm thick as per specifications and recommendations of manufacturer.(inclusive of cost of cement for paver manufacturing)	SQM	1178.00	0.1683000%
1405	Providing and laying 50 mm thick floor finish with 25mm thk Terrazo Tiles including minimum 25mm thick cement mortar bedding of 1:3 (1 cement : 3 sand) with neat cement slurry@4.4 kg/sqm,labour,materials, etc. all complete.(inclusive of cost of cement for tiles manufacturing)	SQM	94.00	0.0143660%
1406A	Providing and laying polished Kota stone 22mm to 25mm thk in flooring . Under bed shall average 15mm thk of 1 cement : 2 sand : 4 stone aggregates by volume 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 spread over the surface with fine joint finished including pigments, curing, grinding, granite polishing etc. all complete.	SQM	10.00	0.0029230%
1406B	Providing and laying 40 mm thick Kota stone floor on stair / dado using 20 mm thick kota stone of approved brand, quality and colour over cement mortar bed of required thickness all complete as per specification, approved drgs and direction of Engineer-in-charge	SQM	60.00	0.0141400%
A1408	Providing polished Kota stone 22-25mm thk in skirting projecting 6mm from adjacent plaster including cutting brickwall upto the required depth, edging, finishing etc. all complete.	SQM	1.00	0.0002950%
A1412	Providing and laying 18-20mm thick Mirror polished Granite stone of approved color and texture in flooring in large slab with brass/stainless steel strips. Under bed shall average 30mm thk of 1 cement : 2 sand : 4 stone aggregate by volume and brought to proper level. The granite 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 spread over the surface with fine joint finished including pigments, curing, grinding, granite polishing etc. all complete.	SQM	2.00	0.0008810%
1414	Providing and laying polished Granite stone 18-20mm thk in skirting and dado with 6mm thick projection from adjacent plaster including mortar, cement slurry, pigments, curing, grinding,moulding, granite polishing etc. all complete	SQM	2.00	0.0008750%
1416	Providing and laying vitrified ceramic tiles of polished variety of size 600x600 from reputed / approved manufacturer, complete including underbed of cement mortar 1:3 with neat cement slurry etc. all complete for following			
a	7mm thick tiles In flooring	SQM	50.00	0.0085870%
b	10mm thick tiles In flooring	SQM	6.00	0.0011390%
d	10mm thick tiles In skirting and dado upto specific height	SQM	1.00	0.0001960%
1416A	Providing and laying 10mm thick vitrified ceramic tiles of size 750mm X 750mm unpolished variety from reputed manufacturer for skirting and dado up to specified height complete as per specification	SQM	10.00	0.0047060%
A1417	Providing and laying vitrified ceramic tiles of matt finish variety from reputed / approved manufacturer, complete including underbed of cement mortar 1:3 minimum 20mm thick underbed for flooring and 12 mm thick underbed for dado/skirting with neat cement slurry @3.3 kg/sqm etc all complete for following			

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
a	7.2 mm thick tiles in flooring	SQM	67.00	0.0121050%
b	8 mm thick coloured glazed tiles of size 300x450x 8mm thick In skirting and dado upto specific height	SQM	1.00	0.0002050%
1418	Providing and laying 10 mm thk non-skid fully vitrified tiles of make 'MARBONITE' or 'FERRASTONE of BOSS Profile limited' or equivalent in flooring and skirting over 30 mm thick underbed of 1 part cement and 3 parts coarse sand by weight mixed with sufficient water, complete as per specification laid in pattern of following sizes			
a	600X600 mm	SQM	1.00	0.0001870%
1419	Providing and laying granite stone slab of 20mm thickness single piece for wash basin / sink slab /facia of black or approved colour with cutting,making corners,moulding and opening etc. all complete	SQM	215.00	0.1232090%
1420	Providing and laying Heavy Duty dust pressed Ceramic Tiles of 7mm thick of reputed manufacturer of approved finish shade and colour including 20mm underbed of cement mortar 1:3 with neat cement slurry @3.3kg/sqm etc. all complete			
a	300X300mm	SQM	1322.00	0.2102400%
1422	Providing & fixing Acid / Alkali resistant (Chemical resistant) tiles conforming 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 epoxy 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 & durable.			
a	20mm thick	SQM	91.00	0.0633380%
b	25mm thick	SQM	35.00	0.0189640%
1424	Providing & fixing chemical resistant (AR)(Acid / Alkali) bricks (75mm thick) conforming to IS:4860 in the floor 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 with bituminastic AR bricks shall be laid with 6mm wide & 50mm deep pointing (epoxy / furnace / CNSL) & acid curing shall be done all complete as per specification.	SQM	20.00	0.0094440%
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. Maximum height of false ceiling shall be 600mm from RCC floor.	SQM	1.00	0.0008920%
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, specification and instructions of engineer in charge.			
a	Glass strips 40 mm wide and minimum 6 mm thick.	RM	101.00	0.0009620%
b	Glass strips 50 mm wide and minimum 6 mm thick.	RM		
c	Aluminium strips 40 mm wide and minimum 3 mm thick	RM	1.00	0.0000190%
1500 ROOFING / SIDE CLADDING				
	Roofing/side cladding work including all labour, material, equipment, transportation, handling, scaffolding, ladders, hooks, washers, corner pieces etc. at any level as per specification, drawings and as directed by engineer-in-charge			
1501	Design,Supply,Transport and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour and conforming to class3 of IS 14246 over roof purlins for cast-in-situ roof slab as per relevant IS code and specification. Bare metal thickness of deck plate shall be minimum 0.8mm with minimum trough depth of 44 mm having minimum yield strength of 250 MPa and shall serve as permanent shuttering to the roof slab 100mm thick measured over crest of metal decking & shall have adequate strength to support weight of green concrete and imposed loads of min 150 kg/sqm during construction between purlins as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to purlins, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with silicon modified polyester paint of minimum 20 micron DFT on exposed surface (facing operating floor) and minimum 7 micron on other face over epoxy primer applied over hot dipped galvanising @ 275 gm/sqm including fixing of sheet to purlin with self drilling white zinc plated heat treated carbon steel screws of minimum 5.6 mm dia@ 260mm c/c in the trough and stitch screws between two adjacent sheets and sealing with epoxy sealant. Measurement of profile sheeting shall be of the plan area of roof covered by MS trough metal decking.Payment terms - (a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%.			
a	Span Upto 1800mm	SQM	2.00	0.0004920%
1501A	Design,Supply, unloading, stacking, fabricating, transporting to site, erecting & fixing in position permanently colour coated (on exposed face) troughed metal sheet decking of approved profile having minimum base metal thickness of 0.8mm of galvanised (with minimum rate of galvanisation of 275 gm/sq.m.) .M.S. sheet or minimum 0.8mm of high tensile steel (minimum yield strength 350 MPa) coated with zinc aluminium alloy (zincalume) (coating not less than 150 gm./sq.m). Silicon modified polyester paint having DFT of minimum 20 microns shall be used for permanent coating. The sheeting shall be fixed by means of concealed fixing system or any other compatible method approved by the Engineer. Quoted rate shall include cost of all labour, transport, tools, tackles, scaffolding, lead, lift, fixing etc. complete as per the specification and direction of engineer.	SQM	1000.00	0.2041490%

VOLUME-III				
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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
1501 B	Design, supply & erection of permanent colour coated single skin metal cladding, standing seam or approved equivalent (external sheet) of approved color for external walls comprising of profiled sheet of 0.55 mm TCT (Total Coated Thickness) permanently color coated zincalume steel (150 gsm Zinc - aluminium alloy coating) having 300 Mpa yield strength with color coating of SMP/super polyester XRW including color coating of 20 microns finish coat over a 5 micron primer coat on the exposed side and a back coat of 5 micron over a primer coat of 5 micron on the reverse side. The sheet having 500 mm cover width, 47 mm high crests at 250 mm c/c with special male/female side laps & siphoning feature to prevent leakage including fixing of sheet by concealed clips (including sub-girts of size 50X50X50 mm manufactured out of 16G GI 'Z' shape, without penetrating external sheet) complete with fixing materials including flashings as per specification. Payment terms - (a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%..			
i	2mm thick Translucent sheets of polycarbonate material approved make on roof & side cladding as per the specification and direction of engineer in charge.		100.00	0.0158750%
1501C	Erecting & fixing in position permanently colour coated (on exposed face) troughed metal sheet decking of approved profile having minimum base metal thickness of 0.8mm of galvanised (with minimum rate of galvanisation of 275 gm/sq.m.) .M.S. sheet or minimum 0.8mm of high tensile steel (minimum yield strength 350 MPa) coated with zinc aluminium alloy (zincalume) (coating not less than 150 gm./sq.m). Silicon modified polyester paint having DFT of minimum 20 microns shall be used for permanent coating. The sheeting shall be fixed by means of concealed fixing system or any other compatible method approved by the Engineer. Quoted rate shall include cost of all labour, transport, tools, tackles, scaffolding, lead, lift, fixing and all fixing hardwares materials including EPDM, gaskets, self tacking screws etc. complete as per the specification and direction of engineer (deck sheet shall be supplied by BHEL free of cost)	SQM	160.00	0.0076540%
1502	Providing and fixing self drilling shear connectors of mild steel studs having 16mm dia and minimum 75 mm projected length above purlin passing through metal decking as per relevant IS codes and specification.	QUINTAL	22.00	0.0901350%
A1504	Design,Supply,Transport and fixing External sheet of Permanent colour coated metal cladding with high strength tensile steel sheet 0.6 mm total coated thickness(TCT) having minimum yield strength 550 MPa and zinc-aluminium alloy (Zn:43%,Al:55%,Si:1.5%) organic coating not less than 150 gm/sqm total on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping /self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face of the sheet shall be permanently colour coated with Polyfluro Vinyl Coating (PVF2) or SMP of minimum dry film thickness (DFT) 20 microns over suitable primer. Inner face of the sheet shall be provided with suitable pre-coating of minimum DFT 7 microns over suitable primer. The permanent colour coated sheet shall meet the general requirements of IS : 14246 and shall conform to class 3 for the durability.Payment terms - (a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%..	SQM	1695.00	0.3744970%
B1504	Receipt & Transport & Erection of permanent colour coated single skin metal cladding, standing seam or approved equivalent (external sheet) of approved color for external walls comprising of profiled sheet. Lapping as per specification and drawing & siphoning feature to prevent leakage including fixing of sheet by concealed clips (including sub-girts of size 50X50X50 mm manufactured out of 16G GI 'Z' shape, without penetrating external sheet) complete with fixing materials including flashings as per specification. Contractor to provide all materials including fixing hardwares etc except cladding sheet.Measurement shall be paid after erection of finished surface.			
j)	0.55mm-0.6mm thick metal cladding sheet on sides as per specification in tender	SQM	6300.00	0.3013920%
ii)	2mm thick Translucent sheets of polycarbonate material approved make on roof & side cladding as per the specification and direction of engineer in charge	SQM	955.00	0.0454810%
1600 FALSE CEILING				
	False ceiling including all labour, material, equipment, transportation, handling, suspension system etc at any level as per specification, drawings and as directed by engineer - in - charge.			
1601	Providing and fixing glass fibre reinforced gypsum plaster board (GRG) ceiling (having gypsum core mixed with glass fibre) system consisting of metal supporting grid system forming panels of specified size, suspended from RCC slab/structural steel or catwalkway grid above with 4 mm (minimum) galvanised wires (rods) with special height adjustment clips, including preparation of working drawing, providing openings for AC ducts, return air grills, light fixtures etc (but excluding the cost of catwalkway grid) all complete as per drawings, specification and instructions of the engineer.			
a	12 mm thick GRG board with galvanised light gauge steel load bearing supporting GI frame and finished flat (seamless)	SQM	1235.00	0.2254550%
1601A	Providing and fixing aluminium false ceiling system comprising of 84 mm wide and 12. 5 mm deep closed type plain panels of approved colour , roll formed out of 0.5 mm thk corrosion resistant aluminium alloy AA5050 fixed on roll formed carriers, suspended from RCC slab / structural steel or catwalkway steel channel grid above with 4 mm (min) galvanised wires (rods) with special height adjustment clips , including preparation of working drawing , providing openings for AC ducts, return air grills , light fixtures etc (but excluding cost of catwalkway grid) all complete as per drawings, specifications, and instructions of the engineer.	SQM	250.00	0.1654250%
1700 RAIN WATER DOWN TAKE PIPES				

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
	Rain water down take pipes including all labour, material, transportation, 2 coats of approved paint over one primary coat, fixtures, accessories etc at any level as per specification, drawings and as directed by engineer - in - charge.(CEMENT WILL BE SUPPLIED FREE OF COST BY BHEL AS PER TCC)			
1701	Supply and fixing GI down take pipes of class medium conforming to IS1239/IS3589 as per specification of following dia	RM		
1702	Supply and fixing GI down take pipes of class medium conforming to IS1239/IS3589 as per specification of following dia.- 150 mm dia	RM	270.00	0.0766040%
1702A	GI down take pipes of class medium conforming to IS1239/IS3589 as per specification of following dia.- 150 mm dia (Pipe shall be supplied by BHEL). Necessary hardwares including clamps, screws etc to be supplied by the contractor.	RM	15.00	0.0012770%
1704	Supply and fixing MS down take pipes of 150 mm dia- Medium quality as per IS:1239(part-I) all complete	RM	25.00	0.0064070%
1705	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			
b	110mm dia pipes	RM	45.00	0.0058840%
c	160mm dia pipes	RM	182.00	0.0325680%
A1707	150mm dia PVC pipe of medium class of min pressure 6Kg/sqcm as down comers of rain water, including all fittings, holding down clamps and fixtures complete at all heights and levels as per specifications, approved drawings and direction of Engineer-in- charge.	RM	80.00	0.0066170%
	1800 MISCELLANEOUS WORKS			
	Miscellaneous works including all labour, material, equipment etc. at any level unless otherwise specified as per specification, drawings and as directed by engineer - in - charge.			
1801	Providing and Filling in trenches, plinths, area paving and other underground structures with graded stone aggregate of size range 63 mm to 45 mm in layers not exceeding 230 mm in thickness including breaking of stone boulders to required sizes, filling the interstices with selected sand and compacting to 85 % of original volume of stone stack for all lifts etc. all complete as per the direction of the Engineer and as per specification. Payment shall be made for the measurement of the volume of the compacted fill.	CUM	736.00	0.3426460%
1803	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	25.00	0.0007900%
1810	Providing, laying and fixing rails and guide rails in concrete for transformer, rail track including cutting of rails, joining of rails, anchoring lugs etc all complete.	MT	1.00	0.0172930%
1811	Providing and fixing weep holes in Drains 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 covered with 40 mm downgraded aggregates in 300 X 300 mm sq. and 300 mm deep size all complete.	EACH	50.00	0.0030620%
1812	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	24.00	0.0368520%
1815	Providing and fixing GI rungs in concrete/brick walls having zinc coating of minimum 900 g/sqm etc. all complete.	Kg	100.00	0.0016600%
1817	Providing and fixing HDPE pipes in concrete/ brick work of following sizes including cutting, fixing and levelling in position etc. all complete.			
c	150 mm dia	RM	15.00	0.0018370%
d	200 mm dia	RM	15.00	0.0026260%
1818	Providing and laying dry stone pitching of 230 mm thickness for slope protection in cement mortar 1:6 including hammer dressing, raking of joints, pointing, preparing the bedding surface and voids filling with stone aggregate etc. all complete	SQM	10.00	0.0048330%
1824	Cleaning Debris/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.			
b	Debris & Other waste materials.	CUM	300.00	0.0035930%
1826	Supply and laying approved quality rounded pebbles / gravels of 40mm size in transformer yards	CUM	10.00	0.0059630%
1828	Dismantling old existing reinforced/non-reinforced brickwork/blockwork/stone masonry work in mud/lime/ cement mortar at any level including clearing/cleaning, stacking the serviceable materials at plant site and disposal of unserviceable materials within a lead upto 1km all complete.	CUM	20.00	0.0027640%
1829	Dismantling old existing plain/re-inforced concrete work at any level including clearing/cleaning, stacking the serviceable materials at plant site and disposal of unserviceable materials within a lead upto 1km all complete	CUM	20.00	0.0027640%
1830	Dismantling old existing structural steel work at any level including plates, bolts, cutting rivets, welding, dismembering and lowering material and carriage of dismantled material upto field fabrication shop/project storage including temporary dismantling, cutting, rewelding, supporting and resorting to correct position all temporarily dismantled members, re-alignment of adjacent corrected members to their position(wt of such adjacent member and temporarily dismantled members not payable), scaffolding, staging, tools and tackles, gas cutting, welding , consumables all complete .	MT	3.00	0.0035340%
1836	Providing and laying cinder filling in the toilets/sunken slab complete as directed by engineer in charge	CUM	175.00	0.0446500%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
A1837	Providing and laying foam concrete blocks in the toilets/sunken slab complete as directed by engineer in charge	CUM	10.00	0.0028600%
B1837	Providing and fixing sliding layer of bitumen/craft/LDP 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	10.00	0.0000680%
1839	Restoration, restraightening & making good of old and existing reinforcement, if required welding of new reinforcement with existing reinforcement in old concrete, etc, all complete including chipping of concrete surface & removal of chipped off concrete, cleaning for laying of new RCC over old concrete surface for forming construction joint as per drawings, and as per direction of engineer in charge. Payment will be made on quantity of reinforcement required for restoration, restraightening & making good of old and existing reinforcement. Extra / new reinforcement, if required, shall be paid separately as per relevant items 5.1(a). New Reinforcement will be issued by BHEL free of cost as per TCC. Joint protocol to be maintained.	MT	10.00	0.0202490%
1840	Dismantling, cutting, removal of HYSD reinforcement already placed in raft /foundation wall etc. for restoration, restraightening & making good of old and existing reinforcement, including dewatering pit, sludge removal all complete. cleaning and re- fixing the same all complete. Payment will be made on quantity of reinforcement required for dismantling, cutting & removal & making good to receive new concrete. Joint protocol to be maintained.	MT	10.00	0.0242990%
1841	Completion of welding of left over welding joints mainly fillet joints of erected items in position of different thickness by making all necessary arrangements for welding at ground or at height as per site condition. Welding electrode to be used : 6012 or 7018 as per site requirement. In case of incomplete members, the balance parts yet to be erected, will be paid as per separate item for the part member (not for total item).	RM	100.00	0.0140110%
1842	Providing peripheral brick drain around buildings, of size 300 mm wide x300mm average depth along with 750mm wide plinth protecion consisting of 75mm thick PCC 1:2:4 complete as per specification and direction of Engineer in Charge. Cement will be supplied by BHEL as per TCC free of cost.	RM	200.00	0.1526750%
1843	Providing and laying 230 mm thick boulder solling joints filled with river sand including necessary compaction etc. complete as per specification, approved drawing and direction of Engineer-in-charge	CUM	180.00	0.0682000%
1844	Supply & Laying of Rubble Soiling	CUM	0.00	
1845	Levelling, Grading / Dressing of existing ground to required level and camber including compaction etc complete as per specifications, approved drawings and directions Filling shall be in layers to correct lines and levels as indicated in the drawings, watering and compacting by movement of rollers as required to achieve compaction equal to 90% standard proctor density as directed by Engineer -in -charge including formation of slopes where required using selected earth from the excavated material.	CUM	10000.00	0.1661440%
2000	Fencing and gates			
	Fencing and gates including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc at any level as per specification, drawings and as directed by engineer - in - charge.			
2003	Supplying and erecting in position 2.4 m high PVC coated galvanised 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. 2003B). Contractor to supply all materials.Payment terms - a) On receipt of chain link fencing at site - 50%; b) On completion of erection & fixing - 50%.	RM	123.00	0.0511570%
2203A	Providing and fixing hot dip GI chain link fence confirming to IS:2721 of mesh size 50 mm of approved quality and brand and the diameter of steel wire for chain link fence shall be not less than 2.5mm above the toe wall with 600mm concertina at top such that total fence heigh of 3.00m above the toe wall is acheived, and the fence to be fixed on the fence post with required clips, nut, bolts etc complete as per specifications, approved drawing and direction of Engineer-in-charge. (Payment for supplying and fixing of fence post shall be made separately under relevent item).	SQM	35.00	0.0084570%
2203B	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. Contractor to supply all materials.	MT	2.00	0.0286480%
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 ball bearing arrangements, castor wheels, paintings etc. all complete.	MT	2.00	0.0332340%
2100 WATER SUPPLY				
	Water supply work including men, material, equipment etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
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 - 15mm nominal bore.	EACH	50.00	0.0085290%

VOLUME-III				
JOB: CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR 2 X 250 MW BARAUNI THERMAL POWER STATION (EXTENSION PROJECT), UNIT # 8 & 9 BEGUSARAI, BIHAR, BARAUNI.				
TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
2102	Providing and fixing in position heavy duty brass stop cock of approved quality including all specials etc all complete - 15mm nominal bore.	EACH	50.00	0.0060610%
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	7.00	0.0013190%
b	50mm nominal bore.	EACH	2.00	0.0009060%
2104	Providing and fixing GI pipes class B medium class conforming to IS:1239 pipes shall be concealed and painted with anticorrosive 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:	RM		
a	15mm nominal bore	RM	39.20	0.0028170%
b	20mm nominal bore	RM	69.50	0.0054860%
c	25mm nominal bore	RM	271.00	0.0245990%
2105	Providing and fixing GI pipes class B/ complete for external work with GI sockets, unions, elbows, tees, nipples etc including trenching & refilling, anti-corrosive paint etc all complete for following sizes			
a	15 mm nominal bore.	RM	10.00	0.0006000%
b	20 mm nominal bore.	RM	52.00	0.0034890%
c	25 mm nominal bore.	RM	690.00	0.0543680%
d	50 mm nominal bore.	RM	12.00	0.0014080%
2106	Providing and fixing 610mmx453mmx6mm thk mirror from reputed mirror manufacturer. Mirror shall be mounted with glass adjustablerevolving CP brackets with CP screws etc all complete	EACH	60.00	0.0119060%
2106A	Providing & fixing 610mmx127mmx6mm thk clear glass with CP guard rails and mounted on CP brackets etc complete as per specification.	NOS	54.00	0.0070210%
2108	Providing and fixing 25 mm diameter stainless steel towel rails (600mm X 25mm) with C.P. mounting brackets all complete	EACH	41.00	0.0048100%
A2108	Providing and fixing 20 mm diameter stainless steel towel rails (600mm X 20mm) all complete.	EACH	4.00	0.0003750%
2109	Providing and fixing 20mm dia chromium plated M.S. pipes wall mounted towel rod with C.P. Brackets etc all complete	EACH	8.00	0.0008360%
2110	Providing and fixing C.P. soap holder mounted with C.P. screws etc all complete.	EACH	38.00	0.0039700%
2110A	Providing & fixing stainless steel soap holder mounted with CP screws etc complete as per specification.	NOS	2.00	0.0001570%
2111	Providing and fixing stainless steel / C.P. liquid soap dispenser . Dispenser shall be round and easily revolving with removable threaded nozzle and mounted on C.P. brackets etc all complete.	EACH	8.00	0.0007560%
2112	Providing and fixing glazed vitreous wall mounted paper holder with suitable cover cum cutter fitted with CP screws etc. sll complete.	EACH	4.00	0.0004100%
2113	Providing and fixing chromium plated brass shower rose 100mm dia with 15 or 20 mm inlet dia all complete	EACH	1.00	0.0001530%
A2113	Providing and fixing chromium plated wall mixture with provision of shower all complete.	EACH	4.00	0.0014990%
B2113	Providing and fixing chromium plated wall mounted sink mixture all complete.	EACH	4.00	0.0025010%
2114	Providing & fixing in position P.V.C. water 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	7.00	0.0068210%
b	1000 litres capacity	EACH	8.00	0.0155890%
c	2000 litres capacity	EACH	31.00	0.1208210%
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 etc. all complete.	EACH	5.00	0.0077230%
2200 SANITARY WORKS				
	Sanitary work including all labour, material, equipment etc. at any level as per specification, drawings and as directed by engineer - in - charge.			
2201	Supply and fixing glazed vitreous china Wash Basin 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, fittings, cutting and making good the walls where required etc all complete.(Cement will be supplied by BHEL free of cost as per TCC):		2.00	
a	White	EACH	25.00	0.0538750%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
b	Colored	EACH	35.00	0.0754260%
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, CP brass waste and 40mm CP brass trap with necessary union complete including painting the fittings, cutting and making good the wall where required etc. all complete.	EACH	8.00	0.0094290%
2203	Providing and fixing stainless steel kitchen sink of size 610x510x200mm conforming to IS: 13983 including all fittings etc. all complete.	EACH	8.00	0.0109430%
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.(Cement will be supplied by BHEL free of cost as per TCC):			

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
a	Floor mounted	EACH	40.00	0.0377060%
2205	Providing and fixing colour glazed vitreous indian type Orissa pattern (580x440mm) water closet conforming to IS:2556 part 3 with allfittings including foot rests, low level 12.5 litre PVC flushing cistern with valveless fittings, necessary C.P connections etc all complete.(Cement will be supplied by BHEL free of cost as per TCC):	EACH	24.00	0.0249860%
A2206	Providing and fixing white flat back glazed vitreous china urinals of size 440x265x355 mm with photo voltaic control flushing system as per IS:2556 (part 6, section 1) with flush pipes, lead pipes, gratings, traps and necessary C.P. fittings etc. all complete.	EACH	44.00	0.1655250%
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	83.00	0.0053420%
b	110 mm dia pipes	RM	196.50	0.0171850%
A2207	Supply, laying and jointing HDPE pipes 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.			
c	160mm dia pipes	RM	20.00	0.0036940%
d	200mm dia pipes	RM	20.00	0.0054320%
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 complete for following.			
a	200mm dia	RM	166.00	0.0154750%
b	150mm dia	RM	10.00	0.0006990%
c	300mm dia	RM	88.40	0.0193910%
d	450mm dia	RM	94.80	0.0311920%
e	600mm dia	RM	82.00	0.0342350%
f	900mm dia	RM	82.00	0.0518430%
g	1800mm dia	RM	10.00	0.0126450%
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 complete for following.			
a	150mm dia	RM	10.00	0.0009180%
b	250mm dia	RM	1367.00	0.1714320%
c	300mm dia	RM	121.00	0.0171820%
d	500mm dia	RM	84.00	0.0180020%
2211	Providing and fixing C.I Manhole heavy duty cover of size 600mmx450mm including frame from reputed manufacture etc. all complete.	EACH	22.00	0.0501030%
2212	Providing and fixing circular heavy duty C.I. manhole cover of 600 mm dia with frame etc. all complete.	EACH	105.00	0.2400350%
2213	Providing and fixing square mouth S.W Gully trap grade 'A' complete with CI grating, brick masonry chamber and water tight CI coverwith 300x300mm (inside). The weight of cover to be not less than 4.53 Kg and frame to be not less than 2.72 Kg etc all complete for following sizes:			
a	100x100mm P or S Type.	EACH	25.00	0.0130640%
b	150x100mm P or S Type.	EACH	6.00	0.0032150%
c	150x150mm P or S Type.	EACH	6.00	0.0032890%
2215	Providing and fixing C.I. floor traps with C.P jalli all complete.	EACH	6.00	0.0017270%
2216	Providing and fixing heavy duty UPVC floor traps with C.P jalli all complete.	EACH	113.00	0.0279510%
A2217	Providing and installing approved brand single tap water cooler of 50 L cooling capacity all complete with two year free maintenance and guarantee.	EACH	4.00	0.0232580%
A2218	Providing and installing approved brand single tap water cooler of 150 L cooling capacity all complete with two year free maintenanceand guarantee.	EACH	6.00	0.1002650%
2219	Providing and fixing white viterous urinal partitions of size 675x325x85mm all complete.	EACH	42.00	0.0191290%
2220	Providing and fixing eye and face drinking water fountain (combined unit with receptacle conforming to IS: 10592) all complete as per specification	EACH	4.00	0.0051200%

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SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
A2221	Providing and fixing heavy duty cast iron pipes for above and below ground sanitary works with water tight lead joint, fixing clamps,excavation, filling, disposal etc. all complete for the following.			
a	150mm dia pipes	RM	20.00	0.0077900%
b	200mm dia pipes	RM	20.00	0.0122200%
c	250mm dia pipes	RM	10.00	0.0109000%
	STRUCTURAL STEEL WORKS			
2301	STRUCTURAL WORK OF FABRICATION AND ERECTION OF, (MS PLATES, CHANNEL, ISMB, ANGLE, CHEQUERED PLATES, WILL BE SUPPLIED BY BHEL FREE OF COST AS PER SCC) "Taking delivery of steel from BHEL stores/store yard or directly from trailer, fabricating, transporting to site, and erecting in position by all sorts of mechanical means including suitable heavy duty crane, as required, alignment and fixing of Structural Steel members including provision of necessary bolts, nuts, washers, cleats, stiffeners, gussets, base plates, and all other fixtures including all operations like preheating, straightening, cutting, drilling, machining, grinding, welding, non destructive and other tests as per specifications & tender for welds, transportation to & from stores etc etc. including cleaning, preparing surfaces by sand blasting to near white metal conforming to Sa21/2 finish, at all elevations to achieve an even shade with all materials and providing with shop coat primer with organic zinc Silicate primer of 75 micron DFT, etc. all complete as per specifications, approved construction / fabrication drawings and as directed by Engineer-in charge for the following. (MS PLATES, CHANNEL, ISMB, ANGLE, CHEQUERED PLATES, STAINLESS STEEL PLATE WILL BE SUPPLIED BY BHEL FREE OF COST AS PER SCC) Quoted rate shall include cost of all labour, tools and plants, consumables, erection bolts,permanent bolts,scaffolding, lead, lift etc complete.			
	All type of structural steel works for columns, beams, bracings, trusses, purlins, side girts, pipe racks and trestles, lattice girders, built-up section, chequered plates etc. (including pack / spacer plates, splice plates, connecting plates,MS square bars,Crane girders, end plates, gusset plates, etc.) at all levels with rolled steel sections like Beams, Channels, Angles, Plates etc,			
a	Receipt of materials, Transportation, Fabrication, shot blasting ,primer painting and shifting to site for erector	MT	282.00	0.6944820%
b	Erecting in position , alignment , fixing & Complete welding etc. complete in all respect as per the direction of engineer	MT	364.00	0.4826900%
2301b	"Receipt of fabricated structural steel materials at site, unloading at site, stacking, transporting to site, and erecting in position by all sorts of mechanical means including suitable heavy duty crane, as required, alignment and fixing of Structural Steel members including provision of necessary bolts, nuts, washers, cleats, stiffeners, gussets, base plates, and all other fixtures including all operations like preheating, machining, grinding, welding, non destructive and other tests as per specifications & tender for welds, loading, unloading, stacking, etc. including cleaning at all elevations etc. all complete as per specifications, approved construction / fabrication drawings and as directed by Engineer-in charge for the following. (MS PLATES, CHANNEL, ISMB, ANGLE, CHEQUERED PLATES, LINER PLATES, WILL BE SUPPLIED BY BHEL FREE OF COST AS PER TCC) . Quoted rate shall include cost of all labour, tools and plants, consumables, erection bolts,permanent bolts, PTFE bearings, scaffolding, lead, lift etc complete(excluding high tensile bolts).	MT	50.00	0.0663040%
2302	Erection of structural steel materials from stock yard or EX works of approved vendor, unloading at site, stacking, Fabricating, transporting to site, and erecting in position by all sorts of mechanical means including suitable heavy duty crane, as required, alignment and fixing of Structural Steel members including provision of necessary bolts, nuts, washers, cleats, stiffeners, gussets, base plates, and all other fixtures including all operations like preheating, straightening, cutting, drilling, machining, grinding, welding, non destructive and other tests as per specifications & tender for welds, loading, unloading, stacking, etc. including cleaning, preparing surfaces by sand blasting and providing with shop coat primer with Organic zinc silicate primer, etc., etc. all complete as per specificationsapproved construction / fabrication drawings and as directed by Engineer-in charge for the following. Quoted rate shall include supply of steel, cost of all labour, tools and plants, consumables, erection bolts, scaffolding, lead, lift etc complete.			
i	Hopper gratings as per the scope, specification and approved drawings	MT	10.00	0.1626890%
ii	Dust Chutes as per the scope, specification and approved drawings	MT	5.50	0.0894790%
iii	Louvers and similar type of works as per the scope, specification and approved drawings	SQM	250.00	0.1781570%
2303	Supply, fabrication and fixing of GI Hand rails as per the scope, specification and approved drawings	MT	17.00	0.2906160%
2303a	Transportation from BHEL Store, Fabrication and fixing of GI Hand rails as per the scope, specification and approved drawings(GI pipe shall be supplied by BHEL)	MT	15.00	0.0769280%

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SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
2303B	Transportation from BHEL Store, Fabrication and fixing of louvers and similar type of works as per the scope, specification and approved drawings (Louvers materials shall be supplied by BHEL)	SQM	200.00	0.0222660%
2304	Extra over ST No. 2301 for providing and applying two coats of synthetic enamel paint with minimum 50 micron total dry film thickness (DFT) of approved make and shade to achieve an even shade over steel sections already having primer coats and keeping overall DFT with primer not less than 110 microns including protection and cleaning, scaffolding etc. all complete	MT	69.00	0.0303610%
2305(a)	Painting of structural steel works with an intermediate coat of 75 Micron epoxy resin based paint pigmented with titanium dioxide/ Micaceous iron oxide (MIO) with min over primer coat.	MT	352.00	0.1773580%
b)	Painting of structural steel works over intermediate coat with epoxy paint suitably pigmented of approved shade and colour with glossy finish and DFT of 70 microns as per the directions of engineer in charge.	MT		
c)	Painting of structural steel works finishing coat of polyurethane of min. DFT of 30 microns over top coat.	MT		
2306	Supplying and fixing in position of permanent mild steel bolts (class 4.6 as per IS : 1367 and grade 'C' as per IS: 1363) and nuts, washers etc. up to and inclusive of 39 mm diameter and upto 300mm long for structural steel work complete as per specification, drawings and instructions of engineer (Contractor shall supply all materials). Payment terms - a) On receipt of materials at site - 65%; b) On completion of erection & fixing - 35%.	QUINTAL	51.00	0.0853750%
2307	Supplying, fabrication , transportation, erection and alignment of factory made electroforged galvanised gratings of steel (having minimum galvanisation of 610 g/SQM) conforming to IS:2062 at all elevations including preparation of design drawings and fabrication drawings in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads, fixing clamps etc. complete with other fittings and fixtures including all taxes, duties, transportation, packing, grinding, drilling, bolting (supply of permanent grade 'C' mild steel bolts and nuts to be paid separately under ST no. 2309 (i), all welding, edge preparation, blast cleaning of steel surfaces to near white metal surface (Sa 2 1/2), testing, complete as per specifications, drawings and instructions of engineer (you shall supply all materials). Payment terms - a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%.	MT	38.99	0.8281620%
2307a	Transportation, from BHEL store, erection and alignment of factory made electroforged galvanised gratings of steel (having minimum galvanisation of 610 g/SQM) conforming to IS:2062 at all elevations including preparation of design drawings and fabrication drawings in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads, fixing clamps etc. complete with other fittings and fixtures including all taxes, duties, transportation, packing, grinding, drilling, bolting (supply of permanent grade 'C' mild steel bolts and nuts to be paid separately under ST no. 2312, all welding, edge preparation, blast cleaning of steel surfaces to near white metal surface (Sa 2 1/2), testing, complete as per specifications, drawings and instructions of engineer (You shall supply all materials, exept gratings).	MT	5.00	0.0053100%
2308	Supplying, fabrication , transportation, erection and alignment of M S grating at all elevations including preparation of fabrication drawings in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads, fixing clamps etc. complete with other fittings and fixtures including all taxes, duties, transportation, packing, grinding, drilling, bolting (supply of permanent grade 'C' mild steel bolts and nuts to be paid separately under ST no. 2312, all welding, edge preparation, blast cleaning of steel surfaces to near white metal surface (Sa 2 1/2), and including two coats of redoxide zinc chromate primer (one coat at shop and one coat after erection) testing etc complete as per specifications, drawings and instructions of engineer (Contractor shall supply all materials). Payment terms - a) On receipt of materials at site - 70%; b) On completion of erection & fixing - 30%.	MT	38.99	0.4923910%
2309	Finishing the fabricated grating unit with hot dipped galvanisation @ 610 gm/SQM over blast cleaned steel surfaces, as per specifications, drawings and instructions of engineer instead of painting with 2 coats of red oxide primer followed by two coats of enamel finish paint.	MT	76.00	0.3552670%
2310	FABRICATE AND ERECTION OF SLAIMA/SAILHARD/TISCRAI LINER MATERIAL OVER WT HOPPER WITH ALL LUGS /INSERT COMPLETE AS PER APPROVED DRAWING.MATERIAL SLAIMA/SAILHARD/TISCRAI LINER SAHLL BE PROVIDED BY BHEL FREE OF COST.	MT	32.00	0.0967700%
2312	Providing and fixing in positioning of high strength structural bolts (of property class8.8 and product grade "C" as per IS:1367) and confirming to IS:3757 and high strength structural hardened and tempered nouts (of property class "8" as per IS:1367) confirming to IS : 6623 with hardened and tempedered washers as per IS:6649 etc. upto and inclusive of 39 mm diametre and upto 300 mm long for structural steel work etc. all complete	Quintal	2.00	0.0070840%
2320	Fabrication and fixing of GI pipe hand railing (900 mm high) of 32 mm/40 mm dia (Medium Grade) including transportation, loading/unloading, painting etc. all complete..	MT	2.00	0.0045150%
2320S	Supply GI pipe hand railing (900 mm high) of 32 mm/40 mm dia (Medium Grade) including transportation, loading/unloading, painting etc. all complete. Contractor to supply all materials.	MT	2.00	0.0289900%
2400 ROAD WORK S				
	Providing Road Work including necessary material, labour, machinery, transportation etc as per specification, drawing, relevant IRC & IS codes and as directed by the Engineer-in-charge for the following.			

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SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
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	28101.00	0.1662680%
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 etc all complete.	Cum	6188.00	0.1678850%
2403	Providing, stacking & laying granular morrum for shoulder including watering, compaction with road roller to required camber etc all complete.	CUM	10214.00	3.3106170%
2403A	Providing & Laying water bound macadam sub base course in layers of required thickness with crushed stone aggregates 90 to 40 mm down size, stone screening & blinding material including screening sorting, spreading to template & consolidation with road roller including carriage, spreading & consolidation of blinding material moorum etc including cost of material labour all complete.	CUM	3958.00	2.2653320%
2403B	Providing & Laying water bound macadam base course in layers of required thickness with stone aggregate 63mm to 40mm size, stone screening and blinding material including screening sorting, spreading to template and consolidation with road roller including carriage, spreading and consolidation of blinding material moorum etc including cost of material labour all complete	CUM	15719.00	9.7021370%
2400C	Laying water bound macadam base course with stone aggregate 50mm to 20mm size stone screening & binding material including screening, sorting, spreading to template & consolidation with road roller including carriage spreading & consolidation of binding material moorum etc including cost of material labour, all complete.	CUM	14565.00	9.5090330%
2403D	Providing and applying tack coat of low viscosity liquid bitumen of a suitable approved grade confirming to IS 73, 217 or 454 as applicable @ 10 kg/10SQM for an untreated WBM surface including scraping, cleaning with compressed air etc complete.	SQM	25621.00	0.3142810%
2403E	Providing, mixing and laying premix carpet (as per IRC-14) of compacted 25mm thickness in a single course composed of suitable small size aggregate premixed with a bituminous binder on a prepared base. Mixing applying rolling as per IRC specification.	SQM	17321.00	0.7898840%
2403F	Providing and applying liquid seal coat comprising of an application of a layer of bituminous binder using medium setting grade bitumen @9.8 kg per 10 sqm followed by a cover of stone chips @ .09 cum per 10 sqm including rolling etc complete as per specification.	SQM	17321.00	0.2724600%
2409	Providing, mixing & laying of bituminous macadam course of specified thickness using bitumen of grade 60/70 conforming to IS 73, aggregates and binder material including hot mixing, hot laying, rolling etc all complete for the following.			
c	55mm compacted thickness	SQM	14821.00	1.2140130%
2411	Providing, mixing & laying 25 mm thick semi dense bituminous concrete(SDBC) in a single course composed of suitable small size aggregate premixed with bituminous binder using medium setting grade bitumen on a prepared base including mixing, applying, rolling etc all complete.	SQM	14821.00	0.7293490%

VOLUME-III				
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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
2411 A	Providing & applying tack coat of low viscosity liquid bitumen of grade 80/100 confirming to IS 73, 217 or 454 as applicable @ 6 kg/ 10 sqm for bituminous surface including cleaning with compressed air etc all complete	SQM	14821.00	0.1818020%
2412	Supplying and laying 300mmx150mmx300mm 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 required etc all complete.	RM	6315.00	0.3596480%
2415	Dismantling of existing road consisting of premix carpet, kerb stone/ brick on edge, bitumen macadam 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	251.00	0.0032220%
A2423	Providing & installation of bitumen impregnated fibre board of specified thickness confirming to IS 1838 as joint filler including nailing, coating of both faces with coal tar pitch/bitumen etc. all complete as per specification, drawing and as directed by engineer.	RM	15.00	0.0023170%
2424	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	10.00	0.0006650%
2425	Providing and laying debonding strip/tape of specified thickness before applying sealant including cleaning etc all complete as per specification, drawing and as directed by Engineer.	RM	10.00	0.0008560%
A2426	Providing and laying 60mm thick factory made cement concrete interlocking paver block of M -30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of coarse sand, filling the joints with line sand etc. all complete as per the direction of Engineer-in-charge.	SQM	80.00	0.0132340%
B2426	Providing & laying 75 mm thick precast interlocking concrete pavers of approved colour and pattern as per specification and recommendation of manufacturer.	SQM	1177.87	0.2378740%
2407A	Providing and placing in position 100 mm thick factory made machine batched & machine mixed Precast RCC Rectangular Covers on drains of footpath of various sizes, of M-25 grade cement concrete for RCC work, including cost of centring, shuttering, reinforcement of 8 mm dia TMT bars of Fe 500 grade @ maximum 100mm c/c on both ways , neat cement punning on finished surface, properly encased on all edges with 1.6 mm thick , 100 mm wide MS sheet duly painted over priming coat , reinforcement to be welded at edges with MS sheet and providing 2 Nos. 12 mm dia bar for hooks etc i/c cost of cartage, all leads & lift, handling at site etc. all complete as per direction of Engineer-in-Charge.	SQM	82.00	0.0171820%
2408A	Providing, fitting and fixing heavy duty minimum six lever mortised lock of godrej or equivalent make with handles or knobs to single and double leaf door (wooden/ steel/Aluminium) with duplicate set of keys and master keyed locks, openable from one side by the key and from the other side by the handle etc all complete as per drawing, specification and instruction of engineer	NOS	10.00	0.0011450%
2409B	Providing and fixing of approved make Toilet fitting and fixtures (chromium plated fancy fixtures)complete as per specific technical requirements including water and sanitary pipeline & fittings, Bib cocks, stop cocks etc..The fittings shall consist of one Indian WC of Orissa pan type of size 588x440mm with 10 litres cistern, One set WC western type as per IS2556(part 2).Set of two urinals of size 465x265x355mm with white glazed china partitions with photovoltaic control flushing system, Two set of oval shaped wash basin fixed on concrete platform with 12thick polished granite stone, two float glass mirror of size 600x450x5.5mm, two stainless steel towel rail of 600x20mm and two stainless steel liquid soap holder cum dispenser . complete for buildings all complete as per specification, approved drawings and direction of Engineer-in-charge .The quoted rate shall be for 1 toilet block including all fittings and fixtures,PVC nahn traps,GI water pipes,Soil waste pipes etc.	Lot	4.00	0.1172470%
2410A	Sprinkling of water by water tanker, fitted with perforated GI pipe (portable tanker of min 3000 ltr cap) for roads, laydown area & misc area within plant boundary for suppression of dust & reduction of suspended particles arising out of day-to-day work under this contract as per instruction of BHEL. Water for this purpose shall be provided by BHEL free of cost & utilisation of tanker will be in terms tank-hr put in actual use for sprinkling.	TANK-HR	400.00	0.0323630%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
2500	PILING AND GROUND IMPROVEMENT WORKS			
2501	Mobilisation of hydraulic rotary piling rigs and accessories capable of pile boring/drilling in all types of strata/installing various size of bored cast in situ RCC piles to project site and demobilisation of the same after completion of piling works etc all complete.	Each	4.00	1.1368230%
2502	Mobilization of DRIVEN cast in situ RCC piling rigs accessories capable of installing 550 mm diameter piles in all types of soil to project site and demobilization of the same after the completion of piling works etc all complete. Payments: a) mobilisation and commissioning of rig- 80%, b) demobilisation- 20%)	Each	1.00	0.2842060%
2503	Installation of Bored cast-in-situ RCC vertical pile as per IS 2911 (Part 1 Sec 2) with diameter and length as specified (length to be measured from pile cut-off level to the bottom of pile) using cement concrete grade M25 conforming to IS:456 with 20 mm nominal size stone aggregates with a minimum cement content of 400Kg per cum of concrete including providing all materials (but excluding reinforcement steel for which measurement/payment shall be made separately), boring/drilling in all types of soil/ash etc. , providing bentonite slurry and/or casing for stabilization of pile bore, flushing of pile bore, cleaning, providing plasticizer wherever required, breaking pile head to cut off level and exposing pile reinforcement for embedment in pile cap etc including empty boring from ground level to pile cutoff level etc all complete as per specification, drawing and as directed by the engineer-in-charge for the			
a	Pile with 450 mm diameter and 25 m length below cut off leve	Each	31.00	0.2079050%
b	Pile with 500 mm diameter and 25 m length below cut off leve	Each	1.00	0.0078290%
d	Pile with 600 mm diameter and 25 m length below cut off leve	Each	355.00	3.9043550%
e	Pile with 750 mm diameter and 25 m length below cut off leve	Each	120.00	1.8257170%
f	Pile with 900 mm diameter and 20 m length below cut off leve	Each	1.00	0.0214490%
B2504	Extra over ST. No. 2503 for pile length more than the specified length of 25m below cut off level for the following.			
c	For 600 mm diameter pile	Rm	15.00	0.0073490%
d	For 750 mm diameter pile	Rm	5.00	0.0033900%
A2505	Rebate on ST.No.2503 for pile length less than the specified length of 25m below cut off level for the following.			
c	For 600 mm diameter pile	Rm	15.00	-0.0069590%
d	For 750 mm diameter pile	Rm	5.00	-0.0030690%
2507	Conducting initial load test upto maximum test load of three times the safe load capacity on single pile as specified in accordance with IS2911 part-4 including preparation of pile head for testing , necessary excavation, providing all arrangements of loading, unloading, test equipments/accessories, jacks, recording of results labour submission of test report etc but excluding the cost of installation of pile (installation of pile shall be paid separately under item head 2503)etc. all complete as per the specification , drawing and as directed by the engineer in charge for the following			
A	for vertical compression test by cyclic load method (Initial Load Test)			
i	450mm diameter pile -	Nos	3.00	0.1822350%
ii	500mm diameter pile -	NOS	2.00	0.1214900%
iii	600mm diameter pile -	Nos	4.00	0.2514900%
iv	750mm diameter pile -	Nos	3.00	0.1977340%
B	for lateral load test			
i	450mm diameter pile -	Nos	3.00	0.1156840%
ii	500mm diameter pile -	NOS	2.00	0.0771230%
iii	600mm diameter pile -	Nos	4.00	0.1843300%
iv	750mm diameter pile -	Nos	3.00	0.1720930%
C	for tension/uplift load test			
i	450mm diameter pile -	Nos	2.00	0.0560400%
ii	500mm diameter pile -	NOS	2.00	0.0560400%
iii	600mm diameter pile -	Nos	3.00	0.1003000%
iv	750mm diameter pile -	Nos	3.00	0.1246590%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
2508	Conducting routine load test on single job pile as specified in accordance with IS 2911 (Part-4) including preparation of pile head for testing, necessary excavation, providing all arrangements of loading, unloading, test equipments/accessories, jacks, recording of results, labour, submission of test report etc but excluding the cost of installation of job pile complete as per specification, drawing and as directed by the engineer-in-charge for the following.			
a	For vertical compression test by maintained load method			
i	450 mm diameter pile	Each	2.00	0.1192620%
ii	500 mm diameter pile	Each	1.00	0.0596310%
iii	600 mm diameter pile	Each	4.00	0.2859900%
iv	750 mm diameter pile	Each	2.00	0.1782660%
v	900 mm diameter pile	Each	1.00	0.1183070%
b	For lateral load test			
i	450 mm diameter pile	Each	2.00	0.0771230%
ii	500 mm diameter pile	Each	1.00	0.0385610%
iii	600 mm diameter pile	Each	4.00	0.1843300%
iv	750 mm diameter pile	Each	2.00	0.1147290%
v	900 mm diameter pile	Each	1.00	0.0761680%
A2509	Carrying out low strain pile integrity test on 450mm/500mm/600mm/760mm diameter pile including all arrangements for test,equipments/accessories, materials, labour, submission of test report etc but excluding the cost of installation of job pile all complete as per specification and as directed by the engineer-in-charge.	Each	7.00	0.0015120%
A2510 a	Mobilization of 500 mm diameter and 12m long driven cast-in-situ compaction stone column with vibro compacting rig with accessories capable of pile boring/drilling in all types of strata/installing various size of stone column to project site and demobilisation of the same after completion of piling works etc all complete.	Each	4.00	0.3999870%
A2510 b	Conducting Dynamic cone penetration test at specified location as per the IS 4968, part-1 for a maximum depth upto 15m below ground level or upto refusal (150 blows for 300mm or less penetration) and submission of approved test report etc as per specification	nos	11.00	0.0086180%
A2510	Providing and installing 500 mm diameter and 12m long driven cast-in-situ compaction stone column with vibro compacting rig by driving of suitable MS casing pipe (removable) having a detachable M.S. Shoe (flat/conical) at the bottom and filling inside the casing pipe in layers of 1m using 1(sand) :2(gravel shall be of 50mm & down) and each layer shall be compacted by dynamic compaction method (before compaction, lift the casing for about 800mm from the bottom and then backfill shall be thoroughly compacted. This procedure shall be repeated for every layer till the ground level is reached) for ground improvement of pond ash deposit at desired location including all materials, equipment etc complete as per the specification, drawings and as directed by engineer-in-charge	Nos	617.09	1.8596940%
a	Extra over item no. A2510 and .for increase in depth of driven cast-in-situ compaction stone column over the specified length of 12m	RM	31.00	0.0080620%
b	Rebate on item no. A2510 for decrease in depth of driven cast-in-situ compaction stone column over the specified length of 12m	RM	31.00	-0.0080620%
2511	Conducting plate load test at specified depth using 600mm x600mm x 25mm mild steel plate as per IS -188 and submission of approved test report etc as per the specification. (earth work in excavation and back filling shall be paid extra as per relevant applicable item)	nos	2.00	0.0215260%
2513	Providing and driving sheet pile upto all depths in various types of soils, cost inclusive of all materials like sheet, tools and plants, anchoring arrangement, labour etc all complete including removing the sheet piles on completion of respective Civil Works as per the direction of engineer in charge. Quoted price is inclusive of design and approval of sheet pile system with anchoring. (The item shall be executed on specific approval by the Engineer-in-charge on a case-to-case basis depending on space constraints).	SQM	150.00	0.0150660%

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TENDER NO. PSER:SCT:BRM-C1953:19				
SCH 2: CIVIL				
ST NO	Descriptions of Item	UNIT	Quantity	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
	LEVELLING & GRADING			
2514	Earth work in stripping of top soil upto a minimum depth of 0.30m below ground level so as to exclude all debris, grass, vegetation, bushes, trees having girth upto 300mm including roots and organic materials etc for levelling 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	20000.00	0.0548390%
2515	Earth work in excavation upto any depth below ground level in all types of soil including moorum, pond ash/fly ash which can be excavated by any means for grading including setting out, levelling, dewatering (wherever required), dressing the sides & bottom, levelling to grade, all lifts, ramming/compacting the excavated bottom/graded surface, stacking/disposal of surplus excavated materials 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.	CUM	5000.00	0.0541170%
2516	Earth work in filling upto any depth below ground level for grading to proper grade and level in layers not exceeding 300mm loose thickness with selected approved quality of pond ash/fly ash/soil from compulsorily excavated soil available within a lead upto 1km and compacted as specified including re-excavation of stacked earth, all lifts, sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing etc all complete as per specification, drawing and as directed by the engineer for the following.			
a	Each layer compacted so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VII)	CUM	5000.00	0.0548390%
				100.0000000%