BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP
SUBCONTRACTS MANAGEMENT
PLOT NO. 25, SECTOR 16A, NOIDA,
DISTT. – GAUTAM BUDDH NAGAR (U.P.) - 201301

TENDER DOCUMENTS

FOR

EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH.

CUSTOMER

NTPC LARA

TENDER SPEC. NO.: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25

DATE: 20.02.2025

TRANSMISSION BUSINESS GROUP

SUBCONTRACTS MANAGEMENT

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BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

SECTOR-16A, NOIDA -201301

e-mail: akmeena**@bhel.in**

NOTICE INVITING TENDER

REF.: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 **DATE: 20.02.2025**

SUB: TENDER FOR "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400KV TRANSMISSION LINE AT 2 X 800 MW NTPC LARA STPP-II, CHATTISGARH".

Dear Sirs,

1. **Sealed tenders are invited for the following:**

NAME OF WORK	TIME OF COMPLETION	EARNEST MONEY DEPOSIT	TENDER SUBMISSION DATE AND TIME	TENDER OPENING DATE & TIME
EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH.	6.5 months from the date of LOI	Rs. 5,00,000/- As per Annexure to conditions of contract	**06.03.2025 11.00 hrs**.	**06.03.2025 16.00 hrs.** (Technical bid only)

2. Bidder has to submit offer directly through E-PROCURMENT MODE. Bidder may visit **https://eprocurebhel.co.in**

Procedure for Submission of Tenders through e-tendering: The tender is also floated online through our E-Procurement Site https://eprocurebhel.co.in . The bidder may respond by submitting their offer online in our e-Procurement platform at https://eprocurebhel.co.in

Offers are invited in two-parts only.

Documents Comprising the e-Tender

The tender shall be submitted online EXCEPT EMD (which shall be submitted in physical form (as described in NIT cl. No.1) above as mentioned below:

a) Technical Bid (Un priced Tender)

All Technical details (e.g. Eligibility Criteria requested (as mentioned below)) should be attached in e-tendering module, failing which the tender stands invalid & may be REJECTED. Bidders shall furnish the following information along with technical tender (preferably in pdf format):

i) Earnest money Deposit (EMD) furnished in accordance with NIT Clause

ii) Technical Bid (without indicating any prices).

b) Price Bid:

i) Prices are to be quoted in the attached Price Bid format online on e-tender portal.

ii) The price should be quoted for the accounting unit indicated in the e-tender document.

iii) Note: It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.

iv) A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrantee that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other

civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.

v) A tender, which does not fulfil any of the above requirements and/or gives evasive information/reply against any such requirement, shall be liable to be ignored and rejected.

c) Uploading of the price bid in prequalification bid or technical bid may RESULT IN REJECTION of the tender.

d) Tenders shall be uploaded with all relevant PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class 3- SHA2- 2048 BIT-SIGNING & ENCRYPTION digital signature certificate (DSC).

3. **Tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described in "Annexure to the Conditions of contract for ETC & Civil work "which shall be part of the Technical Bid.**

   In case of E-Tenders, no paper bids shall be accepted, therefore, the scanned copy of the Banker's Cheque/ Demand Draft/ Pay Order/ Details of payment made through Electronic Fund Transfer/ Fixed Deposit Receipt (FDR) / Bank Guarantee should be uploaded in the E-Procurement Portal and hard copy of the same should reach to following address at before the due date and time of bid submission. BHEL shall not be responsible for postal or any other delays in this regard.)

To,

Ashok Kumar Meena
Sr. DGM (TBSM)
TRANSMISSION BUSINESS GROUP
BHARAT HEAVY ELECTRICALS LIMITED,
6th Floor, BHEL SADAN, Plot no.: - 25, Sector- 16A, Noida,
Distt. – Gautam Buddh Nagar, UP-201301
TELEPHONE: 0120-6748545, 9831038136
E-mail: akmeena@bhel.in

4. **Bidders may please note that no other mode of bid submission shall be considered for evaluation apart from Clause no. 02 to 03 mentioned above.**

5. The prospective bidders who have downloaded the tender documents from our website are requested to send their acknowledgement and willingness to participate in the tender to the undersigned, through fax or email.

6. Offers should be strictly in accordance with the Tender Specifications and General Instructions to Tenderer enclosed herewith.

7. "BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno-commercially qualified bidders as per latest RA Guidelines.

   Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their price bid along with applicable loading, if any, shall be considered for ranking."

8. The contractor shall give his explicit confirmation without any deviations to the HSE (Health, Safety and Environment) requirements as per enclosed specification No. TBSM/HSE/NIT-01, Rev-02 Date 31.01.2024. Contactors are also required to furnish details as per Annexure (HSE) to NIT along with their offer. Offers received without compliance & data about HSE requirements are liable to be rejected.

9. All documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder.

10. Clarifications, if any, can be obtained from the undersigned but such requests should be submitted well before the due date for submission of tenders. Due date for submission and opening of tenders will not be extended on such grounds.

11. Please note that wherever there is a contradiction between the 'ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORS, ANNEXURE TO CONDITIONS OF CONTRACT FOR CIVIL WORKS' and 'Annexure to conditions of contract for ETC & Civil Works, the 'Annexure to conditions of contract for ETC & Civil Works 'clauses shall be governing and binding on the contractor.

12. Drawings & FQP enclosed with the NIT (if provided) are for tender purpose only. Drawings & FQP may get change during execution stage and work to be carried as per latest RFC drawings & Field Quality Plan (FQP).

13. Construction/ RFC drawing/ Fronts shall be furnished progressively as per project requirement and no claim towards idling charges/ project overheads etc. borne by the contractor on account of non-availability of drawings/ fronts shall be entertained.

14. Completion period of the work has been envisaged under best possible conditions. Any changes/ deviation during execution shall be dealt as per relevant clauses mentioned in general/ special conditions of contract for ETC and Civil works.

15. *"In case this tender is awarded to first time contractor*, then the bidder shall be eligible to qualify for the next tender of similar work# of BHEL, TBG; only after successful executing of 50% (fifty percent) of this work prior to the date of next tender (in which bidder desires to quote) and on satisfactory performance feedback by BHEL site Incharge."*

    ** First time contractor: The bidders who have not successfully executed more than 50% (fifty percent) of awarded similar work by BHEL (TBG/ ISG/Power Sector/Any BHEL Unit) in last 5 years from date of NIT.*

    The bidders who have taken any order from BHEL under 1st time category, and desires to further participate in BHEL tenders, needs to submit a certificate/ undertaking mentioning the reason of not executing 50% of awarded work, hence the criteria under 1st time bidder shall not be applicable to them. The certificate/ undertaking shall be duly certified by Site In charge of BHEL

    # Similar work: Similar to nature of work of the tender under consideration.

16. **Before submission of offer, the tenderer is advised to inspect the work & the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, sourcing 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 on any of these conditions/ resources.

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

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

    18.1. Commitment by BHEL:

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

    18.2. Commitment by Bidder/ Supplier/ Contractor:

    18.2.1. The bidder/ supplier/ contractor commits 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.

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

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

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

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

19. Also, offer of the bidders who are suspended (under hold/ delist) for business dealings by BHEL, TBG shall not be considered. Please note that lifting/ restoration of suspension (Ban/Hold/ De-list) of business dealing is not automatic after expiry of specified suspension period. Hence, vendor shall be considered as suspended for business till suspension is lifted by BHEL in writing on specific request of the vendor as per extant guidelines.

20. BHEL Fraud Prevention Policy, "The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice."

21. Offers will be scrutinized based on the qualifying requirements and only those who are technically and financially capable to execute the Job and who fulfil the Pre-Qualifying Requirements (PQR) are eligible to quote against the above NIT. However, final acceptance of the bidder/ offer shall be subject to acceptance of our customer.

22. The evaluation currency for this tender shall be INR.

23. The Submission of EMD is compulsory for subject tender. In case requisite Amount of EMD not submitted by the bidder before tender opening or along with offer, the offer shall not be considered for evaluation and the offer shall be rejected.

24. In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

    In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by toss/ draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

    Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

25. Technical Bid will be opened in the office of undersigned. If required, technical discussions will be held with only those bidders who have taken any deviations. The price bids will be opened subsequently, after Technical Bids of all the bidders have been evaluated and freezed. Bidders should quote their most competitive rates as there will not be any price negotiation. However, if felt necessary by BHEL, price negotiation will be held with lowest bidder (L-1) only. **IT WOULD BE PREFERRED THAT YOUR OFFER IS WITHOUT ANY DEVIATION w.r.t. TENDER SPECIFICATIONS AND THE SAME MAY BE CLEARLY MENTIONED ON THE COVERING LETTER ACCOMPANYING THE TECHNICAL BID.** Offers with deviations are likely to be rejected.

26. In case any adverse information is received concerning performance, capability or conduct of the bidder after issue of tender enquiry, BHEL reserves the right to reject the offer at any stage as deemed fit.

27. **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 no.	IEM	E- mail
1	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2	Shri Bishwamitra Pandey, IRAS (Retd.)	Iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	Iem3@bhel.in

(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,

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

1) Name: - Ajay Kumar Chowdhary Department: - TBG, Subcontracting Address: - BHEL/ TBG, Noida Phone: - 0120 674 8129 E mail: - akchowdhary@bhel.in	2) Name: - Ashok Kumar Meena Department: - TBG, Subcontracting Address: - BHEL/ TBG, Noida Phone: - 0120 674 8545 E mail: - akmeena@bhel.in

28. Any materials (if required) for ETC and Civil works have to be procured from Customer approved sources only. It will be the bidder's responsibility to get the approval of materials and vendors for materials.

29. The purchase preference for central P.S.U.s shall be given as per the prevailing Government policy.

30. Work schedule and the deployment of manpower and T&P resources committed by the contractor in their offer, to match the scheduled completion, shall be submitted by contractor and mutually agreed with site In-charge immediately after the award of work. Further, the contractor shall mobilise at site within two weeks of award of work.

31. In case an offer is not being submitted by the prospective bidders against this tender, they may send their "regret" letter to this office, for information.

32. Details of qualifying work(s) executed by the bidder will be forwarded to the principal employer for verification of the work with respect to completion, commencement & completion date and value of the work executed. Performance feedback of the bidder will also be sought from the principal employer.

33. The bidder representative may be called for discussion with the committee. His originals may be verified by the committee. In addition to above their organisation chart and detail list of manpower, tools & plants and technically capability will be discussed and ascertained by the committee.

34. **Conflict of Interest among bidders/Agents:** -

"A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. ***The bidder found to have a conflict of interest shall be disqualified****. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:*

a) they have controlling partner (s) in common; ***or***

b) *they receive or have received any direct or indirect subsidy/ financial stake from any of them;* ***or***

c) *they have the same legal representative/agent for purposes of this bid;* ***or***

d) *they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder;* ***or***

e) *Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid;* ***or***

f) *In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorise only one agent/dealer. There can be only one bid from the following:*

   1. *The principal manufacturer directly or through one Indian agent on his behalf; and*
   2. *Indian/foreign agent on behalf of only one principal;*

      or

   3. *A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid;* ***or***
   4. *In case of it holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business.* "

Thanking you,

Yours faithfully,
For and on behalf of BHEL,

(Ashok Kumar Meena)
Sr. DGM /TBSM

TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD

ANNEXURE – X

REF: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 **DATE: 20.02.2025**

SUB: Tender for "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400KV TRANSMISSION LINE AT 2 X 800 MW NTPC LARA STPP-II, CHATTISGARH".

It is certified that General Instructions and Information for tenderer have been read/ complied/ agreed to and each page of tender offer has been initialled and stamped.

Also It is being declares that we (……Bidder Name …….) will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competiveness or to introduce cartelization in the bidding process.

In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines

(Signature of Tenderer)

Name and Designation of Authorised person (s)
Signing the tender on behalf of the tenderer

(TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD)

ANNEXURE – Y

REF: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 **DATE: 20.02.2025**

SUB: Tender for "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400KV TRANSMISSION LINE AT 2 X 800 MW NTPC LARA STPP-II, CHATTISGARH".

Subject: Declaration confirming knowledge about Site conditions

I/We, _____ hereby declare and confirm that we have visited the Project Site with reference to above 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. Also, we have acquired information about availability of manpower, construction material, water, electricity etc.

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.

Site Visited Official Name & Contact Details:

(Signature of Tenderer)

Name and Designation of Authorised person (s)
Signing the tender on behalf of the tenderer

ANNEXURE – Z

Ref: - TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 **DATE: 20.02.2025**

SUB: Tender for "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400KV TRANSMISSION LINE AT 2 X 800 MW NTPC LARA STPP-II, CHATTISGARH".

Subject: Authorization of representative who will participate in the Online Reverse Auction Process:

1	NAME & DESIGNATION OF OFFICIAL	
2	POSTAL ADDRESS (COMPLETE)	
3	TELEPHONE NOS. (LAND LINE & MOBILE BOTH)	
4	FAX NO.	
5	E-MAIL ADDRESS	
6	NAME OF PLACE / STATE / COUNTRY, WHEREFROM S/HE WILL PARTICIPATE IN THE REVERSE AUCTION	

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP, NOIDA
PRE-QUALIFYING REQUIREMENTS

REF.: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 **DATE: 20.02.2025**

SUB: TENDER FOR "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400KV TRANSMISSION LINE AT 2 X 800 MW NTPC LARA STPP-II, CHATTISGARH".

Tenders (Under two-part bid system) are invited from competent contractors for subject works. Only those who are technically and financially capable to execute the Job and who fulfil the Pre-Qualifying Requirements [PQR] given under are eligible to quote against the above NIT. Tenderers should submit their offer as per the procedure specified in tender documents. The PQR of contractor for tender submission shall be is as under:

Sl. No.	Criteria	Description
A	Turn Over	Bidders should have a minimum average annual turnover (Annual Gross Revenue from operations/ Gross operating income as incorporated in the profit & loss account excluding Other Income) of **₹ 2,17,75,320/-** for **last three fin. Years (2021-22, 2022-23 & 2023-24)** and should submit audited Balance sheet and Profit & Loss Account Sheet of these years The audited financial statements must be signed by the owner and the auditor. Auditors seal, Name, Membership No., Firm Registration No. & firm name (if applicable), UDIN and the capacity in which he is signing (Proprietor/Partner), must be mentioned on the Profit & Loss A/c and Balance Sheet. In case of proprietorship and partnership firms where Audited Profit & Loss A/c and Balance Sheet is not mandatory as per extant rules, CA certificate certifying turnover and profit for the required financial years must be submitted. CA certificate must be on his letter head mentioning his/her name, Membership No., Firm Registration No. & firm name (if applicable), UDIN, capacity in which he is signing (Proprietor/Partner), date and place of signing.
B	Profit & Networth	Bidder should have earned profit in at least one financial year during the period of last three Financial Years as per Sl. No. A above and Net worth of the Bidder based on the latest Audited Accounts as furnished for 'A" above should be positive. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
C	Similar Work	Bidder should have successfully **Erected and Commissioned of Transmission Line of 400kV or above Voltage Class on Towers** during seven years period ending on **03.03.2023** and should be either of the following: i. Three similar jobs costing (except service tax/GST) not less than **₹ 2,90,33,760/-** each.

		OR ii. Two similar jobs costing (except service tax/GST) not less than **₹ 3,62,92,200/-** each. OR iii. One similar job costing (except service tax/GST) not less than **₹ 5,80,67,519/-.** In addition to above the Bidder/Sub-vendor should have **erected and commissioned at least 30KM of Transmission line of 400KV or above voltage class on Towers in a single or multiple contract cumulatively** during 7 years period ending on 03.03.2023.

Note:

1. The Bidder shall submit the Contract Agreement/Work Order/LOI, BOQ and Performance/completion/execution certificate issued by customer/contractor/end-client with **no adverse remark** along with technical bid in support of qualification.
2. In order to technically qualify in this tender, bidder should meet all criteria i.e. A, B & C mentioned above.
3. If the job is completed in the last seven-years period, as specified above, even if it has been started earlier, the same will also be considered meeting the qualifying requirements.
4. Only those work credentials will be considered that already completed and completion certificate available for that work
5. Consortium/ JV bidding is not allowed unless specifically mentioned in NIT.
6. BHEL reserves the right to:
   (a) Accept or reject any bid received at its discretion without assigning any reasons whatsoever.
   (b) Postpone the above-mentioned date, split and distribute the work among more than one bidder without assigning any reason whatsoever.
   (c) May ask for further qualification during techno commercial scrutiny of bids received.
   (d) May ask for further proofs including TDS certificates/ Form 26AS/ Final bill/ payment detail for the said job for cross- verification.
7. BHEL shall not be responsible for any delay, loss, damage for bid documents sent by post.
8. BHEL shall not be liable for any expenses incurred by bidder in preparation of bid irrespective of whether it is accepted or not.
9. Quotations received from bidders who do not fulfil the PQR shall be summarily rejected without any further evaluation and information to bidders.

10. Canvassing i.e. soliciting favour, seeking advantage etc. in any form is strictly prohibited and any bidder found to have engaged in canvassing shall be liable to have his bid rejected summarily.

11. If the bidder deliberately gives any wrong information in his tender to create in circumstances for the acceptance to his bid, BHEL reserves the right to reject such application.

12. Bidder's selection is subject to approval of BHEL's customer for this work. The approval/acceptance of bidders from Customer is mandatory requirement for subject tender.

13. All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in web page, www.bhel.com and https://eprocurebhel.co.in and not in the newspaper. Bidders shall keep themselves updated with all such amendments.

PROJECT INFORMATION

1.0 CUSTOMER:

M/s NTPC LARA

2.0 PROJECT LOCATION AND DETAILS:

TENDER FOR "**EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH".**

SITE ADDRESS:

NTPC Limited
Lara Super Thermal Power Project
Stage-II (2x800 MW)
P.O. – Pussore, Village – Chhapora,
Raigarh, Chhattisgarh-496440
(The project site is approachable from NH-200 (Raigarh/Sarangarh) via Kondatarai through State PWD Road.)

3.0 CONTACT PERSON: FOR CONTRACTUAL ISSUES

ASHOK KUMAR MEENA
Sr. DGM (TBSM)
SUBCONTRACTS MANAGEMENT,
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301

PHONE: 0120-674-8545/ 98310 38136
E-mail: akmeena@bhel.in

CONTACT PERSON: FOR ENGINEERING ISSUES

Manvender Singh Pundir
Sr. Manager (TBEM)
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301
PHONE: 0120-674- 8512/ 9916366333
E-mail: manvender@bhel.in

CONTACT PERSON: FOR CONTRACT EXECUTION ISSUES

Ratheen Sarkar
Sr. DGM & Sector Head (TBES-Construction)
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301

PHONE: 0120-674-8228/ 8140714999
E-mail: **ratheen@bhel.in**

HSE CONDITIONS
at a GLANCE (for bidders)

Health Safety and Environment Management

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

Transmission Business Group, Noida

DOCUMENT CONTROL			
Document number:	**TBG/HSE/NIT-01**		
Issue number:	00	Issue date:	08.01.2020
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BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

BHEL TBG through its long experience and policy, has developed a culture to consider wellbeing of the society, protection of environment and occupational health and safety of its workers first. TBG has also a culture of transparency in all its business activities. In line to this culture, this NIT annexure is prepared as a peeping window in to the TBG HSE requirements which need to be 100% complied by the successful bidders while executing the contract. Interested bidders should go through these HSE conditions:

1. BHEL HSE Policy

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

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

Atul Sobti
Chairman & Managing Director

June 5, 2018

Creating BHEL of tomorrow

2. Legal Compliances:

a. Statutory Provisions: All the sub-contractors are to comply with client specific rules and procedures, the National legislations and codes, in particular the following or their revised versions:

Srl. No	Acts/Rules Name	Srl. No	Acts/Rules Name
1	The Factories Act 1948, Amendment Act 1947	11	Contractor labour Act, 1970 (Regulation and abolition)
2	The Environment Act 1986	12	Provident fund Act, 1952
3	Workmen's Compensation Act, 1923	13	Payment of gratuity Act, 1972
4	Building and Other Construction Workers (Regulation of employment and condition of service) Act, 1996	14	Indian Explosives Act and the explosives Rules 2008
5	Buildings and Other Construction Workers Welfare Act, 1996	15	The Gas Cylinder Rules, 2016, Static and Mobile Pressure Vessels (Unfired) Rules 2016
6	Payment of wages Act, 2017 Equal remuneration Act,	16	The Indian Electricity Act 2003 and Indian Electricity Rules 2005
7	Minimum wages Act.1948	17	The Atomic Energy Act, 2015
8	Employers liability Act, 1938	18	The atomic energy (Radiation Protection) Rules. 2004
9	Industrial dispute Act, 1947	19	National Fire Protection Association (NFPA),
10	maternity benefit amendment act 2017	20	National Building Code of India 2016 etc.

b. Indian Standard (IS) Codes related to HSE

All the sub-contractors are to comply with client specific rules and procedures, the National legislations and codes in particular the following or their revised versions:

Srl	IS Code	Applies on
1	IS: 4081 -1986	Safety code for Blasting and Related Drilling operations
2	IS: 3764 -1992	Safety code for excavation work

3	IS: 5121 -1969	Safety code for pilling and other deep foundations
4	IS: 2750 -1964	Specification for steel scaffoldings
5	IS: 3696 (Part-I)-1987	Safety code for scaffolds and Ladders: Part- I Scaffolds
6	IS: 3696 (Part-II) -1991	Safety code for scaffolds and Ladders: Part –II Ladders
7	IS: 4082 -1977	Recommendations on stacking and storage of construction materials at site (First revision)
8	IS: 4130-1976	Safety code for demolition of building (First revision)
9	IS: 4912-1978	Safety requirements for floor and wall openings, railings and toe boards (First revision)
10	IS: 5916- 1970	Safety code for constructions involving use of hot bituminous materials
11	IS: 7205 -1974	Safety code for erection of structural steel work
12	IS: 7969 -1975	Safety code for handling and storage of building materials
13	IS: 8989 -1978	Safety code for erection of concrete framed structures
14	IS: 7293 -1974	Safety code for working with construction machinery
15	IS: 2212 -1991	Pipe lines –Identification –Colour code
16	IS: 5216 -1982	Recommendations on safety procedures &practices in Electrical works (Part -I &II)
17	IS: 875 -1964	Code of practice for structural safety of buildings and loading standards
18	IS: 10386 -1983	General aspects Part-1 -1983, Part-2 -1982, Part-6 -1983, Part-10 -1983- Amenities, Protective clothing and equipment, construction, storage, handling, detection and Safety measures for gases, chemicals and flammable liquids
19	IS: 10500-2012	Drinking water (Specification)
20	IS: 10291 -1982	Code of dress in civil engineering works
21	IS: 2925-1984	Safety helmets
22	IS: 1179-1967	Welding helmets
23	IS: 7524 -1979 (Part-I)	Safety goggles
24	IS: 9167 -1979	Ear muff /Ear plugs
25	IS: 6994 -1973 (Part-I)	Canvas hand gloves, Cotton hand gloves, Chrome leather gloves
26	IS: 4770 -1991	Rubber hand gloves tested for 15,000 volts
27	IS: 3521 -1999	Full body safety harness
28	IS: 11057 -1984	Specification for Industrial safety nets

29	IS: 13415 -1992	Protective Barriers in & around buildings (Code of safety)
30	IS: 13416 -1992	Preventive measures against Hazards at work places-Recommendations part-I Falling materials hazards Prevention part-I
31	IS: 13416 -1992	Preventive measures against Hazards at work places-Recommendations part-II Fall Prevention
32	IS: 15298 -2011 (Part 1&2)	Personal Protective Equipment -Safety shoes
33	IS: 12254 -1993	Poly vinyl chloride (PVC) industrial boots
34	IS: 5557:2004	Industrial and Protective Rubber knee and Ankle boots
35	IS: 2878 -2004	Co2 Type fire extinguisher
36	IS: 2171 -1999	Dry chemical powder fire extinguisher
37	IS: 13849 – 1993	Fire extinguisher for ABC fires
38	IS: 10204-2001	Mechanical Foam type extinguisher (Foam used shall conform to IS: 4989 -1974 and Co2 cartridge shall conform to IS: 4947 -1985)
39	IS: 3786 -1983	Methods for computation of Frequency rate and Severity rates for Industrial injuries and classification of Industrial accidents (First revision)

c. The Sub-contractors need to

- Attend HSE familiarization program at TBG-HQ with his site management team. This will be a half day long awareness session on HSE requirements and compliances which the agency is supposed to fulfil during contract execution at site. The session shall be taken by TBG HSE department on intimation by TBSM. **(Rev-01)**
- Request for issuance of Form-V in their name from customer on behalf of BHEL
- Get the Labour license registration from concerned Labour office.
- Get the BOCW Registration done along with the labour license.
- Get their labourers registered under BOCW for benefits provided by the office.
- Maintain Seven registers of labours as per BOCW requirement.
- Ensure payment of wages to labours not less than the current minimum wages applicable in the premises.
- Ensure PF deduction of labourers and submission of proof to BHEL office (Wage sheet, ECR & Challan copies) duly signed.
- Submit Labour Payment Certificate by 10th of Every month.
- File timely returns, get renewals done and submit a copy to BHEL office.

- Get Workmen's Compensation policy before the start of work, covering all the labourers and staff,
  - Policy should clearly mention the project name and location,
  - should be as per labour class and wage.
  - Should cover all the height workers with clear mention of Max. height.
  - Policy should be submitted to BHEL office and renewal before expiry.
- Issue employment card to every worker.

3. Labour Welfare and Medical Facilities

a. Labour Welfare

1. Declaration of normal working hours and weekly off day, Payment day & intervals
2. Paid rest days & holidays.
3. Payment of overtime @ twice the normal wage rate.
4. No labour shall be allowed overtime >12 hrs/week, limited to 48 hrs/month.
5. Rest and lunch area.
6. Separate Male/Female Toilets and Lavatories, clearly marked in local Language and provided with signage.
7. Cold and clean drinking water facility suitable to strength and near workplace
8. Creche for children of female workers as per BOCW requirements
9. Arranging labour accommodation in hygienic environment with the facilities of Water (Drinking, Sanitation), washing and bathing area, toilets in sufficient nos., clean and safe camps and surrounding, access road, well illuminated camp and roads, mode of contact, transport facility, first aid centre, 24x7 Security etc.
10. Cooking and eating place to be maintained in hygienic condition
11. General awareness of health and hygiene.

b. Medical facilities and Health centres

- Availability of first aid box at every work location and agency office, with contents as per BOCW requirement.
- Emergency vehicle (four-wheeler) at work place
- Availability of stretchers in emergency vehicle and in office.
- Trained first aider
- Medical check-up for all the supervisors and workers including cooks, at the time of induction and annually thereafter.
- Tetanus Vaccination for all in every six months.
- Identification and tie-up with nearby reputed hospital(s) and display of their contact number in Emergency contact list.

4. House Keeping & Storage

Housekeeping is a continuous process and is the part of work. Agencies shall maintain safe and presentable housekeeping all the time in their respective areas, common work locations and passage areas. Roads, passages, staircases, entrance/exit gates shall always be maintained obstruction free. No material shall be left or stacked at the roof edges. Agency shall make arrangements to remove scraps on regular basis and dispose them at a space provided by customer, clearly fenced and marked by the sub-contractor as **"SCRAP YARD"**. Suitable arrangement like dedicated housekeeping team and tractor/hydra should be identified for this work.

Construction materials like shuttering materials, staging materials, cables, re-bars, cements bags, earthing flats and rods, FF pipes, surplus soil etc should be stored/stacked properly such that it should neither pose threat to safety of man nor should obstruct the free movement of man and machineries.

Every sub-contractor should have separate and well-maintained storage area for his own materials, T&Ps, PPEs and BHEL issued materials. Consumables like diesel, cotton, grease, oil, paint, admixtures and other fire potential materials should be stored separately with suitable firefighting facility.

Fire capacity of store area to be assessed and accordingly fire extinguishers shall be planned suiting the class and capacity of fire. Sand heaps may also be stacked in open store yards suitably to use in case of fires.

5. Site Safety

a. Induction and others safety trainings

Every sub-contractor shall make arrangement to provide induction training as per BHEL and/or customer requirement on a pre-approved and fixed module to all its new inductees irrespective of class or grade of appointment/hire. He shall also arrange the required facilities for induction training such as board, marker, dummy, posters/banners with all the mandatory PPEs.
Sub-contractor shall also arrange for periodic trainings on fire-fighting, first aid, CPR, importance and use of PPEs, electrical safety, hot work safety, Height work safety, confined space, deep excavations and barricading, concreting work safety etc.

b. Appointment of Safety Officer/Supervisor

Every sub-contractor shall appoint full time **safety officer(s)** as per **Schedule VIII** of **BOCW Act-1996**. The safety officer so appointed, shall not be assigned any duty/work other than assisting in fulfilment of legal and contractual obligations at site. He shall perform his duties in line to meet the requirements of TBG HSE MANAGEMENT SYSTEMS, such as ensuring daily TBT, conducting induction and other HSE training and awareness programs, organising HSE campaigns, health check-ups, periodic mock drills, reporting & record keeping and other such compliances as per **HSE Plan for Site Operation (TBG/HSEP-14)** on regular basis. **(Rev-01)**, **(Rev-02)**

c. Safety organisation, Safety committees and meetings

Safety officer shall report directly to the head of the projects of the sub-contractor management. There shall be some appointed or nominated **safety stewards** from each sub-group like shuttering, bar-bending, concreting, brick work, material handling, structure erection, cable laying, pipe work, maintenance, batching plant, housekeeping, etc.

A **safety committee** shall be formed including members from different agencies, BHEL and customer covering at-least 50% participation from workers. Safety committee shall meet on weekly basis or as may be decided by customer, outcomes shall be complied as committed.

d. Personal Protective Equipment.

Unless mentioned otherwise, there will be three mandatory PPEs- Safety shoes, Safety Helmet and Reflective jackets conforming to relevant IS codes as mentioned above. Every person entering in the project premises shall use above mandatory PPEs.
There will be other PPEs too, based on the work requirement like: Twin lanyard full body harness, fall arresters and life lines for height workers, Face shield for welders and grinders, Induction helmets and Electrical resistant shoes with FRP/PVC toe for electricians and commissioning engineers, Gum boots for concrete workers and manual excavators, Goggle for gas cutters and grinders, Aprons for welders, shoulder pads for material handlers, Hand gloves – Leather for binders/welders/grinders, certified Rubber gloves for electricians, PVC for concrete/cement

handlers, cotton-housekeeping team/brick coolies/erectors, cable laying men and other material handlers. Dust mask for cement handlers.

e. Material Handling

BHEL as a policy discourages continuous manual handling. Material handling contributes a major portion in the project and hence proper means (mechanical/ electrical powered) should be deployed appropriately for this work. Cranes/Faranas/hydras should not be used for material transportation for long distances(>100m), if such movement is un-avoidable, it must be accompanied by a trained signal man. Long materials should be guided by tagline. Roads for material movement should be free from obstructions. Lifting appliances must be in good condition and must have test/inspection certificates.
Lifting tackles like- D-shackles, chains, ropes, slings, belts shall be periodically inspected and shall have valid test certificate and/or third-party inspection certificates.
Painted/galvanized structures/materials to be lifted by adequate capacity nylon belts only.
If a machine undergoes a major maintenance, fresh TPI shall be required before use. Hydraulic/pneumatic machines shall be free from leakages. Daily checklist to be filled and witnessed by the concerned supervisor before start of the work.

f. Vehicle/Machinery Documents and other safety requirements

- Crawler mounted boom cranes/Tyre mounted telescopic cranes/tower cranes
  1. Valid third-party inspection certificate.
  2. Valid Insurance policy
  3. Registration Certificate (if applicable)
  4. Valid Pollution under control (PUC) (if applicable)
  5. Fitness certificate from RTO (if applicable)
  6. Operator's valid license, experience and/or competence certificate.
  7. Swing horn
  8. Reverse horn
  9. Boom aviation light
  10. Approved Load chart (inside cabin)
  11. Fire extinguisher (inside cabin)
  12. First aid kit (inside cabin)
  13. Boom angle indicator
  14. Hook Latch
  15. Reflector strips on around cabin and on boom

- Loader backhoe (JCB), crawler excavators (Poclain), Hydra,
  1. Valid third-party inspection certificate.
  2. Valid Insurance policy
  3. Registration Certificate (if applicable)
  4. Valid Pollution under control (PUC) (if applicable)

5. Fitness certificate from RTO (if applicable)
6. Operator's valid commercial license, experience and/or competence certificate.
7. Reverse horn
8. Approved Load chart (inside cabin) (Hydra)
9. Fire extinguisher (inside cabin)
10. First aid kit (inside cabin)
11. Hook Latch (Hydra)
12. Reflector strips on around cabin and on boom

- Tipper, Transit mixtures (TM), Self-loading concrete mixture (Ajax Fiori), Tractors
    1. Valid third-party inspection certificate.
    2. Valid Insurance policy
    3. Registration Certificate
    4. Valid Pollution under control (PUC)
    5. Fitness certificate from RTO
    6. Operator's valid commercial Heavy license, experience and/or competence certificate.
    7. Reverse horn
    8. Fire extinguisher (inside cabin)
    9. First aid kit (inside cabin)
    10. Reflector strips on around cabin and on body

Note: 1. Tractors may be allowed with Light Commercial/non-commercial license on customer's consent.

- Cars, Taxis, scooters, motor cycles and other public carriers
    - Valid 2/4-wheeler license (as applicable- commercial/non-commercial)
    - Registration Challan
    - Valid Insurance
    - Pollution under control

g. Man-lifts (Cherry pickers), Scissors Lifts

1. Trained operator with experience/competence certificate and license
2. Valid third-party inspection certificate.
3. Valid Insurance policy
4. Registration Certificate (if applicable)
5. Valid Pollution under control (PUC) (if applicable)
6. Swing horn
7. Reverse horn
8. Boom aviation light
9. Fire extinguisher (inside cabin)
10. First aid kit (inside cabin)
11. Reflector strips on around cabin and on boom

Note:

1. No one shall ride man-lift bucket without safety belt, safety shoes, helmet and reflective jacket.
2. Not more than 3 persons at a time will board in bucket of man-lift (without any heavy materials) including operator.
3. Operator will not leave the machine while persons are elevated and working.
4. No one other than the authorised operator will operate the man lifts/Scissors lifts.

h. Excavation

Prior permission/clearance from customer is a must for excavations in areas where underground service services such as gas/water/oil/chemical/electrical lines may be routed. Due precautions shall be taken during excavation in such area. Excavations near water bodies (ponds/canals etc.) shall be done with sand/soil bags ready to plug water from accidental damaged/burst of edges. All the excavations shall be done by either step cutting (min. 600mm step at every 1.5m depth) or slope cutting at 1:2(X:Y axis) (or greater depending upon the soil condition). Where step cutting/slope cutting is not possible due to space constraints, shoring/shuttering or sheet piling to be used to check collapse of soil.

Excavated soil shall be stacked away from edge of the pit, at-least 1.5 meters or half of the depth whichever is higher. Height of the stack shall not exceed 2m in height.

Ramps shall be provided for access of the workers in large pits and ladder of metal/good built for small pits. Ladders shall be of sufficient length protruding at least 1m above the ground level.

Pumps of adequate capacity shall be available for pumping out of water. No lone worker shall be allowed to work in any excavation. Overloaded vehicle shall not be allowed near excavated pits.

i. Bar bending and Binding

Bar bending machine shall be installed under shed/roof. It shall be properly earthed and maintained for operation. Housekeeping of the area shall be team's responsibility on daily basis. All be bar benders shall be given hand gloves (leather/cotton) in addition to mandatory PPEs. Scrap shall be segregated and moved to scrap yard on regular basis. Bar bending station shall be located away from Main plying roads/passages. The station shall be well illuminated, shall have a maintained first aid kit and potable water. Station shall be located in such a way that the movement of the material be minimised.

j. Concreting

No electric vibrators shall be allowed to use. All the concrete workers shall be issued gum boots, safety helmets, reflective jackets and PVC hand gloves. Free fall of concrete from chute shall not exceed 1m in height. Heavy machineries/ vehicles shall be kept at least 2m away from the edge. Emergency vehicle shall be available near concreting work. Late night works shall be avoided, if it is unavoidable, a prior permission from BHEL/Customer is mandatory.

k. Welding, Gas Cutting & other hot works

Welding: Only experienced welders should be deployed for welding jobs. Welders shall be provided with apron, hand gloves, arm pads, leg pads, face shield and safety shoes. Welding leads shall be joint less and insulated. Power input point shall be fully covered at machine.

Gas cutting: If LPG is being used, domestic cylinder is strictly prohibited inside the project premises, (not allowed for site kitchen too). Hose pipes shall be in good condition without cracks, cuts, punctures or joints. Ends should be clamped with worm clamps. Dial gauges shall be of good quality and duly calibrated. Flash back arresters is a must for both oxygen/acetylene or LPG/Oxygen combination. Cylinders shall be stored, transported and used in vertical position only. When not in use, they shall be capped. Empty and filled cylinders to be stored separately with distinct marking.
Cylinders shall neither be rolled on the ground nor thrown during loading/unloading.

Grinding: Grinder shall be given clear glass face shield, apron, safety shoes, ear muffs and hand gloves. Grinder machines shall have wheel guard. Plug tops to be used for power connection preferably three wire type. Only trained persons shall be allowed to use grinders, abrasive cutters. Electrical connection shall be free from cuts, joints etc.

l. Erection & Height Work

Only trained filters and experienced helpers shall be engaged in erection work. Step bolts of lattice towers shall be checked for full tightness with spring washers before use. Height pass shall be issued to the identified group of erectors who have passed medical test and have working experience at height. Name of such workers shall be displayed at appropriate place. These workers only shall be allowed to work at height. Height work shall not be permitted in high wind/bad weather condition, during raining or in night/dark.

m. Electrical Safety

BHEL usually provided single point power source and sub-contractors draw power from there. Otherwise agencies make their own arrangement for construction power like DG sets etc. Sub-contractors shall submit their load requirement (amperage & phase) to BHEL before start of work. Accordingly, they shall make arrangements to draw power and distribution arrangements too in a safe way. MCCBs and HRC fuses to be put in circuit for short circuit and overload protections and RCCBs of 30mA sensitivity to be put at each distribution panel for human safety. Earthing pits shall be installed at each distribution point and maintained below three Ohm resistivity which shall be inspected randomly. The distribution points shall be clean, free from vegetation and water logging, easily accessible and covered/protected from three sides and top for rain. Earthing of DBs shall be done by 25x3mm GI flats connected from proper earth pits. Insulation mat, PVC Sheet/Wooden plank to be placed before DBs as platform. DB Sheds shall be legibly marked with name of agency, contact no of electrician and SLD of that DB. Only industrial plugs and sockets shall be allowed. Three wire (Phase, neutral and earth) system shall be used for tools, lights and machineries and two wire power draws shall be strictly prohibited. PTW and LOTO system shall be maintained to work on LT system. Name and contact no of authorised electricians who will be responsible of electrical power facility maintenance shall be submitted to BHEL by Agencies. Unauthorised sharing of power from one agency to other is strictly prohibited. Electricians shall use standard PPEs and insulated

tools only. Standard and tested/certified discharge rods to be used in the areas where there is a possibility of residual current or induction charge. The induction rod to be connected to the earth first and removed in the last. Induction helmets only to be used in the charged area. Electricians to be provided with electrical resistant safety shoes having FRP/PVC toe.

n. Dust Gases and fumes

Sub-contractor shall make arrangements to avoid accumulation of dust fumes and gases. Cement handlers inside store or at batching plant and gravel spreader shall be given effective nose masks and jaggery (at least 200g per person per day). DG sets and other machineries like cranes excavators etc. shall have valid and effective PUC certificate and shall have maintained engine with silencer. No IC engine operated machine shall be used in confined and covered area like hall, sheds, store etc. where accumulation due to lack of ventilation can increase to harmful levels. Dedicated arrangements (tanker or tractor with sprinkler) shall be made by the sub-contractors (individual or jointly) to continuously subside the dusts arising out of the movement of the vehicle's roads/passages. Welding activities near roof accumulates harmful gases. Welders in such positions shall be provided with effective masks conforming to IS standards.

o. Vehicular Traffic

Speed limits defined within the premises shall strictly be followed by the drivers/commuters of construction as well as other vehicles.
Every construction machinery, man-lift shall display the name, contact no and passport size photograph of the authorised operator (There can be one or more authorised operators).
No one other than operator and co-operator shall sit inside the cabin of any construction machine while it is working.
Construction machineries (tractor, trucks, tippers, JCBs, hydra, Fassi cranes etc. shall never be used as mode of public transport. Machineries like Ajax Fiori and hydra shall not be driven in back direction except for small distances. No overloaded vehicle shall be permitted entry in the project premises.
Over speeding shall be reported and driver/operator shall be barred from entry or shall be penalised.
Drunken drivers shall be barred from entry in the project.
Carrying harmful weapons like knives (>6"), guns etc. shall permanently disqualify the person from entry in project premises.

p. Barricading and floor openings

Every pit deeper than 4 feet (1.2m) shall be barricaded immediately after excavation and will remain barricaded till backfilling.

Pits/trenches drains near roads, passages whether temporary or permanent shall be hard barricaded and well illuminated. Roof edges and openings shall be strictly hard barricaded and illuminated. Height works like masonry works, structure erection, erection by cranes, Lattice tower/beam erection areas shall be barricaded to restrict entry. Areas under charging/commissioning shall be barricaded and caution boards shall be displayed on newly charged areas.

q. Scaffold & Ladder

No bamboo/wooden scaffold shall be allowed to be used. Only tubular steel scaffolds with couplers conforming to the relevant IS codes shall be allowed with base plates. Standard steel or wooden planks to be used as platforms and no packing materials shall be used. All the platforms shall be built with provisions of **top rail at 1m height, mid rail at 0.5m height and toe boards of min 6" height** at floor level. Minimum width of platform shall be 900mm and if wheel barrow is to be used then 1200mm. Means of access to be provided in the form of ladders, ramps or staircase. Multilevel work platforms or those platforms having passage underneath shall be provided with safety net, screen or canopy at each level for protection from falling objects. Platforms shall be free from concrete, debris or other materials. Platforms shall not extend out of the putlogs and shall be secured and fastened. Decking shall be made non-skidding.
Scaffolds under erection shall be tagged **"RED"**, under repair/maintenance/inspection shall be tagged **"YELLOW"** and ready for use shall be tagged **"GREEN"**

Only metal ladders in the construction site and FRP ladders in charged areas shall be allowed. Ladders made from packing materials shall not be used. Ladders shall be securely fixed at bottom, top and long ladders at middle points too at an interval not more than 2400mm and must have a landing at every 6m. Inclination angle should be approximately 1:4 (X:Y) or 75deg. Ladder must extend at least 1m above the platform/access area. Gap between two rungs shall not exceed 300mm. Portable ladder should not be more than 4m in length. Minimum width of the ladder shall not be less than 300mm.

Use of Mobile aluminium scaffold is preferably advisable for erection of transformers/reactors.

r. Illumination

The sub-contractor shall ensure that the areas such as work stations, buildings, batching plants, passages/roads, stores, rest areas, power sources, staircases etc. are illuminated sufficiently to make safe work conditions at site and shall not be less than the relevant IS standards. Excavations/ below ground level structures near passages/roads shall also be sufficiently illuminated.

s. Safety banners/posters, caution boards

Sub-contractors shall display boards and banners in sufficient quantity having safety signs, slogans, important messages, pictures, cautions at prominent locations to promote safety and spread awareness for important precautions such as "Deep Excavation Ahead", Speed Limit", "Charged Area", "Do not operate", "Hard hat area", "No smoking Zone" etc. Boards containing messages of Emergency contacts, First aid facility, rates of minimum wages, working hours, rest day etc. should be displayed at specific areas.

t. Waste management and disposal

Sub-contractor shall make suitable and effective arrangement to remove waste material from site on regular basis and store them in an identified and safe location. Disposal of wastes shall also be done as per manufacturer's instructions or as per the guidelines laid by legal authorities. Re-bars, Cement bags, packing material (wooden/metal/plastic/paper), paint, oil, grease, cables (armour, sheathing, insulation),

civil debris, metal chips, GI sheet scraps, batteries etc. are the common waste materials. Sub-contractor shall arrange disposal of the hazardous wastes/materials in conformance to the legal and contractual requirements only.

u. Inspection of PPEs, T&Ps, Machineries and lifting appliances

All the PPEs, T&P and lifting appliances purchased newly by sub-contractors shall have test certificates which shall be submitted to BHEL office periodically or on demand. There shall be at least monthly joint inspection schedule for inspection of healthiness of all the PPEs, T&Ps and lifting appliances. All the lifting appliances shall be tested and examined by a competent person before taking into use for the first time or after it has undergone any alterations or repairs liable to affect its strength or stability

and also once at least in every twelve months. To confirm quality of the PPEs as per the relevant IS codes, BHEL may ask sub-contractors to get any or all types of PPEs tested through NABL approved lab as per relevant IS codes. At any stage, the 100% cost of such tests shall be in the scope of respective sub-contractors.

v. Cable Laying

Sub-contractor shall ensure cable trenches free from water, mud, debris, snakes, Scorpios, lizards before start of the work in trenches. Cable drum rollers shall be used to pull cables out of drums to avoid twisting of cables. Hand gloves, Safety shoes/gum boots, reflective jackets, safety helmets shall be provided to the workers. Cable laying area shall be well illuminated.

w. Fire Protection

Every sub-contractor has to maintain their working area, store and office area free from bushes. Stacking of flammable materials like wood, paper, plastic, paint, oil, grease, fuel, cotton, gases etc. at isolated place disconnected from other storage and office areas. Adequate arrangements of firefighting means like suitable extinguishers, fire/water buckets, water tanks, sand dunes etc. shall be made by the agency depending upon the fire capacity assessed or as per MSDS. Fire drills and trainings on how to operate fire extinguishers and how to react in case of fire breakouts shall be the part of regular training program. Guards and store persons must be a regular participant of such training programs. A list of trained firefighting persons and periodicity of such training programs shall be submitted to BHEL by every agency and same to be adhered. Sufficient number of fire extinguishers with suitable class shall be placed at such locations where there can be fire hazard like stores, pantry, office, DG set, electrical distribution panels etc.

x. Fencing of exposed rotating parts

Exposed rotating parts poses great threat to the person in vicinity. Such parts need to be fenced/covered. Guards are mandatory of grinders, abrasive cutters. Flywheels of the engines of heavy machines, Diesel engines, DG sets need to be covered. Electric winch machines, pulleys, chains, shafts, exhaust fans at reachable height, table fans, need to be caged/fenced. Such fencing/guard shall not be removed while machinery is in operation.

y. Emergency preparedness response plan and periodic mock drills.

Sub-contractor shall comply JSA (Job Safety Analysis) and arrange to mitigate the effects of identified possible hazards. He shall also define following in response to emergency preparedness:
An emergency assembly point and put a board of the same with information to all in induction training.
Have facility of ambulance or tie-up with nearest hospital for service in minimum possible time (Max-30min) if there is not ambulance inside the premises.
Ensure availability of emergency vehicle with driver all the time at site during work.
Conduct mock-drills on possible risks like electrocution, fall from height, fire, heat stroke etc., record responses and take photographs to submit in BHEL office. Stretchers availability in emergency vehicle or at work place should be well accessible. Provide fire extinguishers of right type at right place in right quantity with information to all. Display emergency contact nos. to various risk locations and at office, service building or at major work locations. Provide first aid training by doctors for and display names of such trained first aiders and fire fighters. Rescue kit with trained staff or man lift or both to rescue a man hanging by safety belt at height. Provide running water tap near chemical storage and handling points. Agencies shall follow emergency response plan prepared by BHEL in each area of work, store and office.

z. Safety reports & Reporting of accidents

BHEL will provide ''formats and checklists'' for the purpose of records/documents pertaining to the compliance of aforesaid clauses. Agencies shall be responsible for strict adherence and compliance for timely generation and fill-up of the checklists and reports. These shall be submitted on weekly and monthly basis as specified in the formats.

Agency shall also promote such an environment that the near misses, incidents and accidents are reported by every person, whosoever witnesses them. These shall help in analysing the trend and taking measures in reducing/stopping the accidents/incidents. Initial reporting can be in any form-by call, SMS, WhatsApp, e-mail, letter etc.
Major and fatal accidents or high potential incidents shall be investigated for route cause and outcomes shall be immediately implemented to check recurrences.

6. General conditions and penalty clauses

Following are the general conditions:

PPEs shall not only bear the ISI mark but also be conforming to the required standards, 100% compliance of the PPEs is mandatory.
Over speeding of vehicles shall attract penalty/notice and recurrence will attract debarring from entry into project premises.
Hiding of facts like incidents, accidents, fake/forged reports/certificates shall also attract penalty/ notice or both. Only approved third party agencies shall be allowed to inspect the machines, T&Ps. Reports shall directly be sent to BHEL/customers by the third parties.

Insurance and TPIs to be renewed before expiry. Machines, T&Ps shall not be allowed to work if renewal delayed. Continuity of WC policy to be maintained religiously by the respective agencies.

Agency shall submit the status report of his labour license, BOCW registration, WC Policy, insurance & TPI validity on monthly basis with list of machineries and T&Ps

Sub-contractors shall also maintain a buffer stock of all the PPEs in at least 20% excess to the present strength of the work force.

If construction power is not drawn as per the guidelines laid in clause no. 5(m), given above, BHEL may take-up this work at the risk and cost of the agency and/or may withhold a sum of min. Rs. 50,000/- (Rs. Fifty Thousand) or more as the site in-charge deems fit till the system is aligned as per aforesaid requirement.

Agencies shall be responsible for the compliance of the above requirements. Failure in one or more clauses/area shall attract a notice or monitory penalty or a combination of above.

Monitory penalty will be

- Rs. 1000/- per person/incident per day for non-conformity in above areas.
- A Major/severe accident shall attract a penalty of Rs. 2,00,000/- per head
- Fatality or permanent disability with total loss of earning capacity, if any, will attract a penalty of Rs. 5,00,000/- (Rs. Five Lakh).
- Further fatality/permanent disability shall attract double the last penalty imposed on the agency.
- Above penalties are exclusive of medical expenses of the victim or compensation to the family through insurance policy (WC Policy or group insurance).
- **Penalties imposed by customer shall be fully transferable to the sub-contractor. In the event of above cases, penalties shall be imposed whichever will be higher.**
- Evaluation of agency's performance on HSE compliance shall be done as per BHEL guide lines/system.

Revision History

Revision Date	Revision No.	Old Text	New Text	Reason	Revised by (with sign)
03.05.2019	00	N/A	Full Document	New Release	
12.10.2021	01	Nil	Attend HSE familiarization program at TBG-HQ with his site management team. This will be a half day long awareness session on HSE requirements and compliances which the agency is supposed to fulfil during contract execution at site. The session shall be taken by TBG HSE department on intimation by TBSM. (at page no. 5)	For better understanding of HSE requirements to agency. (HSE Review meeting dated 23.08.2021)	
12.10.2021	01	Edition	Inclusion of penalty provisions in case of non-deployment of safety person(page-8)	Introduction of HSEP-14	
17.01.2024	02	Edition	Appointment and duties of qualified safety officer (Page-8)	As per BOCW 1996	

-:End of Document:-

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP,

NEW DELHI

CONDITIONS OF CONTRACT

FOR

ERECTION WORKS

DOC. NO. – TB-ETC-GCC,REV.-02
20th JUNE, 2005

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SECTION- A

GENERAL INSTRUCTIONS TO TENDERERS

SECTION - A

GENERAL INSTRUCTIONS AND INFORMATION FOR TENDERER

A.1.0 : PROCEDURE FOR SUBMISSION OF SEALED TENDERS

Please refer Annexure to the Conditions of Contract for Erection work attached with the tender documents

PART - II (PRICE - BID) COVER - II:

Rate/Price Schedule only shall be given in this part - II "Price Bid".

A.2.0 : PROCEDURE FOR EVALUATION OF PRICE BID

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

A.3.0

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

A.4.0

A.5.0

A.6.0

A.7.0

A.8.0

A.9.0

A.10.0

A.11.0

A.12.0

A.12.1

A.12.2 Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

A.12.3 Three years financial turn over (certified), present commitments with all orders in hand, value of total order, value completed, and balance with completion dates as per Annexure-A.

A.12.4 **ORGANISATION CHART & MANPOWER DEPLOYMENT**:

The organisation pattern and the manpower that are totally available with him & that will be deployed by the tenderer for this work in the form of month wise and category wise deployment plan duly indicating the number of Engineers, Supervisors, Skilled and Unskilled Workers etc. as per proforma at Annexure-B shall be submitted.

A.12.5 A list of machines, tools and plant that the tenderer is having and those that will be deployed on this job giving proof of ownership or any tie-up of equipment as per proforma enclosed at Annexure-C.

A.12.6 Analysis of unit rate quoted as per proforma enclosed at Annexure-D.

A.12.7 Declaration sheet as per proforma enclosed at Annexure-E.

A.12.8 Checklist as per proforma enclosed at Annexure-F.

A.12.9 Certificate from schedule Bank to prove his financial capacity to undertake the work or solvency certificate from the concerned Government Authority.

A.12.10 A certificate of Income Tax/Sales Tax verification from the appropriate authority in the forms prescribed duly indicating annual turnover. These certificates shall be valid for one year from the date of issue or for the period prescribed therein for all tenders submitted during the period.

A.12.11 In addition to the above, the particulars required elsewhere in the tender documents.

A.12.12 NOTE: In terms of clauses A.12.1 to A.12.11 above, all the data required to be enclosed with the tender need to be furnished neatly typed, signed & stamped in the given formats only (in the form of separate sheets) failing which the tender may be considered as incomplete and is liable for rejection. Documentary proof wherever necessary also need to be enclosed.

A.13.0 EARNEST MONEY DEPOSIT

A.13.1 Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

A.13.2

A.13.3

A.13.4

A.13.5 Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

A.13.6

A.13.7

A.13.8

Above clause No. A.13.0 stands deleted. Please refer Annexure to conditions of contract for ETC works.

A.14.0 **AUTHORISATION AND ATTESTATION:**

A.14.1 Tenders shall be signed by persons duly authorised / empowered to do so. Certified copies of such authority and relevant documents shall be submitted along with the tenders.

A.15.0 **VALIDITY OF OFFER:**

A.15.1 THE OFFER SHALL BE KEPT OPEN FOR ACCEPTANCE FOR A MINIMUM PERIOD OF FOUR MONTHS FROM THE DATE OF OPENING OF TENDERS. In case the BHEL calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderer.

A.16.0 **EXECUTION OF CONTRACT :**

A.16.1 The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by BHEL. The successful tenderer shall be required to execute an agreement in the prescribed form as per Annexure-H with BHEL within a reasonable time after the acceptance of his tender and in any case before submitting the first bill for payment. The expenses for completion, stamping and registration of the agreement with prescribed authority if necessary, shall be borne by the contractor.

A.17.0 **SECURITY DEPOSIT:**

A.17.1 Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

e)

f)

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

g)

h)

i)

j)

k)

l)

Note

A.17.2

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

A.17.3

A.17.4

A.17.5

A.17.6

A.17.7

Above clause No. A.17.0 stands deleted. Please refer Annexure to conditions of contract for ETC works.

.

A.19.0 **REJECTION OF TENDER & OTHER CONDITIONS:**

A.19.1 Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

A.19.2

A.19.3

A.19.4

A.19.5

A.19.6

A.19.7

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS"
attached with the tender document

A.19.8

A.19.9

A.19.10

A.19.11

A.19.12

A.19.13 The tenderers must go through Annexure 'Q' of Section-B which details out the List of Tools, Tackles & Calibrated Test Equipments to be arranged by ETC contractor together with special purpose instruments which can be provided by BHEL free of cost for execution of work provided the same is informed to BHEL on award of contract.

Also, Annexure 'Q' gives the details of specialised Services which can be provided by BHEL for system commissioning on NO CHARGE basis with advance intimation to 'ENGINEER' in this regard. The tenderer must also see Clause E.4.2 & E.6.3 of Section E for more details.

A.19.14 IT WOULD BE PREFERRED THAT YOUR OFFER IS WITHOUT ANY DEVIATION w.r.t. TENDER SPECIFICATIONS AND THE SAME MAY BE CLEARLY MENTIONED ON THE COVERING LETTER ACCOMPANYING THE TECHNICAL BID. Offers with deviations are likely to be rejected. However if the bidder insists on any technical or commercial deviations, from the specification and/or tender conditions, the price implication if any, of withdrawing the deviations must be submitted along with the price bid in a separate sealed envelope superscribed "Price Implication for withdrawal of deviations". No price implication for withdrawal of deviation shall be accepted at a later date, after the opening of technical bid.

ANNEXURE - A

DETAILS OF WORK EXECUTED / BEING EXECUTED

A) WORK EXECUTED

SL. NO.	FINANCIAL YEAR	CUSTOMER	DESCRIPTION OF WORK	TOTAL ORDER VALUE	REMARKS

B) WORK BEING EXECUTED

SL. NO.	CUSTOMER	DESCRIPTION OF WORK	TOTAL VALUE	VALUE OF THE PORTION COMPLETED	ACTUAL START DATE	EXPECTED COMPLE-TION DATE	REMARKS

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - B

(A) PROPOSED MANPOWER (ENGINEERS / SUPERVISORS) RESOURCES FOR EXECUTION OF WORK

SL. NO.	NAME OF STAFF	QUALIFICATION	EXPERIENCE IN YEARS	REMARKS

(B) MONTH WISE MANPOWER DEPLOYMENT PLAN

SL. NO.	CATEGORY	INDICATE NO. OF PERSONS TO BE DEPLOYED IN EACH MONTH								
		1st	2nd	3rd	4th	5th	6th	7th	8th	AND SO ON

(C) Total Man-days planned to be deployed for the work : .....Man-days

Plus man-days for unskilled labour as per site requirement.

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - C

(A) STATUS OF TOOLS, PLANTS & INSTRUMENTS

Sl. No.	Name of Eqpt.	Quantity owned	Registration No. wherever applicable	Documents enclosed for proof of Ownership/Tie-up	Present Location	Quantity proposed to be deployed for this job

(B) MONTH WISE TOOLS, PLANTS & INSTRUMENTS DEPLOYMENT PLAN

Sl. No.	Description of Tools, Plants and Instruments	(Indicate No. to be deployed in each month)							
		1st	2nd	3rd	4th	5th	6th	7th	and so on

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - D

ANALYSIS OF UNIT RATE

Sl. No.	DESCRIPTION	PERCENTAGE OF THE UNIT RATE	REMARKS
01	Salary & Wages for staff & workers		
02	Materials (a) .....) (b) .....) (c) .....) (d) .....)		
03	Depreciation & maintenance for T & P		
04	Depreciation & maintenance for other items		
05	Establishment & Admn. expenses of site		
06	Overheads		
07	Profit		

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE -E

DECLARATION SHEET

I ..... hereby certify that all the information and data furnished by me with regard to this Tender Specification No. ..... are true and complete to the best of my knowledge. I have gone through the specification, conditions and stipulations in detail and agree to comply with the requirements and intent of specifications.

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - F

CHECKLIST & SCHEDULE OF GENERAL PARTICULARS

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

1.	Name & Address of the Tenderer	:	
2.	Telegraphic/telex address		:
3.	Phone/Fax No. (Office)	:	
4.	Name & designation of the official of the tenderer to whom all the references shall be made	:	
5.	Tenderer's Proposal No. & date	:	
6.	Whether EMD submitted (by cash/ Bank Guarantee/Bank Draft)	:	By.....
7.	Validity of offer/rates quoted for six months from the date of opening of tender	:	Yes/No
8.	Attested copy of power of attorney as per Clause-A.12.1	:	Yes/No
9.	Solvency Certificate submitted as per Clause-A.12.9	:	Yes/No
10.	Income Tax/Sales Tax Certificate submitted as per Clause-A.12.10	:	Yes/No
11.	Details of work executed/being executed as per Annexure-A	:	Yes/No
12.	Monthwise & Category wise manpower deployment plan as per Annexure-B	:	Yes/No
13.	Status of Tools, Plants and Instruments & their month wise deployment plan as per Annexure-C	:	Yes/No
14.	Analysis of unit rate quoted as per Annexure-D	:	Yes/No
15.	Declaration sheet as per Annexure-E	:	Yes/No
16.	Request for registration (for new tenderers) submitted	:	Yes/No

Date .....

(SIGNATURE OF TENDERER)
WITH STAMP

WITNESS : (Signature with full particulars)

1.
2.

ANNEXURE - H

C O N T R A C T A G R E E M E N T

CONTRACT NO. :
LETTER OF INTENT NO. :
WORK ORDER NO. :

1. The Contract Agreement entered into the day of ....., 20... (..... day of .....two thousand and……. ....) at New Delhi between M/S BHARAT HEAVY ELECTRICALS LIMITED, TRANSMISSION BUSINESS GROUP, New Delhi, having it's Registered Office at BHEL House, Siri Fort, New Delhi - 110 049 (hereinafter called the FIRST PARTY which expression shall include their executors, administrators, successors and permitted assigns)

   AND

   M/S ..... (hereinafter called the SECOND PARTY which expression shall include their executors, administrators, successors and permitted assigns).

2. And whereas the FIRST PARTY called for the offer for the work of..... as per approved specifications, drawings and quality plan at ..... as per Tender Specification No..... , dated .....

3. Whereas the SECOND PARTY submitted their offer No. ..... dated ..... against above.

4. Whereas the FIRST PARTY has accepted the offer referred to above & issued Letter of Intent No....., dt..... and also detailed Work Order No…….. dt .....

5. Whereas the SECOND PARTY has agreed to work as Sub-Contractor of the FIRST PARTY on the conditions specified in the Tender Specifications at a contract price of Rs...……..(Rupees.....)

6. Now, therefore it is hereby mutually agreed to by and between the parties hereto as under :

   a) The SECOND PARTY shall execute the works of ..... at ..... on the conditions specified in Tender Specifications of FIRST PARTY and Letter of Intent referred to herein before at a total contract price of Rs..... ……(Rupees .....)

   b) That the SECOND PARTY shall organise all activities and mobilisation of facilities so that the work specified herein before is completed by .....as per the time bound programme mentioned in the Tender Specifications.

c) That all disputes arising out of or relating to this agreement shall be referred to the sole Arbitrator as per arbitration clause mentioned in the Tender Specifications. The Arbitrator from time to time with the consent of the parties enlarge the time for making and publishing award without reference to the court for the purpose.

d) That the jurisdiction in all suits or claims arising out of this agreement shall be of New Delhi Courts only.

e) The Following documents shall form part of this agreement :-

i)
ii)
iii)
iv)
v)
vi)

7. Deviation Limit : The contract value is subject to deviations depending upon the actual requirement within plus or minus 30%. Quantities of individual items may vary to any extent or may get deleted.

8. Terms of Payment : The terms of payment applicable to this contract shall be those covered under Point No.... of Work Order dt. ..... and as per Tender Specifications.

9. Abandoning the work : In the event of the SECOND PARTY abandoning the work, FIRST PARTY reserves the right to get the unfinished work done at the risk and cost of the SECOND PARTY.

10. All other terms and conditions shall be as stipulated in the Tender Documents.

11. This contract agreement consists.... pages.

IT WITNESS WHEREOF, the parties have signed this agreement on the date, month and year first above written in presence of:

For and on Behalf of
(FIRST PARTY)

WITNESS (WITH ADDRESS)

For and on Behalf of
(SECOND PARTY)

1.
2.

ANNEXURE - I

MODEL FORM OF BANK GUARANTEE (FOR SECURITY DEPOSIT)

1.

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

2.

b)

c)

5.

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

6.

7.

NOTE

ANNEXURE - J

PROFORMA FOR PERFORMANCE GUARANTEE
(to be used in appropriate value non - judicial stamp paper)

1. This deed of guarantee made this ..... day of ..... 20… by ..... Bank Limited ..... in favour of Bharat Heavy Electricals Limited, having their registered office at BHEL House, Siri Fort, New Delhi - 110 049.

2. Whereas M/s ..... (hereinafter called the CONTRACTOR / SELLER have entered into a Contract bearing No. ..... dated..... (hereinafter called the CONTRACT) for supply / civil works /erection, testing and commissioning of M/s Bharat Heavy Electricals Limited (hereinafter called the COMPANY).

3. And whereas the said CONTRACT Inter - alia provides that the CONTRACTOR / SELLER shall pay to the COMPANY a sum of Rs. ..... only towards Performance Guarantee in the form and manner therein specified.

4. And whereas the SELLER / CONTRACTOR have approached ..... Bank Limited (hereinafter referred to as the GUARANTOR) and at their request 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.

NOW THIS DEED WITNESSES AS FOLLOWS:

5. The GUARANTOR by the hand of Mr. ..... and its lawfully and fully constituted attorney and do hereby guarantee the due and faithful performance of the said CONTRACT and do hereby irrevocably undertake and promise to pay the COMPANY without any demur merely on demand made by them a sum not exceeding Rs. ..... only in case the COMPANY sustains any loss or damage by reason of any breach, default by the CONTRACTOR / SELLER of any of the terms, conditions, stipulations or undertakings or any one of them contained in the said CONTRACT and the tender documents attached hereto and for payment of any moneys payable by the CONTRACTOR / SELLER to the COMPANY under the terms and conditions of the said CONTRACT. The decision of the COMPANY regarding the breach, default, loss, damage and payment shall be conclusive and binding in the GUARANTOR, irrespective of the fact whether the CONTRACTOR / SELLER admits or denies such claims or questions its correctness in any court, tribunal or arbitration proceedings or before any other authority.

6. The COMPANY shall have the fullest liberty without effecting 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 by the SELLER / CONTRACTOR or to postpone for any time and from time to time any of the powers exercisable by its against the SELLER / CONTRACTOR and either to enforce or forbear from enforcing any of 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 reason of time being given to the SELLER or any other forbearance, act or omission on the part of the COMPANY or any indulgence by the COMPANY to the SELLER / CONTRACTOR or of 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 / CONTRACTOR from its liability under this Guarantee.

7. This Guarantee shall remain in full force and effect and the GUARANTOR shall be liable under the same irrespective of any concession or time being granted by the COMPANY to the CONTRACTOR in or for fulfilling the said CONTRACT and this Guarantee shall remain in full force irrespective of any change in terms and conditions, stipulations or any variations in the terms of CONTRACT irrespective of whether notice of such change and / or variation is given to the GUARANTOR or not and the claim to receive such notice of any change and or variation of the terms / or conditions of the CONTRACT is hereby specially waived by the GUARANTOR.

8. The GUARANTEE herein contained shall not be determined, prejudiced or effected by the liquidation or winding up or insolvency of or change in the constitution of the CONTRACTOR but shall in all respects and for all purposes be binding and operative until all payments or all moneys due or that may hereafter become payable to the COMPANY are paid in respect of any liability or obligation of the CONTRACTOR under the CONTRACT.

b) The GUARANTOR further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the commencement of the CONTRACT till end of the CONTRACT and its claim satisfied or discharged and till the COMPANY certified that the terms and conditions of the CONTRACT have been fully and properly carried out by the SELLER and accordingly discharges this guarantee, subject, however, that the COMPANY shall have no claim under this Guarantee after ..... months from the date of completion of the Guarantee has been served on the GUARANTOR before the expiry of the said period in which case the same shall be enforceable against GUARANTOR not withstanding the fact that the same is enforced after expiry of said period.

The GUARANTOR undertake not to revoke this Guarantee during the period it is in force except with the previous consent of the COMPANY in writing and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the SELLER or the GUARANTOR shall not discharge the GUARANTOR's liability here under.

It shall not be necessary for the COMPANY to proceed against the SELLER before proceeding against the GUARANTOR and the Guarantee herein contained shall be enforceable against them not withstanding any security which the company may have obtained or obtained from the SELLER shall at the time when proceedings are taken against the GUARANTOR here under be outstanding or unrealized.

The GUARANTOR hereby declares that it has power to execute this Guarantee and the executant has full powers to do so on its behalf under the proper authorities granted to him / them by of the guarantor.

10. Not withstanding anything herein before contained, our liability under this Guarantee is restricted to Rs. ..... (Rupees .... only) and will expire on ..... and unless a claim in writing is presented to us or an action or suit to enforce the claim is filed against us, within six months from the date, all our rights shall be forfeited and we shall be relieved and discharged from all our liabilities thereunder.

IN WITNESS whereof the ..... (Bank) have hereunto set and subscribed their hands the day, month and year first above written.

SIGNED FOR AND ON BEHALF OF THE BANK

WITNESS:

NAME AND ADDRESS **SIGNATURE**

1.

2.

ANNEXURE - K

REVISED PRICE OFFER IN LIEU OF WITHDRAWAL OF DEVIATIONS/ CLARIFICATIONS OFFERED BY BHEL DURING TECHNICAL DISCUSSION

Sl. No.	Clause Ref.	Description of Deviation/ Clarification	Whether Increase/ Decrease in Price	Unit Rate (if applicable)	Total Increase/ Decrease	Remarks

NOTE: Total increase or decrease in total price shall be indicated either in percentage or in value (Rs.).

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE -L

(On Bank's Letter Head)

To,
AGM(Finance)
Transmission Business Group,
Block-VI, Central Annexe, IInd Floor,
Bharat Heavy Electricals Ltd.
Bhopal – 462 022

Ref & Date

Sub : Confirmation of Bank Guarantee no. <<BG No.>>

We are a Scheduled Bank other than Co-operative sector Bank under the RBI Act 1934. The aforesaid << BG No.>> for Rs. <<BG Amount>>/ (In Words Also) and valid up to <<validity date>> is issued by us on behalf of M/s << Beneficiary's Name>> in favour of BHARAT HEAVY ELECTRICALS LTD.
The format of the Bank guarantee is strictly as per the format prescribed by M/s BHEL and the stamp papers forming part of the BG are as per the state rules extant.

The signatures to the Bank Guarantee are duly authorised.

Thanking you,

For & On behalf of
Name of the Bank & Seal

(Please Sign here)

SECTION-B

GENERAL TERMS AND CONDITIONS

SECTION - B

GENERAL TERMS AND CONDITIONS

B.1.0 The following terms shall have the meaning hereby assigned to them except where the context requires otherwise:-

B.1.1 BHEL (or B.H.E. Ltd.) shall mean Bharat Heavy Electricals Limited, a Company registered under Indian Companies Act 1956, with its Registered Office at BHEL House, Siri Fort, New Delhi-110 049 or its Authorised Officers or its Engineer or other Employees authorised to deal with any matters with which these persons are concerned.

B.1.2 "GENERAL MANAGER" shall mean the Officer in Administrative charge of the Contracting Unit of BHEL.

B.1.3 "ENGINEER" OR "ENGINEER-IN-CHARGE" shall mean Engineer deputed by BHEL. The term includes "Deputy General Manager, Construction Manager, Resident Engineer, Assistant Site Engineer of BHEL/at the site as well as the officers in charge at Head Office.

B.1.4 "SITE" shall mean the place or places at which the plants/equipments are to be erected and services are to be performed as per the specification of this tender.

B.1.5 "CLIENTS OF BHEL" or "CUSTOMER/OWNER" shall mean the organisation to whom BHEL is responsible for this work.

B.1.6 "CONTRACTOR" or “ETC CONTRACTOR” shall mean the individual, firm or Company who enters into this Contract with BHEL and shall include their executors, administrators, successors and assigns.

B.1.7 "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the agreement, the work order, the accepted appendices of rates, Schedules of Quantities, if any, General Terms and Conditions of Contract, Special Conditions of Contract, Instructions to Tenderer, the drawings, the Technical Specifications, the Special Specifications, if any, the tender documents and the Letter of Intent\Accepting Letter issued by BHEL. Any conditions or terms stipulated by the tenderer 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 and incorporated in the Agreement.

B.1.8 "GENERAL CONDITIONS OR CONTRACT" shall mean the "Instructions and Information for Tenderer and General Terms and Conditions" pertaining to the work detailed.

B.1.9 "TENDER SPECIFICATIONS" shall mean the Special Conditions, Technical Specifications, Appendices, Site Information and drawings pertaining to the work for which the tenderer are required to submit their offer. Individual Specification Numbers will be assigned to each technical specifications.

B.1.10 "TENDER DOCUMENTS" shall mean the General Terms and Conditions and Tender Specifications.

B.1.11 "LETTER OF INTENT" shall mean the intimation by a letter/telegram/telex/ fax 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 the terms and conditions of contract are applicable from this date.

B.1.12 "COMPLETION TIME" shall mean the period by date specified in the Letter of Intent/Work Order or date mutually agreed upon for handing over of the erected equipment/plant which are found acceptable by the Engineer being of required standard and conforming to the specifications of the contract.

B.1.13 "ZERO DATE" shall mean the planned commencement date of work under this tender and shall be date of issue of Letter of Intent.

B.1.14 "PLANT OR PROJECT OR SWITCHYARD" shall mean and connote the entire assembly of the plant and equipments covered by the contract.

B.1.15 "EQUIPMENT" shall mean all equipments, machineries, materials, structural, electrical and other components of the plant covered by the contract.

B.1.16 “TESTS" shall mean and include such test or tests to be carried out by 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 contracted work or part thereof.

B.1.17 "APPROVED" "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

B.1.18 "WORK OR CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles required for complete and satisfactory site transportation, handling, stacking, storing, civil and electrical works, erection, testing & commissioning of the equipment to the entire satisfaction of BHEL.

B.1.19 "SINGULAR AND PLURAL" etc. words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting masculine gender shall be taken to include the feminine gender and words imparting persons shall include any Company or Association or Body or Individuals, whether incorporated or not.

B.1.20 "HEADINGS" The headings in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation of construction thereof or the contract.

B.1.21 "MONTH" shall mean calendar month.

B.1.22 "WRITING" shall include any manuscript typewritten or printed statement under the signature or seal as the case may be.

B.2.0 **LAW GOVERNING THE CONTRACT & COURT JURISDICTION**:

The Contract shall be governed by the Law for the time being enforce in the Republic of India. The Civil Court at New Delhi having ordinary Original Civil Jurisdiction shall alone have exclusive jurisdiction in regard to all claims in respect of this contract.

B.3.0 **ISSUE OF NOTICE**:

The contractor shall furnish to the Engineer, the name, designation and address of his authorised agent and all complaints, notices, communications and references shall be deemed to have been duly given to the Contractor, if delivered to the Contractor or his authorised agent and shall be deemed to have been so given in the case of posting on the day on which they would have reached such address in the ordinary course of post or at which they were so delivered or left.

B.4.0 **USE OF LAND:**

No land belonging to BHEL or its customer under temporary possessions of BHEL shall be occupied by the contractor without the written permission of BHEL.

B.5.0 **COMMENCEMENT OF WORK:**

B.5.1 The contractor shall commence the work within fifteen days of Letter of Intent or the time indicated in the Letter of Intent/Work Order and shall proceed with the same with due expedition without delay.

The Contractor shall have to give programme of work in Annexure 'M' to the ENGINEER-IN-CHARGE after mobilisation at site. This will have to be regularly updated / revised so as to meet the Project completion schedule as per requirement of BHEL /Owner.

B.5.2 If the successful tenderer fails to commence the work within the stipulated time, BHEL, at its sole discretion will have the right to cancel the Letter of Intent/ Contract. His Earnest Money and/or Security Deposit 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.

B.5.3 All the works shall be carried out under the direction and to the satisfaction of BHEL/Customer/Owner.

B.5.4 The transported equipment, erected/constructed plant or work performed under the contract, as the case may be, shall be taken over when it has been completed in all respect and/or satisfactorily put into operation at site.

B.6.0 **MEASUREMENT OF WORK AND MODE OF PAYMENT:**

B.6.1 All payments due to the contractor shall be made only by "Account Payee Cheques".

B.6.2 For progress/running bill payments, the contractor shall present detailed measurement sheets in duplicate duly indicating all relevant details based on technical documents, protocols & material test reports and connected drawings for the work done during the calendar month/period under different categories in line with terms of payment as per Letter of Intent. The basis of arriving at the quantities/ weights shall be the relevant documents and drawings released by BHEL.

These measurement sheets shall be prepared jointly with Engineer and signed by both parties. Where required, joint measurement with Customer/Owner shall have to be taken.

B.6.3 The measurement sheets will be checked by the Engineer and quantities and percentage eligible for payment under different groups shall be decided by him. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in the Measurement Book & signed by both the parties. Where required counter signature of Customer/Owner shall have to be taken.

B.6.4 Based on the above quantities, contractor shall prepare the bills in the prescribed proforma and work out the financial value. These will be entered in the Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the Contractor.

B.6.5 All recoveries due from the contractor for the month/period shall be effected in full from corresponding running bills unless specific approval from Competent Authority is obtained to the contrary.

B.6.6 Measurement shall be taken jointly by person duly authorised by BHEL and the Contractor.

B.6.7 The Contractor shall bear the expenditure involved, if any, in taking the measurements and testing of materials to be used in the works. The Contractor shall without extra cost to BHEL, provide all the assistance with appliances and other things necessary for measurement.

B.6.8 If at any time due to any reason whatsoever, it becomes necessary to remeasure the work done, in full or in part, the expenses towards such re-measurement shall be borne by contractor.

B.6.9 Passing of bills covered by such measurement does not amount to acceptance by BHEL of the completion of the work measured. Any left out work has to be completed by the Contractor, as directed by BHEL.

B.6.10 Final measurement bill shall be prepared in the proforma prescribed for the purpose, based on the certificate issued by the Engineer that the entire work as stipulated in the tender specification has been completed in all respects to the entire satisfaction of BHEL.

The contractor shall give unqualified "No claim" and "No Demand" certificates. All the tools and tackles loaned to him should be returned in condition satisfactory to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Book and signed by both the parties. The final bill shall be paid after completion of all the defects/deficiencies etc. pointed out by BHEL. The contractor should submit all the original documents such as material consumption, site order book etc. maintained at site. After payment of final bill only guarantee obligation, percentage value shall remain unpaid which shall be released in accordance with Clause A.15.0.

B.7.0 **RIGHTS OF BHEL:**

B.7.1 Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

B.7.2

B.7.3

B.7.4

B.7.5 Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

B.7.6

B.7.7

B.7.8

B.7.9

Please Refer "ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS" attached with the tender document

B.7.10

B.7.11

B.8.0 **RESPONSIBILITY 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.

B.8.1 As far as possible, unskilled workers shall be engaged from the local areas in which the work is being executed. In case of any necessity is felt by the contractor to bring labourers from out side State, provisions of law governing such immigration by the concerned State are to be followed.

B.8.2 The Contractor at all times during the currency of this contract, shall in all his dealings with the local labour for the time being employed on or in connection with the work, have due regard to all local festivals, religious and other customs.

B.8.3 The contractor shall comply with all State and Central Laws, Statutory Rules, Regulations etc., such as : The payment of wages to, The Minimum Wages Act, The Workmen Compensation Act, The Employees Liability Act, The Industrial Dispute Act,The Employees Provident Fund and Miscellaneous Provisions Act 1952, Employees State Insurance Scheme, The Contract Labour (Regulations &Abolition) Act 1970 and other Acts, Rules and Regulations for labour as may be enacted by the Government during the tenure of the contract and having in force or jurisdiction at site. The Contractor shall give to the local Governing Body, Police and other concerned Authorities all such notice as may be required under law.

The contractor should have Provident Fund Code Number and shall ensure compliance of the EPF& MP Act, 1952 by the sub-contractors, if any engaged by the contractor for the said work,

B.8.4 The contractor, as required, will obtain independent license under the Contract Labour (Regulations and Abolition) Act 1970 from the concerned authorities based on the certificate (Form-V) issued by the Principal Employer/Customer.

B.8.5 The Contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalty, commissions or other charges which may be Leviable on account of any of his operations connected with this contract. The Contractor is responsible to furnish documentary evidence towards GST Registration of the State wherein the site is located and any other documents as per GST Act which may be required from time to time by BHEL.The contractor should have to get the contract registered immediately after award of works as per rules and regulations of the State Government. The contractor will file regular return as per statute of the State/

Centre and provide all information to BHEL as required for the assessment of the project concerned . In case BHEL is forced to make any of such payments, BHEL shall recover the same from the contractor either from moneys due to him or otherwise as deemed fit.

B.8.6 Arrangements for the periodical visits of inspection agencies such as Electrical Inspector etc. to site, inspection certificates etc. will have to be made by the contractor at his cost. The contractor will also meet all expenses in connection with his welder's qualification/ re-qualification tests etc.

B.8.7 The contractor shall be responsible for provision of health and sanitary arrangements {more particularly described in the Contract Labour (Regulation & Abolition) Act 1970} and safety precautions as may be required for safe and satisfactory execution of the contract.

B.8.8 The Contractor shall be responsible for proper accommodation including adequate medical facilities for the personnel employed by him.

B.8.9 The Contractor shall be responsible for the proper behaviour and observance of all regulations by the staff employed by him.

B.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 shall be the responsibility of the contractor to make good the losses or compensate them.

B.8.11 All the properties/equipment/components of BHEL/its customer loaned with or without deposit, to the contractor, shall remain the properties of BHEL/its customer. The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be taken to in good condition unless notified to the contrary by the contractor within 48 Hrs. The Contractor shall return them in good conditions as and when required by BHEL/its customer. In case of non-return, loss, damage repairs etc., the cost thereof, as may be fixed by the Engineer, will be recovered from the contractor.

B.8.12 It shall not be obligatory on the part of BHEL to supply any tools and tackles or materials other than those specifically agreed to be given by BHEL. However, depending upon availability/possibility, BHEL/its customer's equipment and other materials may be made available to the contractor on payment of the hire charges as fixed by them, subject to the conditions laid down by BHEL/its Customer from time to time. Unless paid in advance, such hire and other charges shall be recovered from out of dues to the contractor or Security Deposit in one instalment.

B.8.13 The Contractor shall fully indemnify and keep indemnified BHEL/its customer against all claims of whatsoever nature arising during the course of execution of this contract.

B.8.14 In case the contractor is required to undertake any work outside the scope of this contract, the amount payable shall be as may be mutually agreed upon.

B.8.15 Any delay in completion of works or non-achievement of periodical targets, due to reasons attributable to the contractor, will have to be compensated by the contractor either by increased manpower and resources or by working extra hours or more than one shift at no extra cost to BHEL.

B.8.16 The contractor shall execute the work under the conditions usual to such construction work and in conjunction with numerous other operations at site and proceed in a manner that shall help in the progress of work at site as a whole.

B.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving details of all payments made to the workmen duly signed by the contractor's representative should be furnished to BHEL, along with each Running Account Bill. Also, Contractor shall display wages paid by him as per The Minimum Wages Act.

B.8.18 In case of any class of work for which there is no specification laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

B.8.19 No levy, payment or charges made or imposed shall be impeached by reason of any clerical error or by reason of any mistake in the amount levied, demanded or charged.

B.8.20 No idle labour charges will be admissible in the event of any stoppage of work resulting in the contractor's workmen being rendered idle due to any reason any time.

B.8.21 The contractor shall take all reasonable care to protect the materials and the work till such time the place/equipment has been taken over by BHEL/its customer.

B.8.22 The contractor shall not stop work or abandon the site for whatsoever reason or dispute, excepting for force majeure conditions. All problems/disputes shall be separately discussed and settled without effecting the progress of work. Stoppage or abandonment of work, other than under force majeure conditions, shall be treated as breach of work of contract and dealt with accordingly.

B.8.23 The contractor shall keep the area of work clean and shall remove debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of works, 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.

B.8.24 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 instructions of the Engineers.

B.8.25 The contractor shall furnish progress reports on work at regular intervals as required by the Engineer.

B.9.0 **RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL & ENVIRONMENT**:

B.9.1 All safety rules and codes applied by BHEL/its customer at site shall be observed by the contractor and his workmen without exception. The contractor shall be responsible for the safety of the equipment/materials and work to be performed by him and shall maintain all lights, fencing guards, signs etc. or other protections 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 etc. and 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 the work under this contract. The contractor shall arrange for such safety devices as are necessary for this type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per usual standards and practices.

B.9.2 The contractor shall provide to its work force and ensure the use of required personal protective equipment as found necessary & as directed by the authorised BHEL officials in line with latest Amendments / Revisions of various Indian Standards.

i) Safety helmets conforming to IS-2925 : 1984.

ii) Safety belts conforming to IS-3521 : 1983.

iii) Safety shoes conforming to IS-1989 : 1978.

iv) Eye and face protection devices conforming to IS-8520 : 1977 and IS-8940 : 1978.

v) Hand and body protection devices conforming to IS-2573 : 1975, IS-6994 : 1973, IS-8807 : 1978 and IS-8519 : 1977.

B.9.3 All tools, tackles, fitting appliances, material handling equipment, scaffolds, cradles, safety nets, ladders, equipment, etc. used by the contractor (as per Annexure 'N') shall be of safe design and construction and maintained in good condition. However BHEL officials shall have the right to ban use of any of them or get them tested at their discretion.

All test & measuring instruments to be pre-calibrated through certifying agency before use. Also, please see. Cl. E.4.2 & E.6.3 of section - E for more details.

All electrical equipment, connections and wiring for construction power, its distribution and use shall conform to the relevant requirements of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carry out electrical works.

B.9.4 All electrical appliances including portable electric tools used by contractor shall have safe plugging system to source of power and be appropriately earthed.

B.9.5 The contractor shall not use any hand lamp energised by electric power with supply voltage of more than 240 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 240 volts.

B.9.6 Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in the relevant Government Acts, such as Petroleum Act, Explosive Act, Petroleum and Carbides of Calcium Manual of the Chief Controller of Explosives, Government of India etc. Prior approval of the authorised BHEL official at the site shall also be taken by the contractor in all such matters.

B.9.7 The contractor shall arrange at his cost appropriate illumination as required at all work spots for safe working, when natural day light may not be adequate for clear visibility.

B.9.8 In case of a fatal or disabling injury/accident to any person at construction sites pertaining to this work, the victim and/or his/her dependents 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 the contractor & recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

B.9.9 In case of any damage to property due to lapse by the contractor, BHEL shall have the right to recover the cost of such damages from the payments due to the contractor.

B.9.10 In case of any delay in the 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 the payments due to the contractor, after notifying the contractor suitably and giving him opportunity to present his case.

B.9.11 If 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 instructions regarding

safety issued by the authorised BHEL official, BHEL shall have the right to take the corrective steps at the risk and cost of the contractor after giving appropriate notice indicating the steps that would be taken by BHEL.

B.9.12 The contractor shall submit report of all accidents, fires, property damaged & dangerous occurrences connected with his area of work or caused due to his action/ inaction, to the authorised BHEL official immediately after such occurrence, but in any case not later than 12 hours of the occurrence.

B.9.13 During the course of construction, alteration or repairs scrap lumbers with protruding nails, sharp edges etc. and all other debris including combustibles scrap shall be kept cleared from working areas, passage ways and stairs in and around site.

B.9.14 Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally/ negligently dropped, struck or permitted to strike each

other violently. When cylinders are transported by powered vehicles, they shall be secured in a vertical position.

B.9.15 The contractor shall be responsible for the safe storage of his radioactive sources if same have been permitted to use.

B.9.16 All contractor's supervisory personnel and sufficient number of workmen shall be trained for fire fighting and first aid duties and shall be assigned specific duties. Enough number of such trained personnel must be available during the tenure of the contract.

B.9.17 Contractor shall provide enough fire protecting equipment of the types & numbers at his office, stores, construction/erection site, other temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all times. Compliance of the above requirement under fire protection system at project site shall in no way relieve the contractor of any of his responsibilities & liabilities to fire accident occurring. In the event of fire safety measures being not to BHEL's satisfaction, BHEL shall have option to provide the same and recover the cost plus incidentals from contractor's bills and/or impose penalty as deemed fit by the Engineer.

B.9.18 Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with BHEL Engineer at site.

B.9.19 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 recognise the safety performance of the contractor may be considered by BHEL after completion of the job.

B.10.0 **CONSEQUENCES OF CANCELLATION:**

B.10.1 Whenever BHEL exercises its authority to terminate the contract/withdraw a portion of work, the work may be got completed by any other means at the contractor's risk and cost provided that in the event of the cost of completion (as certified by the Engineer which shall be final and binding on the contractor) being less than the contract value, the advantage shall accrue to BHEL. If the cost of completion exceeds the money due to the Contractor under the Contract, the Contractor shall either pay the excess amount demanded by BHEL or the same shall be recovered from the contractor. This will be in addition to the forfeiture of Security Deposit and recovery of liquidated damages as per relevant clauses.

B.10.2 In case BHEL completes the work under the provisions of this clause, the cost of such completion to be taken into account for determining the excess cost to be charged to the contractor shall consist of cost of materials purchased and/or labour provided by BHEL with an addition of such percentage to cover supervision and establishment charges as may be decided by BHEL.

B.11.0 **INSURANCE:**

B.11.1 BHEL/its customer shall arrange for insuring the project materials/properties of BHEL/its customer covering the risks during transit, storage, construction, erection and commissioning.

B.11.2 It shall be the sole responsibility of the Contractor to insure his workmen against risks of accident and injury while at work as required by the relevant rules and to pay compensation, if any, to them as per Workmen's Compensation Act. The Contractor shall also insure his staff against accidents. The work will be carried out in a protected area and all the rules and regulations of BHEL/its client in the project area which are in force from time to time will have to be followed by the contractor.

B.11.3 If due to negligence and/or non-observance of safety and other precautions any accident/injury occurs to any other person/public, the contractor shall pay necessary compensation and other expenses, if so decided by the appropriate authority.

B.11.4 It shall be the responsibility of the contractor to provide security and insurance claim related information/reports, FIRs etc. for the equipment/material belonging to BHEL/its customer and handed over to the contractor for transportation/erection/ construction till these are taken over by BHEL after erection/construction or are returned to BHEL/its customer's store.

B.11.5 If due to Contractor's carelessness, negligence, non-observance of safety precautions, improper security arrangements or due to non-compliance of paper work needed for lodging insurance claim, damage to BHEL/its Customer's property and/or personnel should occur, and if BHEL is unable to recover its claim from the Insurance Company, the deficit will be recovered from the Contractor. **All losses arising out of theft of material from the contractor's store/erection site shall be recovered from the contractor irrespective of the insurance claims.**

B.12.0 **STRIKES & LOCKOUTS:**

B.12.1 The Contractor will be solely responsible for all disputes & other issues connected with his workmen. In the event of the contractor's workmen resorting to strike or the contractor resorting to lockout and if the strike or the lockout so declared is not settled within a period of one month, BHEL shall have the right to get the work executed by employing its own men or through other agencies or both. The cost incurred by BHEL in this regard shall be recovered from the Contractor.

B.12.2 For any purpose whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL/its Customer.

B.13.0 **FORCE MAJEURE:**

B.13.1 The following shall amount to force majeure conditions:-

Acts of God, Act of any Government, war, Sabotage, riots, civil Commotion, Police Action, Revolution, Flood, Fire Cyclone, Earthquake, Epidemic and other similar causes over which the contractor has no control.

B.13.2 If the contractor suffers delay in the due execution of the contract, due to delays caused by force majeure conditions, as defined above, the agreed time of completion of the work covered by this contract may be extended by a reasonable period of time in consultation and after agreement of BHEL's clients / owner, provided that on the occurrence of any such contingency, the Contractor immediately reports to BHEL in writing the causes of delay. The Contractor shall not be eligible for any compensation on this account.

B.14.0 **GUARANTEE:**

B.14.1 Even though the work will be carried under the supervision of BHEL Engineers, the contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 12 months from the date of putting the complete system into commercial operation or 18 months from the date of system is declared completely erected duly tested and accepted by customer whichever is later and shall rectify free of cost all defects due to faulty erection detected during the guarantee period starting from the date of the completion of rectification. 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 expense without prejudice to any other rights and recover the same from Security Deposit/other dues.

B.15.0 **ARBITRATION:**

B.15.1

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

NOTE:

Above clause No. B.15.0 stands deleted. Please refer Annexure to conditions of contract for ETC works.

B.16.0 **VARIATIONS AND VALUATIONS:**

B.16.1 **QUANTITIES:**

The quantities set out in the Bill of Quantities are the estimated quantities of the work but they are not to be taken as the actual and correct quantities of the works to be executed by the Contractor in fulfilment of his obligations under the Contract.

B.16.2 **VARIATIONS:**

B.16.2.1 The Engineer shall have power to make any variation of the form, quantity of the Works or any part thereof that may in his opinion be necessary and for that purpose or if for any other reason it shall in his opinion be desirable shall have power to order the Contractor to do and Contractor shall do any of the following:-

a) Increase or decrease the quantity of any work included in the contract.

b) Omit any such work.

c) Change the character or quality or kind of any such work.

d) Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract but the value (if any) of all such variation shall be taken into account in ascertaining the amount of the Contract Price.

e) Restrict the extent of work of any item covered under Clause E.10.0 of Section - E "Schedule of Equipment".

B.16.2.2 Orders for Variations to be in writing. No such variation shall be made by the contractor without an order in writing of the Engineer provided that, no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this clause but is the result of the quantities exceed in for being less than those stated in the Bill of Quantities. Provided also that if for any reason the Engineer shall consider it desirable to give any such order verbally the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the Engineer whether before or after the carrying out of the order shall be deemed to be an order in writing within the meaning of this clause. Provided further that if the contractor shall confirm in writing to the Engineer any verbal order of the Engineer and such confirmation shall not be contradicted in writing by the Engineer, it shall be deemed to be an order in writing by the Engineer.

B.16.3 **VALUATION OF VARIATIONS:**

The Engineer shall determine the amount (if any) which in his opinion should be added to or deducted from the sum named in the Contract in respect of any extra or additional work done or work omitted by his order. All such work shall be valued at the rates set out in the Contract if in the opinion of the Engineer the same shall be applicable. If the contract shall not contain any rates applicable to the extra or additional work then suitable prices shall be derived from the nearest item of BOQ or arrived at from the actual cost of manpower utilised (the cost of T&P and testing equipment etc. are not to be taken into account for arriving at the rates of additional/extra works) plus 10% for contractor's OH and profit. The rates for manpower shall be as per the minimum wages applicable for the project area.

Above clause No.B.16.3 shall be read in conjunction with clause No.1.of of Annexure to conditions of contract for ETC works.

B.16.4 **POWER OF ENGINEER TO FIX RATES:**

If the nature or amount of any omission or addition relative to the nature or amount of the whole of the contract work or to any part thereof shall be such that in the opinion of the Engineer the rate or price contained in the Contract for any item of the Work is by reason of such omission or addition rendered unreasonable or inapplicable then a suitable rate or price shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such other rate of price as shall in his opinion be reasonable and proper having regard to the circumstances and the same shall be binding on the contractor. But under no circumstance the contractor shall suspend the work on the plea of non-settlement of rates falling under the clause or claim any compensation on that account.

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ANNEXURE - M

PROGRAMME OF WORK

SL.NO.	ACTIVITY	DURAION
01.	Award of work.	Zero week
02.	Mobilisation & setting up of site office	..... weeks
03.	Start / finish of structure erection	..... weeks
04.	Start / finish of stringing of shielding wire and conductors	..... weeks
05	Start / finish of Circuit Breaker erection	..... weeks
06.	Start / finish of other equipment erection	..... weeks
07.	Start / finish of testing and precommissioning	..... weeks
08.	Start / finish of commissioning	..... weeks
09.	Final Handing over	..... weeks

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - N

LIST OF TEST EQUIPMENTS TO BE ARRANGED BY ETC CONTRACTOR

All measuring and testing instrument shall be pre-calibrated through a certifying agency before use. The certificate of calibration shall be submitted to BHEL Site Engineer for records. Also see clause E.4.2 & E.6.3 under Section E of the tender specification for more details.

A -	**General purpose**	**Qty.**
1.	Digital multimeter - 4½ digits Accuracy ± 1% (Any reputed make - preferably Fluke - make)	4 Nos.
2.	Megger 2.5 kV - 5kV, range 0.5 MΩ - 10,000 MΩ (Motorised/Electronic) (Any reputed make)	1 No.
3.	Meggar having voltage multiplier 0-500V- 1000V, (Motorised / Electronic) Range 0.5 MΩ - 1000 MΩ (Any reputed make)	1 No.
4.	Single phase variac 8 A, 0.-250V, 50 HZ	2 No
5.	Three phase variac 15A, 0-440V, 50 HZ	1 No
6.	Single phase transformer 220V / 4000V, 500VA, 50HZ	1No
7.	Stop watch	1No
8	Micro- ohm- meter (mV drop test kit) 0-200ADC, 0-2000 micro ohm with suitable calibrated cable leads for current injection and mV drop.	1 No
9.	Phase sequence meter	1 No
10.	Two way intercom set with 50 to 100 M cables for checking of cable continuity	2 sets
11.	Walkie - Talkie sets with battery charging sets Receiver + Transmitter, Type GP 300 - Motorola - make	1 set
12.	Variable D.C. power supply 0-220VDC, 10 A	2 Nos
13.	4 pole Miniature moulded case breaker 16 A	3 No
14.	Capacitance meter having range 20 PF- 100mfd ± 1%	1 No
15.	Isolation Transformer 1KVA, 240V AC, 1 phase, 50Hz	2 Nos

B	**For testing of current transformer**	
1.	Primary injection test kit, range 0-2000A with a pair of leads & C clamps for testing of CT's	1 No
2.	Secondary injection test kit suitable for 5A& 1A with banana plug cable leads.	1 No
3.	Digital Tongue tester 0-2000A, 600VAC, 50 Hz (Any reputed make).	1 No
4	Digital Tongue tester 0-20A, 600V AC, 50 Hz (Any reputed make).	1 No
5.	Digital Tongue Tester, 0-1A, 600V AC, 50Hz	2 Nos.
C -	**For testing of oil cooled transformer and AC reactor**	
1.	Transformer winding resistance meter or Kelvin's double bridge	1 No
2.	Transformer turns ratio meter	1 No
3.	PPM tester for transformer oil	1 No
4.	BDV tester for transformer oil	1 No
D	**For testing of relays**	
	Single phase / 3 phase relay test kit having timer current source 5A, 1A, voltage source 0-220VDC, 0-110 VAC 50 HZ. (Any reputed make)	1set
E-	**For time measurement of breaker**	
	Breaker closing and / opening time measurement timer	1 No
F	**For testing of relays and distance protection**	1 Set
1.	CFB kit or equivalent - of any reputed make	
2.	ZFB kit or equivalent - of any reputed make	

G **For testing of transformer bushings CT, CVT & Circuit Breaker used in HV System**

Capacitance and tan Delta kit suitable for 12KV 1 Set
(Any reputed make)

H. **Safety / protective means**

- Protective earth rod suitable for 220Kv / 400 KV system 2 Nos
having leakage current meter, 70MM^2 copper cables and C clamps
(Any reputed make).
- Helmets and hand globes etc.

I. **For PLCC Equipment:**

b) Digital time interval meter and frequency counter, 8 digits with frequency range 10 Hz to 10MHz.

c) 200Hz to 620KHz Selective level meter.

d) 200Hz to 620KHz Selective level generator.

Note:

1. Above is only a specimen/indicative list and any other test equipment (s) as may be required by Owner / BHEL at site during the execution of work will be arranged by the contractor well in time.
2. The status of tools, plants and instruments mentioned in annexure C of section - A does not relieve the subcontractor of his responsibility to make available all the test equipments and tools & tackles mentioned in annexure N of section B as per requirement of project.

ANNEXURE - P

ACTIVITIES FOR TESTING AND COMMISSIONING BY ETC CONTRACTOR

1. Preparation of joint inspection records / observation by BHEL, BHEL customer and the contractor on the pending activities of erection holding for starting of testing and commissioning.

2. Issue of certificate for completion of erection activities to the satisfaction of BHEL customer.

3. Compilation of documents (scheme, cable schedules, FQP, technical literature, operation and maintenance manuals, technical reports, works test certificate for the equipments / components, and other relevant documents to expedite commissioning) in a systematic manner to present to customer/owner to meet the contractual requirement.

4. To expedite the testing activities contractor has to arrange the engineers and his staff and instruments at site for testing and commissioning of switchyard equipments as follows:

4.1 Testing of individual relay, energy meter, transducer and meters for their satisfactory operation.

4.2 Protection devices / relays will be tested with appropriate current and voltage injections.

4.3 Individual control and protection panels testing for their satisfactory operation as per scheme.

4.4 Individual CT, PT, CVT, Breaker, Transformer and Isolator LA, MB, Battery Charger etc. where ever possible to test them independently.

4.5 Wiring check as per scheme and cable schedule preferably in the following sequences:

- Between marshalling Kiosk in the yard to other yard equipments.
- Between equipments in the yard.
- Yard equipments to control room equipments.
- Inter connection between control room equipments.

5. All cables to be properly glanded, identified and terminated suitably.

6. Cables should have proper / accurate cross reference ferruling and necessary cable tags for identifications as per recommendation by BHEL/ Customer.

7 Green marking in cable schedule and scheme after wiring check. Contractor to make also “As Built” scheme and cable schedule for submission to BHEL/Customer.

8. List of wiring mistakes, component damage and mal-operation of components.

9. Successful completion of equipment level testing operative from local and remote and desired FQP filled up and approved by ultimate customer. Approval/acceptance on FQP results by customer has to be obtained by Contractor. For any technical clarifications, BHEL will only assist.

10. In case the contractor is finding difficulty to understand the technicalities to undertake testing and commissioning of a particular equipment, subsystem and system he has to inform BHEL in advance with in 2 months from the date of award of contract for necessary information and explanation.

11. For erection/commissioning of SF6 Circuit Breakers (If called for in BOQ), the services of experts +for supervision will be extended by BHEL free of cost. Contractor will provide adequate support by providing skilled manpower and tools & tackles**.** However the complete responsibility for erection and commissioning lies with subcontractor.

12. Contractor has to keep a senior and experienced person in the area of testing and commissioning associated with his skilled staff till charging and handing over of complete switchyard to the satisfaction of BHEL customer.

13. Contractor has to be well equipped at site with testing instruments and safety measures (like helmet and hand globes) while doing testing and commissioning.

14. Contractor will also carry out design validation tests as per BHEL / BHEL customer documents.

15 If the contractor fails to take up testing and commissioning work as per the requirement of contract or project requirement, then BHEL will be at liberty to hire services of third agency for this work at the risk and cost of subcontractor.

16 Testing of mandatory spares or any other spare (if required by customer / BHEL), cleaning and handing over to customer's stores is also included in the scope of this Tender Specification. The site Test Reports of these mandatory spares will also be generated by subcontractor in such a case.

17 In case contractor fails to arrange Test equipments as referred in Annexure 'N' (as per requirement of equipment covered in BOQ), BHEL will arrange the instruments at the risk and cost of contractor for providing such instruments.

18. Contractor has to repeat any tests free of cost, even if already conducted, whenever required to prove and check the healthiness of system before power flow, such tests could be primary injection and secondary injection in CT, CVT, meggering, and functional tests or any other tests as required by BHEL/customer.

19. Oil processing/filtering in a transformer, CT and CVT shall also be repeated free of cost if required before charging and handing over of the switchyard to the owner in case BDV and PPM of oil is not satisfactory.

20. As isolator is a rotating equipment and its alignment is likely to get disturbed. Therefore contractor has to do alignment of isolators and measurement of contact resistance repeatedly free of cost as and when required till handing over of the station.

21. Commissioning means charging of total system in a sub-station and inter connected equipments by power flow. Accordingly the payment will be made to the contractor as per payment terms.

22. Contractor has to deploy adequate and experienced man power at site as per project requirement and advice of BHEL site in-charge. Non compliance of this requirement will be treated as indiscipline and non cooperation of the contractor. Accordingly BHEL will hire the man power as required at the risk and cost of the contractor after giving a single notice.

23. Based on site requirement, for the works not stipulated in the contract, the contractor has to provide assistance of skilled manpower with required tools and test instruments.

24 If any Expert services of manufacturer for commissioning supervision of special protection relays / numerical relays / equipment is felt necessary by the contractor, the same shall be arranged by the contractor themselves at their cost. Contractor shall provide testing & Commissioning, Engineer, electrician, other tools tackles and consumables for these equipments and for total system.

Any delay in arranging special testing & commissioning equipment and expert supervisor shall not entitle the contractor to any claim (idle labour, additional time etc.) whatsoever.

25. Any idle days of the expert supervisor at site due to reasons attributable to the contractor, due to lack of readiness in erection, delay in arranging of manpower, tools etc. shall be to contractor's account.

NOTES :-

(1) Above is only an indicative list. Contractor has to mobilise and keep adequate competent commissioning staff at site to ensure that all mile stones & events and relevant commissioning activities are completed successfully in a scheduled time.

(2) In case contractor is not finding competent and adequate staff with him, he can hire the commissioning services from out side agencies approved and accepted by BHEL. Contractor will furnish the details (experience, qualification) of all commissioning staff and the commissioning tools and instruments available with the contractor OR obtained on loan basis with in 60 days from the date of award of the work.

ANNEXURE - Q

LIST OF TOOLS & TACKLES TO BE ARRANGED BY CONTRACTOR

Sl. No.	PARTICULARS
01.	Electrical Drilling Machine & Hand drilling Machine.
02.	Hydraulic Bending Machine for Al. pipes.
03.	Gas Welding Set & Gas Cutting Set.
04.	Hand Operated Winches.
05.	Electric Welding machine.
06.	Jack with axle for lifting Cable Drum.
07.	Jointers Tool Box.
08.	Blow Lamps.
09.	Compression Tools suitable for Cables.
10.	Pull Lifts.
11.	Pulley Blocks.
12.	Hooks/Chains
13.	Cable Rollers.
14.	Hydraulic Jacks - For cable laying.
15.	Aluminium Rollers.
16.	D- Shackles.
17.	Dynamometers.
18.	TIG, Welding machine (for Aluminium welding).
19.	High Vacuum 1000 GPH Oil Filtration Machine for Transformer / Reactor oil suitable for 760mm vacuum. In case 250 MVA / 315 MVA transformer ETC work is covered in the scope, Oil filtration equipment of 1500 GPH suitable for High Vacuum along with 30 kL capacity storage tank for oil storage and processing of oil should be provided.
20.	Hydraulic cranes including accessories (20 tonne or more and boom height of 15mts. Vertical or more) suitable for erection of transformer bushings accessories and other equipments.
21.	Hydraulic Crimping tools for conductor / Shield wire.
22.	Crimping tools for cable termination.
23.	Torque wrenches of different ranges in sufficient numbers.
24.	All general purpose hand tools in sufficient quantities.
25.	Shearing Machine for cutting of Earthing Flat.

26. Tool Kit for fitters.
27. Tool Kit for Electrician.
28. Bench Vice.
29. 'A' type collapsible Al. ladder height 8M.
30. 'H' type Al. ladder height 5M.
31. Pressure Gauge 0-1kg/Sq.cm for measurement of N2 pressure.
32. Vacuum gauges for measuring fire vacuum of less than 1 torr in transformer.
33. Nylon slings for 4T capacity with different lengths.
34. Turper
35. Angle meter for measurement of bushing angle during erection.
36. Nylon hammer.
37. Wedge for cutting of 'O' rings/neoprene gaskets.
38. Die/Drill tool for making holes in gland plates (All sizes in sufficient numbers)
39. Phoenix screw drivers for handling of Terminal Blocks.

IMPORTANT NOTE:

1. The Contractor shall submit the copies of latest test certificate of lifting tackles, slings, pulleys etc. after mobilisation at site to the ENGINEER-IN-CHARGE.
2. Above is only a specimen/indicative list and any other Tools & Tackles as may be required by Owner/ BHEL at site during the execution of work will be arranged by the contractor promptly.
3. The status of tools, plants and instruments mentioned in annexure C of section - A does not relieve the subcontractor of his responsibility to make available all the test equipments and tools & tackles mentioned in the annexures of section B as per requirement of project.

SECTION-C

SPECIAL CONDITIONS OF CONTRACT

SECTION - C

SPECIAL CONDITIONS OF THE CONTRACT

C.1.0 **QUALIFICATION OF THE CONTRACTOR :**

C.1.1 The contractor must have the experience of execution of identical work in the past as specified in the tender documents and must have executed contracts of similar nature. The contractor must furnish enough evidence to establish his capacity in erection, testing and commissioning of similar equipments covered under this specification.

C.1.2 The contractor should be able to obtain clearance from the Electrical Inspector/ State Authorities on completion of the installations. If required, the Contractor is supposed to obtain such clearances on part completion of the installation as required by BHEL / Owner time to time. Also, before the start of work the contractor should obtain the supervisory license from the concerned Electrical Authorities.

C.1.3 The Contractor will have following certificates.

a) Contractor electrical licence.

b) Supervisor competency certificates to deal with Electrical high voltage equipments for their installation and for their installation and testing.

Such certificates from two persons of subcontractors representatives who will be posted at site will be required.

C.1.4 The contractor should be aware of the local conditions and be well acquainted with the site.

C.1.5 The contractor shall be preferred who has worked for State Electricity Boards/BHEL/Steel Authorities/Public Undertakings.

C.1.6 The contractor should have a very good engineering background and capability of carrying out erection and commissioning work of large scale.

C.2.0 **TERMS OF PAYMENT FOR ERECTION, TESTING AND COMMISSIONING :**

C.2.1

C.2.2

C.2.3

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

C.2.4

C.2.5

C.2.6

C.2.7

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

C.2.8

Above clause No. C.2.0 stands deleted. Please refer Annexure to conditions of contract for ETC works.

C.3.0 **SECURITY DEPOSIT:**

C.3.1

C.3.2

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

C.3.3

C.3.4

C.3.5 **RETURN OF SECURITY DEPOSIT:**

The contractor should refer the clause A.17.7.

No interest shall be payable by BHEL on Earnest Money/Security Deposit or on any money due to the contractor by BHEL.

C.4.0 **PERFORMANCE GUARANTEE:**

C.4.1 The contractor shall be responsible for any defects in the execution of work noticed in guarantee period of 12 months reckoned from the date of putting the complete system into commercial operation/handing over to customer or 18 months from the date of system is declared completely erected, duly tested and accepted by BHEL and customer. The Contractor shall submit a bank guarantee worth 10% of the total contract value of erection, testing and commissioning of equipment in the prescribed proforma form of BHEL. If the contract is for more than one sub-station and the substations are completed and taken over by customer in stages, then the performance BG for the substation completed and handed over may be submitted based on the contract value of individual substation at the time of submitting the final bill, substation wise.

C.5.0 **LD/PENALTY FOR DELAY IN EXECUTION:**

C.5.1

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

Above clause No.C.5.0stands deleted. Please refer Annexure to conditions of contract for ETC works.

C.6.0 **RECEIPT/ UNLOADING, HANDLING, TRANSPORTATION, SECURITY AND PRESERVATION OF EQUIPMENT AT SITE:**

C.6.1 The contractor shall take the delivery of all the equipment, structures and materials etc. at site and their security shall be the responsibility of the contractor. Further transportation of materials to work place as per requirements will be in the scope of the contractor. For any delay, demurrage/wharfage/detention charges will be borne by the contractor.

In order to ensure timely completion of project, some of the equipment/material as covered under clause no. E.10.0 of Section-E (Schedule of equipment) may arrive at site and are unloaded and stacked/stored prior to mobilisation of ETC Contractor for the work covered under this Tender Specification. In such a case, the amount actually spent by BHEL on unloading and storage till the time of mobilisation by the ETC contractor shall be debited to their account. Immediately after mobilisation, the contractor shall take these into their custody and all the conditions as applicable for the material directly received by the contractor will be applicable for these material.

C.7.0 **FACILITIES TO BE PROVIDED AT SITE BY THE CONTRACTOR:**

C.7.1 Watch and ward by authorised/licensed agency for the safe custody of the equipment shall be responsibility of the contractor.

C.7.2 It is the responsibility of the contractor to dismantle and take away all the materials of his office accommodation as soon as the project in handed over to BHEL/Owner and clean the area off debris.

C.8.0 **TESTING AND COMMISSIONING:**

C.8.1 All the electrical/mechanical test of the materials and equipment will be arranged by the contractor as per standard Specification/Field Quality Plan/ Erection Manual/Directive of the Site Engineer and Owner. The contractor shall have to fill the check list (site inspection record forms)for receipt, storage, erection, testing and commissioning of all the equipments as per BHEL systems to ensure proper quality of work.

C.8.2 All the testing equipment required to carry out the site test for all the equipment or the erected equipment shall be calibrated and shall be arranged by the contractor at his own cost. However, necessary instruction and the guidelines will be given by BHEL/owner.

In case Contractor is unable to provide the calibrated measuring and test instruments to the satisfaction of 'ENGINEER' then as per his own wisdom/ judgement can recommend a deduction of maximum limit up to 5% from the Contractor's bill. But this in no way relieves the Contractor from arranging the test & measuring instruments / equipment as required for completion of the 'PROJECT' without affecting the quality of work and meeting any Contractual obligation whatsoever.

C.8.3 The contractor shall be completely responsible for the satisfactory erection and providing Test Equipment and skilled manpower for testing, commissioning of all equipment, not withstanding the fact that he may be assisted by BHEL or its authorised representative.

C.8.4 The installation of all electrical equipment shall be carried out only by an electrical contractor holding a valid License for carrying out installation work of the voltage classes involved, under the direct supervision of and by persons holding valid certificates of competency for the same voltage classes, issued or recognised by the State Government. Contractor shall submit the particulars of the License held by him.

C.8.5 The contractor shall furnish to BHEL the names and particulars of certificates of competency of the supervisors and workmen to be engaged for carrying out installation work against this specifications.

C.8.6 The work shall be executed in a workman like manner in accordance with the requirements specified in the General Specification of Electrical Equipment installation, testing and commissioning specifications. Copy of such specifications/ drawings will be given to successful bidder before starting the work.

C.8.7 All electrical work shall also comply with standard norms and practices adopted by the State Electricity Board. Site test reports shall be prepared and submitted by the contractor.

C.8.8 Before charging the installation in part or full, this shall have to be approved by Statutory Govt. Authorities like Electrical Inspector, other concerned agency and the contractor has to arrange approval for the same as and when required by BHEL/Owner.

C.8.9 Any feasible modification in the equipment or installation that may be demanded by Electrical Inspector shall have to be carried out by the contractor at no extra charges to BHEL. The contractor shall take all necessary steps to enable BHEL/Owner to get the installation approved by the above authorities & shall render all necessary assistance to BHEL/Owner in the matter.

C.9.0 **COMPLETION OF CONTRACT:**

C.9.1 All equipment, mountings, fittings accessories or apparatus which may not have been specifically mentioned but which are usual or necessary for completing the erection and commissioning work of system, shall be done by the contractor without any extra charges.

C.10.0 **TRIAL OPERATION AND HANDING OVER:**

C.10.1 On completion of erection of the equipment and before pre-commissioning tests of the equipment, each of the equipment shall be inspected by the BHEL/Owner for the correctness and completeness of the installation. Thereafter commissioning engineers shall carry out all pre-commissioning tests. The results of such pre-commissioning tests shall be signed jointly by the contractor`s representative and BHEL/Owner.

C.10.2 On conclusion of satisfactory pre-commissioning tests, the trial operation of the equipments shall start. The equipment shall be on trial operations during which period all necessary adjustments shall be made.

C.10.3 After completion of trial operation, the plant will be handed over to the owner, after the period to be specified by BHEL. On taking over the plant, the owner shall issue a certificate to that effect.

C.10.4 BHEL/Owner shall be at liberty from time to time or at any time before the completion of the works to take possession and use any part of the completed works and in such case the contractor shall completely finish the said uncompleted part or parts of the works as and when the engineer shall direct whether before or after the respective prescribed time or extended time (if any) for the completion of the works and if required by the engineer while the owner is in possession of the said part or parts, of the site or works.

C.10.5 If due to reason of any default on the part of Contractor, a taking over certificate has not been issued in respect of any portion of the works, within one month after the time for completion or extended time as the case may be, the Owner/BHEL shall be at liberty to use the works or any portion thereof in respect of which a taking over certificate has not been issued, provided that the works or the portion so used as aforesaid shall be reasonably capable of being used and that the Contractor shall be afforded the earliest opportunity of taking such steps as may be necessary to permit the issue of the taking over certificate.

C.11.0 **ADDITIONAL EXPENDITURE:**

In case any additional expenditure is incurred in the works arising out of the faulty execution of the works by the contractor, such additional expenditure shall be borne by the contractor.

C.12.0 **SPLITTING THE WORK:**

BHEL reserves the right to split the work and award any part of the work to any agency without assigning any reason whatsoever.

C.13.0 **SUPPLY OF MATERIAL:**

C.13.1 The Contractor shall in no case be entitled to any compensation or damage on account of any delay in supply or non- supply there of for all or any such materials and stores but the contractor shall be entitled to suitable extension of time as may be determined by the Engineer whose decision shall be final and binding.

C.13.2 The contractor shall satisfy himself of the quantity and quality of the materials at the time of taking delivery from the BHEL/Owner. No claim whatsoever will be entertained by the BHEL/Owner on account of quality or quantity after the materials are taken by the contractor from the BHEL/Owner.

C.14.0 **ELECTRICITY AND WATER:**

C.14.1 Electricity for construction work shall be provided at one point on chargeable basis at the rate prevailing at the time of drawal of power, unless specified otherwise. The contractor shall have to make their own arrangements, at their cost, for distribution to various locations for their works including proper switch/fuse units, distribution boards, cables, poles etc. to ensure safety of men and equipment. Where required the contractor shall employ diesel operative equipment in addition to electric operated ones to ensure timely completion of work.

In case BHEL is unable to provide Electricity on chargeable basis then the contractor has to arrange same at his end.

C.14.2 The contractor shall indicate in his offer the power load required by him along with the load details for which power is required.

C.14.3 The owner shall not be responsible for any inconvenience caused due to any failure of lighting and power supply and no compensation for delay in works can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.

C.14.4 The contractor should ensure that the work in critical areas is not held up in the event of lighting and power breakdown and for the same he should have some standby arrangement at his cost. 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 after restoration of electric supply so that over all progress of work is not affected. The contractor shall make proper arrangement of illumination at work place while working in late hours or in darkness.

C.14.5 Unless stated otherwise in the scope of works, the contractor shall make his own adequate arrangement for procuring clear water to be used in the works.

C.15.0 **INSURANCE :**

C.15.1 Contractor shall take insurance cover(s) to cover his Tools and Plants, Assets, workmen compensation and third party liability. The contractor shall make available the original insurance cover(s) to the Engineer for necessary verification before commencement of work.

C.16.0 **ESCALATION/PRICE VARIATION :**

C.16.1 Under this contract, **No escalation/ Price variation** is allowed. The quoted prices are FIRM till complete commissioning and handing over of the Project to Customer/Owner.

C.17.0 **OVERRUN CHARGES:**

C.17.1 Above clause No.C-17.0 stands deleted. Please refer Annexure to conditions of contract for ETC works.

C.18.0 **CONSTRUCTION SCHEDULE:**

C.18.1 While submitting the offer the contractor shall furnish Bar Chart detailing out all major activities, as to how he proposes to complete the work maintaining the completion schedule as given in Notice Inviting Tender. If the contractor fails to achieve any milestone indicated in the Bar Chart/completion schedule mentioned elsewhere, the contractor shall be levied penalty as per clause C.5.0.

C.19.0 **HEAVY MATERIAL HANDLING EQUIPMENT:**

The contractor must clearly indicate the details of all Heavy Materials Handling Equipment owned by him in Annexure-C of Section-A, General Instructions to the Tenderer. The boom length, capacity of handling load and other relevant details must also be given.

C.20.0 **CALIBRATED TEST INSTRUMENTS:**

Contractor is required to bring all the required testing equipments and instruments for conducting pre-commissioning test. All instruments should be calibrated as this is an ISO System requirement and the contractor should furnish test certificate for calibration. Also, please see clause E.4.2 and E.6.3 of Section-E for more details.

C.21.0 Contractor should maintain moisture free store.

C.21.1 Illumination system in & around store should be maintained by the contractor.

C.21.2 All the material stored in the open yard shall be covered by tarpaulins to be arranged by the contractor.

C.22.0 **PROTECTION OF WORK :**

C.22.1 Contractor shall effectively protect his work, equipment, material from theft, damage or tempering at his own expenses till the work is finally taken over by the BHEL/Owner.

C.22.2 Finished work where required, shall be suitably covered to keep it clean and free from defacement or damage.

C.22.3 Necessary fire protection arrangement is to be made by the contractor for store and place of work.

C.23.0 **SAFETY MEASURES :**

C.23.1 All safety rules and codes as applicable to work shall be followed without exception.

C.23.2 All safety appliances and protective devices including safety belt, hand gloves, aprons, helmets, shield goggles etc. shall be provided by the contractor to his personnel. Also, the Contractor must follow BHEL Quality system to ensure safety in all activities of site work.

C.24.0 **QUALITY RECORDS (FQPs, MATERIAL MANAGEMENT ETC.)**

C.24.1 Contractor should follow field quality plan furnished by BHEL to ensure quality in all activities of work performed at site.

C.24.2 The contractor shall have to maintain records pertaining to Material Verification on receipt at site as well as Daily Receipt Register, Stock Register as per the various quality systems of BHEL.

C.25.0 The contractor shall remove all scaffolding, ladders, temporary structures etc. erected by him during erection in order to leave place neat and clean to the satisfaction of the owner.

C.26.0 All packing/items are to be checked immediately on receipt at site. Any shortages, damages are to be reported to BHEL within a week's time in writing.

C.26.1 All parts shall be thoroughly cleaned, all rust removed and surface polished as required before erection of any equipment.

C.26.2 Cleaned and polished parts shall be coated with anti-corrosive paints wherever necessary.

C.27.0 After completion of work, reconciliation is to be done for all the material issued to the contractor. Balance materials are to be returned to BHEL/Owner.

C.28.0 **WORKING HOURS:**

If in the opinion of BHEL, the progress of the erection work by the contractor at any stage needs expediting so as to ensure completion of work within stipulated time, BHEL shall have the right to instruct the Contractor to increase the Contractor's manpower and working hours and the contractor shall comply with such instructions without any Extra Charges.

C.29.0 **DIVISION OF WORK:**

Prices are to be quoted for schedule of Equipment - E.10.0 of Section-E. Work can be split-up and awarded to more than one contractor as per requirement of BHEL/Owner for timely completion of Project.

C.30.0 **INCOME TAX / SALES TAX / WORKS TAX/VAT**

~~The prices to be quoted by bidder should be EXCLUSIVE of service tax and~~

Please refer " Annexure to conditions of contract for ETC Work" attached with the tender documents.

Above clause No.C-30.0 stands deleted.Please refer Annexure to conditions of contract for ETC works.

C.31.0 DISCREPANCIES AND ADJUSTMENT OF ERRORS

C.31.1 The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawings & figures dimensions in preference to scale & special conditions in preference to general conditions.

C.31.2 In case of discrepancies between schedule of quantities, the specification and/or the drawings the following order of preference shall be observed.

a) Description in Schedule of Quantities.
b) Special Conditions.
c) Drawings
d) Technical Specifications.
e) General Conditions of Contract.

C.31.3 If there are varying or conflicting provisions made in any one document forming part of the contract, the Engineer shall be deciding authority with regard to the document.

C.31.4 Any error in the description, quantity in schedule of quantities or any omission there from shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to the drawings and specifications or from any of his obligations under the contract.

C.31.5 If on check there are found to be differences between the rates given by the contractor in words and figures or in the amount worked out by him in the schedule of quantities and general summary, the same shall be adjusted in accordance with the following rules. :

a) In the event of discrepancies between description in words and figures quoted by tenderer, the description in words shall prevail.

b) In event of an error occurring in the amount column of schedule of quantities as a result of wrong extension of the unit rate and the quantity, the unit rate shall be regarded as firm and extension shall be amended on the basis of the rates.

c) All errors in totalling in the amount column and in carrying forward totals shall be corrected.

d) The totals of sections of bill of quantities amended shall be carried over to the general summary and the tendered sum amended accordingly. The tendered sum so altered shall, for the purpose of tender be substituted for the sum originally tendered and considered for acceptance instead of the original sum quoted by the tenderer. Any rounding of quantities or in sections of bill of quantities or in general summary, by the tenderer, shall be ignored.

C.31.6 If neither drawings nor specifications contain any mention of minor details of construction which in the opinion of the Engineer, whose decision shall be final and conclusive, are reasonable and obviously and fairly intended for satisfactory completion of work, such details shall be provided by the contractor without any extra cost, as if they were specially mentioned and shall be deemed to be included in the contract.

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SECTION-D

ERECTION CONDITIONS OF CONTRACT

SECTION - D

ERECTION CONDITIONS OF CONTRACT

D.1.0 **GENERAL:**

D.1.1 The following shall supplement the conditions already contained in the other parts of these specifications and documents and shall govern that portion of the work of this contract to be performed at site.

D.1.2 The contractor upon signing of the contract shall, in addition to a Project Coordinator, nominate another responsible officer as his representative at site suitably designated for the purposes of overall responsibility and co-ordination of the works to be performed at site. Such person shall function from the site office of the contractor during the pendency of the contract.

D.2.0 **REGULATION OF LOCAL AUTHORITIES AND STATUTES:**

D.2.1 The contractor shall comply with all the rules and regulations of local authorities during the performances of his field activities. He shall also comply with the **Minimum Wages Act, 1948 and the Payment of Wages Act** (Both of Government of India) and the rules made there under in respect of any employee or workman employed or engaged by him or his sub-contractor.

The Contractor should note that all instructions of Engineer shall be binding for example display of Minimum Wages paid to the workmen, construction of toilets etc. in the vicinity of working area from health and sanitation standpoint etc.

D.2.2 All registration and statutory inspection fees, if any in respect of his work pursuant to this contract shall be to the account of the contractor. However any registration, statutory inspection fees lawfully payable under the provision of the statutory laws and it's amendments from time to time during erection in respect of the plant equipment ultimately to be owned by the Owner/BHEL shall be to the account of the Owner/BHEL. Should any such inspection or registration need to be rearranged due to the fault of the Contractor or his sub-contractor, the additional fees for such inspection and/or registration shall be borne by the contractor.

D.3.0 **OWNER'S LIEN ON EQUIPMENT :**

The owner/ BHEL shall have lien on all equipments including those of the contractor brought to the site for the purposes of erection, testing and commissioning of the plants. The Owner/ BHEL shall continue to hold the lien on all such equipments through out the period of contract. No material brought to the site shall be removed from the site by the contractor and/ or his Sub-contractors without the prior written permission of BHEL.

D.4.0 **RE-WORKS ETC. :**

In case Owner/BHEL/consultant during inspection at site rejects an item already agreed and the same is agreed to by BHEL and any re-execution of works of other contractors and/or his agencies, which might have got damaged or affected by the replacements will have to be attended to by the contractor free of cost.

D.5.0 ACCESS TO SITE AND WORKS ON SITE :

D.5.1 Suitable access to and possession of the site shall be provided to the contractor by Owner/ BHEL in reasonable time.

D.5.2 The works so far as it is carried out on the owner's premises shall be carried out at such time as the owner/BHEL may approve and the Owner/ BHEL shall give the contractor reasonable help/ facility for carrying out the works.

D.5.3 In the executions of the works, no persons other than the Contractor or his duly appointed representative, Sub- contractor and workmen shall be allowed to do work on the site except by the special permission in writing by BHEL.

D.6.0 **CONTRACTOR'S SITE OFFICE ESTABLISHMENT:**

The contractor shall establish site office at the site and keep posted an authorised representative for the purpose of contract. Any written order or instruction of BHEL or his duly authorised representative shall be communicated to the contractor at the site office and the same shall deemed to have been communicated to the contractor at his legal address.

D.7.0 **CO-OPERATION WITH OTHER CONTRACTORS:**

D.7.1 The contractor shall co-operate with all other contractors or tradesmen of the owner/BHEL who may be performing other works on behalf of them and the workmen who may be employed by the owner/BHEL doing work in the vicinity of the works under the contract. The contractor shall also arrange to perform his work as to minimise to the maximum extent possible interference with the work of other contractors and his workmen. Any injury or damage that may be sustained to the employees of the other contractors, BHEL and the owner due to the contractor's work shall promptly be made good at contractors own expenses. The owner/ BHEL shall determine the resolution of any difference or conflict that may arise between the contractor and other contractor's or between the contractor and workmen of the owner and BHEL in regard to their work. If the works of the contractor is delayed because of any acts or omission of another contractor, the contractor shall have no claim against the owner/ BHEL on that account other than an extension of time for completing his works.

D.7.2 BHEL shall be notified promptly by the contractor of any defects in the other contractor's works that could affect to the contractor's works. The owner/BHEL shall determine the corrective measures if any, required to rectify this situation which shall be binding on the contractor.

D.8.0 **DISCIPLINE OF WORKMEN:**

D.8.1 The contractor shall adhere to the disciplinary procedure set by the owner in respect of his employees & workman at site. The owner/BHEL shall be at liberty to object to the presence of any representatives or employee of the contractor at the site, if in the opinion of the owner/ BHEL such employee has misconducted himself or be incompetent or negligent or otherwise undesirable and then the contractor shall remove such a person objected to and provide in his place a competent replacement.

D.9.0 **CONTRACTOR'S FIELD OPERATION:**

D.9.1 The contractor shall keep informed in advance regarding his field activity plans & schedule for carrying out such part of the works. Any review of such plan or schedule or method of work by the BHEL shall not relieve the contractor of any of his responsibilities towards the field activities and its schedule. Such reviews shall also not be considered as an assumption of any risk or liability by the owner/BHEL or consultant or any of his representatives and no claim of the contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method or work reviewed. The contractor shall be solely responsible for the safety adequacy and efficiency of plant and equipments and his erection methods.

D.9.2 The contractor shall be completely responsible for the conditions of the work-site including the safety of all persons employed by him or his sub-contractor and all the properties under his custody during the performance of the work. This requirements shall apply continuously till the completion of contract and shall not be limited to normal working hours.

D.10.0 **PHOTOGRAPH AND PROGRESS REPORT:**

D.10.1 The Contractor shall furnish to BHEL photographs of the progress of work / work done at site. Photographs shall be taken as & when indicated by BHEL representative. Photograph shall be adequate in size & number to indicate various stages of erection. Each photograph shall contain the date, the name of the Contractor and the title of the Photograph. The cost of photographs is to be born by the Contractor.

D.10.2 The above Photographs along with the soft copy (on floppy/CD) shall accompany the monthly progress report detailing out the progress achieved on all erection activities as compared to the schedules. The report shall also indicate the reasons for the variance between the scheduled and actual progress and action proposed for corrective measures wherever necessary.

D.11.0 **MANPOWER REPORT:**

D.11.1 The Contractor shall submit to BHEL from the first working day of every month, a Manpower report of the previous month detailing the number of persons scheduled to have been employed and actually employed skill-wise and the areas of employment of such labour.

D.12.0 **PROTECTION OF WORK:**

The Contractor shall have total responsibility for protecting his works till it is finally taken over by the owner. No claim will be entertained by the BHEL for damage or loss to the Contractor's works & the contractor shall be responsible for the complete restoration of the damaged work to its original condition to comply with the specification & drawings. Should any such damage to the Contractor's works occur because of other party not under him directly, & if disagreement or

conflict or dispute develops between the contractor & the other party or parties concerns works the same will be resolved as per the provisions of the clause D.7.0 above entitled cooperation with other contractors. The contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such dispute. The contractor shall proceed to repair the work immediately & no cause thereof will be assigned pending resolution of such dispute.

D.13.0 **EMPLOYMENT OF LABOUR:**

D.13.1 The Contractor will be expected to employ on the work only his regular skilled employees with experience of his particular work. No female labour shall be employed after darkness. No person below the age of eighteen years shall be employed.

D.13.2 All travelling expenses including provision of all necessary transport to and fro for Site, lodging allowance and other payments to be Contractor's employees shall be the sole responsibility of the contractor.

D.13.3 The hours of work on the Site shall be decided by the owner/BHEL and the Contractor shall adhere to it. Working hours will normally be eight (8) hours per day Monday through Saturday or depending upon the situation/ requirement.

D.13.4 Contractor's employees shall wear identification badges while on the work at site.

D.13.5 In the case of owner/BHEL become liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen Compensation Act, Contractor Labour Regulation Abolition Act or any other law due to act or omission of the Contractor, BHEL may make such payment and recover the same from the Contractor's bills or from any amount which is already under process of payment to the Contractor.

D.14.0 **FACILITIES TO BE PROVIDED BY OWNER:**

D.14.1 Space: The Contractor shall advice BHEL within Fifteen (15) days from the date of acceptance of the Letter of Intent about his exact requirement of space for his office, storage area. The above requirements shall be reviewed by the Owner/BHEL & space will be allotted to the Contractor for construction of his temporary structures like office and storage sheds.

D.14.2 Construction water and power (Electricity) (Refer Clause C.14.0).

D.15.0 **FACILITIES TO BE PROVIDED BY THE CONTRACTOR:**

D.15.1 **CONSTRUCTION EQUIPMENTS, TOOLS, TACKLES AND SCAFFOLDINGS:**

The Contractor shall provide all the construction equipments, tools, tackles and scaffoldings required for pre-assembly, erection, testing and commissioning of the equipments covered under the contract. He shall submit a list of all such materials to the BHEL before the commencement of work at Site. These tools and tackles shall not be removed from site without the written permission of the owner/BHEL.

D.15.2 **COMMUNICATION:**

The Contractor will make his own arrangement for all his communication needs such as telephone, fax etc., at his site office and his residential accommodation.

D.15.3 **FIRST AID:**

The Contractor shall provide necessary first aid facilities for all the employees, representatives and workmen working at the Site. Enough number of contractor's personnel shall be trained in administering first aid.

D.15.4 **CLEANLINESS:**

D.15.4.1 The Contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris, etc. during the period of contract. The Contractor shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by the owner/BHEL. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of the flame resistant, oil proof shield shall be provided to protect the floor from such damage.

D.15.4.2 Similarly the labour colony, the office & the residential areas of the Contractor's employees and workmen shall be kept clean & neat to the entire satisfaction of the Owner/BHEL. Proper sanitation arrangements shall be provided by the contractor in the workmen areas, office and residential areas of the contractor.

D.16.0 **LINES AND GRADES:**

All the works shall be performed to the lines, grades and elevations indicated on the drawings. The Contractor shall be responsible to locate the layout of the works. Basic horizontal and vertical control points as required will be established & marked by the Owner/BHEL at Site at suitable points.

These points shall be used as datum for the works under the contractor. The contractor shall inform the Engineer well in advance of the time and places at which he wishes to do work in the area allotted to him, so that suitable datum points may be established and checked by Owner/BHEL to enable the contractor to proceed with his works. Any work done without being properly located may be removed and/or dismantled by the Owner/BHEL at Contractor's expenses.

D.17.0 **FIRE PROTECTION:**

D.17.1 The work procedures that are to be used during erection shall be those which minimise fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once each day. Fuels, oils and volatile or flammable materials shall be stored away from the construction and equipments and material storage and areas in safe containers. Untreated canvas paper, plastic or other flammable materials shall not at all be used at site for any other purpose unless otherwise specified, if any such materials are received with the equipment at the Site, the same shall be removed and replaced with acceptable materials before moving in to the construction area or storage.

D.17.2 Similarly corrugated paper fabricated cartons etc., will not be permitted in the construction area either for storage or for handling of materials. All such materials used shall be of water proof and flame resistance type. All other materials such as working drawings, plants etc. which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.

D.17.3 All the contractors supervisory personnel and sufficient number of workers shall be trained for fire-fighting and assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.

D.17.4 The contractor shall provide enough fire protection equipment of the types and number for the ware-houses, office, temporary structures, labour colony area etc., access to such fire protection equipment shall be easy and kept all times.

D.18.0 **SECURITY:**

The Contractor shall have total responsibility for all equipments & materials in his custody stored, loose, semi assembled and/or erected by him at site. The contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipments and works from theft, fire, pilferage & other damages and losses. All materials belonging to the Contractors shall enter and leave the project site only with the written permission of the Owner/BHEL in the prescribed manner.

D.19.0 **CONTRACTOR'S AREA LIMITS:**

The Owner will make out the boundary limits of access roads, parking spaces, storage and construction areas for the contractor and the contractor shall not trespass the areas not so marked out for him. The contractor shall be responsible to ensure that none of his personnel move out the areas marked out for his operations. In case of such a need for the contractor's personnel to work in the areas not marked out for him, the same shall done only with written permission of the Owner/BHEL.

D.20.0 **CONTRACTOR'S COOPERATION WITH THE OWNER/ BHEL:**

In cases where the performances of the erection work by the contractor affects the operation of the system facilities of the Owner/BHEL such erection work of the contractor shall be scheduled to be performed only in the manner stipulated by the Owner/BHEL and the same shall be acceptable at all times to the contractor. The Owner/BHEL may impose such restriction on the facilities provided to the contractor such as electricity, water etc., as he may think fit in the interest of the Owner/BHEL and the contractor shall strictly adhere to such restrictions and cooperate with the Owner/BHEL. It will be responsibility of the contractor to provide all necessary temporary instrumentation and other measuring devices required during start up and operation of the equipment system which are erected by him. The contractor shall also be responsible for flushing and initial filling of all the oil and lubricant required for the equipment furnished and erected by him, so as to make such equipments ready for operation. The contractor shall be responsible for supplying such flushing oil & other lubricants unless otherwise specified elsewhere in these documents and specifications.

D.21.0 **PRE-COMMISSIONING TRIALS AND INITIAL OPERATIONS:**

The pre-commissioning trials and initial operations of the equipments furnished and erected by the contractor shall be the responsibility of the contractor as detailed in relevant clauses. The contractor shall provide in addition, test instruments calibrating devices etc. and the labour required for the successful performance of these trials. If it is anticipated that the above test may prolong for a long time, the Contractor's workmen required for the above test shall always be present at site during such trials.

D.22.0 **MATERIAL HANDLING AND STORAGE:**

D.22.1 All the equipments furnished under this contract arriving at site shall be promptly received, unloaded, transported and stored in the storage spaces by the contractor.

D.22.2 Contractor shall be responsible for examining all the shipments immediately on receipt at site and notify BHEL immediately if any damage, shortage, discrepancy. Filling of material verification reports on receipt of materials shall be carried out by the Contractor as per the instructions of Engineer. For any shortages or damages in transit, handling and/or in storage and erection of the equipments at site shall be intimated to BHEL/ equipment supplier promptly to enable them lodge claim with the underwriters. Any financial and/or time loss happened due to contractor's negligence in this regard shall be to the account of the contractor. Any demmurrage, wharfage and any other charges claimed by the Transporter or Railways due to any reason attributable to the contractor such as delay in taking delivery in time shall also be to the account of the contractor.

D.22.3 The Contractor shall maintain an accurate and exhaustive record detailing out the list of all equipments received and keep such record open for the inspection of the Owner/BHEL at any time.

BHEL is an ISO Company and the contractor shall extend all help in maintaining records of receipts, issue and stock in line with Material Management System issued by BHEL. Also, he shall assist in periodic inspection of equipment/materials in stores as per this system.

The Contactor shall carryout all field activities related with ETC work as per Field Quality Plans (FQPs) provided by Engineer to ensure Quality of work at site as well as meet the contractual obligation to BHEL/Owner.

D.22.4 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and/or handling of the equipments without the specified written permission of BHEL. The equipment stores shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.

D.22.5 All electrical panels, control gears, motors and such other devices shall be properly dried by heating before they are installed and energised. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotation parts if any, in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.

D.22.6 All the electrical equipment, such as motors, transformers etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and record for such measured insulation values maintained by the contractor. Such records shall be open for inspection by the Owner/BHEL.

D.22.7 The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before the equipments are installed.

D.22.8 The consumable and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.

D.22.9 All the materials stored in the open or dusty location must be covered with suitable weather proof & flame proof covering materials wherever applicable.

D.22.10 If the materials belonging to the contractor are stored in areas other than these earmarked for him, the Owner/BHEL will have the right to get it removed to the area earmarked for the contractor at the contractor's cost.

D.22.12 **STORAGE INSTRUCTION FOR GAS FILLED EQUIPMENTS:**

D.22.12.1 All transformers despatched to site are fitted with Nitrogen cylinder in the tank to maintain positive pressure. It will be the responsibility of the contractor to maintain the pressure and replace the empty Nitrogen cylinder with Nitrogen filled cylinder of required purity at his own cost whenever such cylinders are become empty. Contractor should also maintain the periodic record of the pressure of Nitrogen in the transformer in a register for this purpose.

D.22.12.2 For all other gas filled equipments, like CTs, VTs, CVTs etc. the contractor should also maintain the gas pressure & if it falls below the required value, contractor should refill the leaked gas of required purity at his own cost.

D.23.0 **CONSTRUCTION AND ARRANGEMENTS:**

D.23.1 The field activities of the contractors working at site, will be coordinated by BHEL and BHEL decision shall be final in resolving any dispute or conflicts between the contractor and other contractor's and tradesmen of the BHEL regarding scheduling and coordination of work. Such decisions shall not be cause for extra compensation for time to the contractor.

D.23.2 The Owner/Consultant shall hold weekly meetings of all the contractors working at the site at a time and a place so designated. The contractor along with BHEL shall attend such meetings and take notes of discussions during the meeting and the decisions of the Owner/BHEL/Consultant shall be strictly adhered to in performing his works. In addition to the above weekly meetings, the Owner/Consultant/BHEL may call for other meetings either with individual contractors or with selected number of contractors and in such a case the contractor, if called will also attend such meetings with BHEL.

D.23.3 Time is the essence of the contract & the contractor shall be responsible for performance of his work in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule, he shall take necessary action to make good for such delay by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the BHEL satisfying them that his action will compensate for the delay. The contractor shall not be allowed any extra compensation for such action.

D.23.4 BHEL shall however not be responsible for provision of additional labour and/or materials or supply or any other service to the contractor except for the coordination work between various contractors as set out earlier.

D.24.0 **FIELD QUALITY PLANS AND RECORDS:**

The contractor shall maintain at his Site Office upto date copies of all drawings, specifications, FQPs and other contract documents and any other supplementary data complete with all the latest information thereto. The contractor shall also maintain in addition the continuous record of all changes to the above contract documents, drawings, specifications, supplementary data etc. effected at the field and on completion of his total assignment under the contract, shall incorporate all such changes on the drawings and other engineering data to indicate as installed/build conditions of the equipments furnished and erected under the contract.

Such "AS BUILT DRAWINGS" and "ENGINEERING DATA" shall be submitted to BHEL in required number of copies.

D.25.0 **CONTRACTOR'S MATERIALS BROUGHT ON TO SITE:**

D.25.1 The contractor shall bring to site all equipments, components, parts, materials, including construction equipment, tools & tackles for the purpose of the works under intimation to the owner/BHEL. All such goods shall, from the time of there being brought to site but may be used for the purpose of the works only and shall not on any account be removed or taken away by the contractor without the written permission of the BHEL.

D.25.2 After the completion of the works the contractor shall remove from the site under the direction of the BHEL the material such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission of BHEL. If the contractor fails to remove such materials within fifteen (15) days of issue of a notice by the BHEL to do so, then BHEL shall have the liberty to dispose/remove such materials and expanses incurred by BHEL in this regard will be recovered from the Contractor.

D.26.0 **PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY:**

D.26.1 The contractor shall be responsible for any damage resulting from his operation. He shall also be responsible for protection of all persons including members of public and employees of the Owner/BHEL and the employees of other contractors and subcontractors building, other plants and equipments and utilities either above or below the ground.

D.26.2 The contractor will ensure provisions of necessary safety equipments such as barriers, sign-boards, warning lights and alarm etc. to provide adequate protection to persons and property. The contractor shall be responsible to give reasonable notice to Owner/BHEL of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his work shall make all necessary arrangements with such owners related to removal and or replacement or protection of such property and utilities.

D.27.0 **PAINTING:**

All exposed metal parts of the equipment including pipings, structures, railings etc. wherever applicable shall be first painted with at least one coat of suitable primer after thoroughly cleaning all such parts off dirt and rust scales, greases, oil and other foreign materials by wire brushing, scraping or/and blasting and the same being inspected and approved by the Engineer for painting. After wards the above parts shall be finished with two coats of enamel paint. The quality of the finish paint shall be as per the standards of ISI equivalent and to be of the colour as approved by the Owner/BHEL.

D.28.0 **PROTECTION OF MONUMENTS AND REFERENCE POINTS:**

The contractor shall ensure that at points such as relic, antiquity, coins, fossils etc. which he may come across during the course of performance of his works either during excavation or elsewhere are properly protected & handed over to the owner under intimation to BHEL. Similarly the contractor shall ensure that the bench marks reference points etc. which are marked out either with the help of owner or by BHEL shall not be disturbed in any way during the performance of his works. If any work is to be performed which may disturb such references, the same shall be only after these are transferred to other suitable locations under the direction of BHEL. The contractor shall provide all necessary materials and assistant for such relocation of reference points etc.

D.29.0 **WORK AND SAFETY REGULATIONS:**

D.29.1 The contractor shall ensure the safety of all the workmen, materials, and equipment either belonging to him or to others working at site.

D.29.2 The contractor will notify the BHEL office of his intention to bring on to site any equipment or any container with liquid or gases, fuel or other substances which may create hazards. BHEL shall have the right to prescribe the conditions 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. BHEL shall have strictly the right to inspect any construction plant and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition shall be entertained by BHEL.

D.29.3 Where it is necessary to provide and/or store petroleum products or petroleum mixtures & explosive, 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. Explosively Act,1948 and petroleum and carbide of calcium manual published by the Chief Inspector Of Explosive of India. All such storage shall have prior approval of BHEL in case any approval are necessary from the Chief Inspector of Explosive of any statutory authorities, the contractor shall be responsible for obtaining the same.

D.29.4 The contractor shall be responsible for the safe storage of his & his sub-contractor's radio-active source if any.

D.30.0 **ELECTRICAL SAFETY REGULATIONS:**

D.30.1 In no circumstances will the contractor interfere with fuses and Electrical Equipment belonging to BHEL/Owner or to the other contractors.

D.30.2 Before the contractor connects any electrical appliances to any plug or sockets belonging to the other contractor or Owner, he shall:

(a) Satisfy the Owner/BHEL that the appliances are in good working conditions.
(b) Inform the Owner/BHEL of the maximum current, relating, voltage etc. of the appliances.
(c) Obtain permission of the Owner detailing the sockets to which the appliances may be connected.

D.30.3 The BHEL will not grant permission to the contractor until he satisfies that:

(a) The appliance is in good conditions and fitted with suitable plug.
(b) The appliance is fitted with a suitable cable having proper earthing provisions.

D.30.4 No cable in use will be disturbed by the contractor without prior permission. No weight of any description will be imposed on any such cable and no ladder or similar equipment will rest against or attached to it.

D.30.5 No work shall be carried out on any live equipment. The equipment must be made safe by the BHEL/Owner and a permit to work issued before any work is carried out.

D.30.6 The contractor shall employ the necessary number of qualified full time electrician to maintain his temporary electrical installation.

D.31.0 **CONSUMABLES:**

The contractor shall make arrangements for an adequate inventory at site of necessary consumable prior to erection so that the requirements of the same will not come in the way of timely completion of the works under the contract.

D.32.0 **MILD STEEL AND ALUMINIUM WELDING & OTHER SPECIAL PROCESSES :**

D.32.1 Only an approved and qualified welder shall be employed by the contractor. The welder will be subjected to pre-qualification test by Owner/BHEL.

D.32.2 The Contractor shall ensure that personnel employed for doing other special processes like tube/pipe bending etc. are having proper experience and are qualified for doing such work.

D.32.3 Erection of Aluminium tubular bus bar shall include cutting, bending, aluminium welding with sleeves (sleeves supplied by BHEL), Radiographic testing and D.P test of 100% welded joints, fixing corona end bells etc to complete.

D.32.4 For MS welding, red lead paint shall be applied followed by aluminium paint and bitumen after welding. For GS welding , two coats of cold galvanising anti-corrosive paint shall be applied after welding. In case any special process is indicated in customer's specification, then the same shall be applicable.

D.32.5 10% welded joints in earthing shall be tested for Dye penetration test.

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SECTION – E

SCOPE OF WORK AND COMPLETION SCHEDULE

SECTION - E

SCOPE OF WORK AND COMPLETION SCHEDULE

E.1.0 **SCOPE OF WORK :**

The scope of work of the successful tenderer shall comprise but not limited to the following. The Tenderer shall read this scope of work in conjunction with all terms and conditions (Section -A,B,C & D) contained else where in this document. The quoted rates for various equipments/activities are deemed to include all the below mentioned activities and nothing extra is payable on account of these.

E.1.1 **For Contractor supplied materials:** It shall be prime responsibility of contractor to ensure safe storage of material supplied by him. The contractor may construct open/ covered store to ensure proper storage of the materials as per site requirement. Contractor will be permitted to dismantle and take back the stores after completion of the work. No additional payment shall be made/deducted on account of stores constructed by contractor for storing these materials.

For BHEL supplied materials: Contractor shall construct open/ covered store only if the same is mentioned in the Bill of Quantities.

If due to any reason the material can not be unloaded in designated store/open yard and it is unloaded at some nearby place on instructions of site Engineer then this material has to be shifted by subcontractor to designated store/open yard when it is ready without any additional claim. Any multiple handling of material within project premises is not payable by BHEL

Some items may get delivered at stores of other BHEL unit on account of convenience of despatch within the plant area. These material will be collected/shifted by subcontractor to switchyard store at no extra cost.

E.1.2.1 Inspection / verification of equipment / materials received for any shortage / damage after opening the packing cases and intimating the same to BHEL/ Owner and underwriters within the time period specified by BHEL and to strictly follow the procedures specified. Storage of equipment indoor / open stores in line with the instructions of the manufacturer / BHEL.

Conservation / maintenance / upkeep of the equipment in the store.

Temporary lighting in stores & construction area wherever required.

Safety / Security of equipments / materials.

E.1.2.2 **Watch and ward of Erected Equipment/Material** - Soon as the erection of switchyards are taken up, the watch and ward for the erected items will also be arranged by the subcontractor till the switchyards are taken by BHEL/customer

E.1.3 Erection, levelling and fixing of GI Structures of towers, beams including all the equipment support structures on their respective foundations in line with drawings to be furnished by BHEL. Final adjustment of foundation levels by chipping and dressing, checking location, elevation, etc., and checking position of foundations / anchor bolts and grouting/under pinning of anchor bolts and base plates wherever necessary for certain aux. equipment and accessories of main equipment. Materials such as M.S. packing shims of required thickness for levelling and alignment and civil material for final grouting with 1:1 cement mortar with approved make anti-shrinkage compound and finishing shall be arranged by contractor. *The grouting/underpinning of all tower and equipment foundation bolts as per specifications is in the scope of Contractor ie Bidder.*

Fixing and assembly including minor modification, where required, of all cable trench materials like cable tray racks, cable trays, coupler plates, 'T' and 'L' bends etc in line with drawings to be furnished by BHEL. The work shall also covers laying of all cables including glanding and termination for all the equipments covered under BOQ . At various crossing and wherever necessary the cables to pass through pipes laid underground in line with drawing to be furnished by BHEL. Pipes will be supplied by BHEL for cabling from trench to equipment and laying of the same including excavation and backfilling and making and finishing of holes in trench walls will be carried out by the contractor.

E.1.4 Transportation of equipment/material from stores to erection site, erection of equipment materials in line with the drawings/instructions to be furnished by BHEL including filtration of oil wherever required, testing and commissioning and handing over to owner/customer.

E.1.5 Earthing (if called for in BOQ) : laying of earth mat and risers including excavation, bending, cutting, welding, cleaning and painting of joints, backfilling and earth compaction etc. as per BHEL drawings/specifications.

Cutting, pointing and driving of MS rod electrode, installation of pipe electrode and construction of chambers as per drawings.

Earth connections from risers to equipment, structures etc. through GI flat including bending, cutting, welding, cleaning and painting of welded joints as per BHEL's drawings/specifications.

Welding electrode should be of reputed make company ISI certified, and as per BHEL's specifications.

E.1.6 Providing for all consumables : It shall be noted by the tenderer that BHEL shall supply only the equipments/materials listed in schedule of equipments as free issue items. Any other sundry items required for completion of the job shall be procured by the contractor.

All Equipment fixing hardware shall be arranged by BHEL.

All cable glands shall be arranged by BHEL. However cable accessories like ferrules, lugs and markers, cable dressing and tying material etc. shall be in the scope of the contractor. The lugs shall be of reputed make company and as advised by BHEL site Incharge.

E.1.7 Maintenance of switchyard and associated equipment till handing over to the owner, any other activity necessary for completion of the job but not specifically mentioned in this specification.

E.1.8 Unloading, shifting, storing, verification, preservation during storage and handing over of spare items/maintenance equipment to Customer/Owner.

E.1.9 Reconciliation and shifting of all the balance excess material and scrap material to BHEL store or handover in customer store, as the case may be.

This excess material may include erection spares for various items of BOQ such as ACSR/AAC conductor, Al tube, Cable trench materials, Cables etc. Excess erection spare (except main equipment) supplied by purchaser upto 10% of the erected quantity shall be absorbed by the contractor & shall not be payable. Only as erected quantity of the various items of BOQ shall be payable as per the unit rates. However, any erection spares (excluding main equipment) handled in excess of 10% of the erected quantity shall be payable @ 10% of the unit rate (to account for only unloading, storage and watch & ward. However, any additional quantity of main equipment, handled but not erected, shall be paid @ 10% of the item rate.

E.2.0 **ERECTION, TESTING & COMMISSIONING REQUIREMENTS :**

E.2.1 All the switchyard equipment shall be erected, installed, tested and commissioned by the contractor to the satisfaction of BHEL/Owner adhering to the latest national standard and codes. Some of the Reference standards are given below which are normally applicable for Switchyard work. ETC activity of all other equipment to be done as per relevant standards.

a) IS : 10118-1982 Code of practice for selection, installation and maintenance of switchgear & control gear.

b) IS : 10028-1985 Code of practice for installation and maintenance of transformer.

c) IS : 732-1963 Code of practice for electrical wiring.

d) IS : 3043-1963 Code of practice for earthing.

e) IS : 2309-1989 Code of practice for the protection of building and allied structure against lightning.

f) IS : 1646-1982 Code of practice for fire safety of building (General) Electrical installations.

E.2.2 All electrical equipment and installations hall also conform to the latest Indian Electricity rules as regards safety, earthing and other essential provisions specified therein for insulation and operation of electric plants.

E.2.3 Earthing system, earth connections, testing of earthing system and connection, lightning protection system, electrical clearance and safety shall be strictly followed as per the national specifications which will be given to the successful bidder.

E.2.4 The schedule of equipment indicates the quantity of the equipment and these will be procured by BHEL and are to be erected by the contractor. The contractor has to erect, test all equipment for system commissioning and putting the same into operation. The trial run of individual equipment and final commissioning upto the handing over of the system to the customer of BHEL is the responsibility of the contractor.

Contractor will have to provide necessary support i.e.. suitable manpower, common tools, conventional testing instruments as per Annexure 'N' and other assistance as required by BHEL wherever expert services of any equipment are arranged by BHEL viz.. SF6 circuit breakers.

E.2.5 All equipments, material and accessories provided by the contractor shall conform to the requirements of the relevant Indian standard or International standard.

E.3.0 **METHOD OF WORKMANSHIP & QUALITY OF WORK**:

E.3.1 Workmanship will be in accordance with the best engineering practices to ensure satisfactory performances and service life.

E.3.2 All works shall be installed in a first class manner with technical skill in the trade involved to achieve quality of work of high standard. BHEL site supervisor's comments regarding quality of work should be taken care by the contractor.

E.3.3 The erection work shall be supervised by the competent supervisor holding supervisory license by the state or central Government or statutory licensing authority, as the case may be.

E.3.4 The installation shall be carried out in such a manner not to obstruct access to the other equipment installed or likely to be installed in the vicinity.

E.3.5 The complete erection shall be performed in accordance with the modern practices for similar substation equipments.

E.4.0 **EQUIPMENT, MATERIAL & SERVICES TO BE FURNISHED**

E.4.1 The contractor shall employ sufficient labours, skilled, unskilled, supervisory and administrative personnel for timely and effective execution of the contract.

E.4.2 The contractor shall arrange as per Annexure - Q erection tools and tackles, mobile crane, all transport vehicles, measuring & testing equipments necessary for timely and effectively execution of the contract. All measuring & testing instruments shall be pre-calibrated through a certifying agency before use. The certificate of calibration shall be submitted to Engineer for records. In case Contractor is unable to provide the calibrated measuring and test instruments then 'ENGINEER' according to his own wisdom / judgement can recommend a deduction of maximum limit up to 5% from the Contractor's bill. But this in no way relieves the Contractor from arranging the test & measuring instruments / equipment as required for completion of work without affecting the quality of work and meeting any Contractual obligation whatsoever.

E.4.3 All equipment including individual component fittings and accessories shall be properly stored at site so as to obviate any deterioration of electrical properties and mechanical damages.

E.4.4 All equipment shall be thoroughly cleaned of packing materials, scales rust, oil grease etc. prior to commencement of the installation work.

E.4.5 All equipment shall be checked physically for the completeness of all components and devices before taking up installation.

E.4.6 The contractor shall repair all minor defects in equipment, free of charge, if required prior to installation in consultation with equipment manufacturer of BHEL, so that manufacturer's guarantee is not affected in any way. In case of any major damage to the equipments, the same shall be rectified or replaced by the manufacturer's representatives with the approval of BHEL / Owner.

E.4.7 All equipments and accessories shall be installed strictly in accordance with the manufacturer's instructions / drawings. Equipment supplied in sections or in dismantled conditions shall be re-assembled at site with all associated accessories as per manufacturer's instructions.

E.4.8 If the services of BHEL engineers, suppliers, and / or of any equipment manufacturers are required by the contractor at any stage of work, it will made available on chargeable basis at existing rates prevailing at that time.

E.4.9 All consumable items required to carry out welding, brazing, soldering etc. for the erection and commissioning is included in the offer of contractor and shortages in hardware (due to careless / negligent handling at site) to be made up free of cost by the contractor. The quality of such replenishment shall be at par with main supply and to be acceptable to BHEL / Owner.

E.4.10 The successful contractor should note that after execution of work they will send marked up drawings "as erected" drawings to Project Manager at site for preparation of firm "AS BUILT" drawings. "AS BUILT" drawings will bear the signature of Project Manager of BHEL and Contractor's representative.

E.4.11 **OIL FILTRATION (IN CASE OF TRANSFORMERS COVERED IN BOQ):**

An extra high vacuum oil filtration plant with a minimum of thousand GPH capacity shall be employed by the contractor for oil filtration.

An empty oil tank of minimum of 12000 ltrs. capacity also shall be arranged by the contractor to prepare the oil before pushing it into the transformer.

E.5.0 **TESTING AND COMMISSIONING OF EQUIPMENT:**

E.5.1 The testing of all electrical equipment as well as the system as a whole shall be carried out to ensure that the equipment and its components are in satisfactory condition and will successfully perform its functional operation. All required tests shall be carried out by the contractor using his own instruments, testing equipments as well as qualified testing personnel. The tests on power transformer (if covered in BOQ) shall include winding resistance, tan-delta, PPM of moisture, acidity in oil. For SF-6 Circuit Breaker (if covered in BOQ) closing and tripping timing test shall also be carried out in addition to other routine tests.

E.5.2 At site all equipments shall be energised only after certification by the personnel performing the test that the equipment is ready for energising and with the concurrence of BHEL / Owner.

E.6.0 **PREPARATION FOR COMMISSIONING:**

E.6.1 After completion of the installation at site and for the preparation of system commissioning the contractor shall carry out checking and testing of all equipment and installation in accordance with the agreed standards, codes of practices of Indian Standards Institutions and specific instruction furnished by the particular equipments suppliers as well as the Owner.

E.6.2 Required checking to be made on all equipment and installation at site. This shall include but not limited to the following:

a) Physical inspection for removal of any foreign bodies external defects such as damaged insulators, loose connecting bolts, loose foundation bolts etc.

b) Check for grease insulating / lubricating oil leakage and its proper level / quantity.

c) Check for free movement of mechanism of the circuit breaker / isolator and rotating parts of other rotating machine and devices.

d) Check for tightness of all the cables, busbars as well as earth connection in the main earthing net work.

e) Check for clearance of live busbar and conductors from the metal enclosures.

f) Continuity check in case of power and control cables.

g) Checking of all mechanical and electrical interlocks, including tripping of breakers using manual operation of relay.

h) Checking of alarm and annunciation circuits by manual actuation of relevant relays like buchholz relay in case of transformer.

i) Check and calibrate devices requiring field adjustments / calibration like adjustment of relay setting etc.

j) Check proper connection to earth-mat work of all non current carrying parts of equipments & installation.

E.6.3 All the measuring and testing instruments will be arranged by the contractor and while submitting his quotation he shall furnish list of testing equipments which are readily available with him and also which can be procured by him from outside agency for the purpose of testing and commissioning.

E.7.0 **MINOR CIVIL WORK:**

E.7.1 Minor civil works including secondary grouting/under pinning of structure i.e. filling the gap between structure and foundation after levelling, alignment shall be done by the contractor at no extra cost. This shall also include necessary materials required for doing the work.

E.7.2 Minor civil works of final / secondary grouting of structures, towers equipment has to be arranged by the contractor and the rate for the same should be included in respective erection. Final / secondary grouting means filling the gap between the structure and foundation after levelling, alignment etc.

E.7.3 Minor civil work shall also include fixing of foundation bolts for radiator / cooling oil pump etc. Foundation bolts for such work shall however be arranged by BHEL.

E.8.0 **PRICE SCHEDULE**

E.8.1 The prices to be quoted FIRM and should be valid till the work is completed to the satisfaction of BHEL / Owner and handed over the system to Owner.

E.8.2 The quantities given in schedule of equipment are estimated ones and may vary up to ± 30% on the total value of the contract. Quantity of individual item may vary up-to any extent.

E.9.0 **START OF WORK AND COMPLETION SCHEDULE**

E.9.1 The contractor shall mobilise at site within one week from the date of LOI.

E.9.2 The entire work under this tender is required to be completed as indicated in Letter of Intent.

E.9.3 Detailed Bar Chart (activity schedule) should be submitted by the bidder in Annexure 'M' showing as to how the work is proposed to be executed in order to meet the completion schedule. This shall be filled in by the bidder after mobilisation at site and to be given to ENGINEER-IN-CHARGE at site.

E.9.4 The contractor is required to commence the work within the time as indicated in Letter of Intent failing which the contract is liable to be cancelled and EMD/SD shall be forfeited.

E.10.0 **SCHEDULE OF EQUIPMENT:**

The estimated quantities in the Schedule of Equipment given in Annexure-1 is tentative to give idea of work and to enable tenderer to quote unit rates. The actual quantities required to be erected shall be based on relevant drawings and latest revisions.

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SECTION- A

GENERAL INSTRUCTIONS TO TENDERERS

SECTION - A

GENERAL INSTRUCTIONS & INFORMATION FOR TENDERER

A.1.0: PROCEDURE FOR SUBMISSION OF TENDERS

Bidder **has** to submit offer directly through E-PROCURMENT MODE. Bidder may visit **https://eprocurebhel.co.in**

Procedure for Submission of Tenders through e tendering : The tender is also floated online through our E-Procurement Site https://eprocurebhel.co.in . The bidder may respond by submitting their offer online in our e-Procurement platform at https://eprocurebhel.co.in
Offers are invited in two-parts only.
Documents Comprising the e-Tender
The tender shall be submitted online EXCEPT EMD (which shall be submitted in physical form (as described in NIT cl. No.1) above as mentioned below:

a. Technical Bid (Un priced Tender)
All Technical details (eg. Eligibility Criteria requested (as mentioned below)) should be attached in e-tendering module, failing which the tender stands invalid & may be REJECTED. Bidders shall furnish the following information along with technical tender (preferably in pdf format):
i. Earnest money Deposit (EMD) furnished in accordance with NIT Clause 4.0
ii. Technical Bid (without indicating any prices).

b. Price Bid:
i. Prices are to be quoted in the **attached Price Bid format online on e-tender portal**.
ii. The price should be quoted for the accounting unit indicated in the e-tender document.
iii. Note: It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.
iv. A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrantee that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.
v. A tender, which does not fulfil any of the above requirements and/or gives evasive information/reply against any such requirement, shall be liable to be ignored and rejected.

c. Uploading of the price bid in prequalification bid or technical bid may **RESULT IN REJECTION** of the tender.
d. Tenders shall be uploaded with all relevant PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION digital signature certificate (DSC).

A.2.0: PROCEDURE FOR EVALUATION OF PRICE BIDS:

The following shall be Evaluation *Procedure* of the prices offered: -

Payment terms, Completion Schedule and other contractual terms & conditions shall be as per Tender Specifications.

No deviations are acceptable. Offers with deviations are likely to be rejected.

However, if the bidder insists on any technical or commercial deviations from the specifications and / or tender conditions, **the price implication, if any, of withdrawing the deviations must be submitted along with the price bid in a separate sealed envelope** super-scribed "Price implication for withdrawal of deviations". No price implication for withdrawal of deviation shall be accepted at a later date, after opening of technical bid.

The offers of new vendors may not be considered even after opening of price bid if the vendor is not found suitable on final assessment.

A.3.0 This tender specification as a whole, furnishing all the details and other documents as required in the following pages, shall be duly signed & sent in a sealed cover superscribing the name of work as given in the tender enquiry.

A.4.0 The tender shall be addressed to: OFFICER INVITING THE TENDER AS INDICATED IN THE TENDER ENQUIRY.

A.5.0 DELETED

A.6.0 Tenders shall be opened by the concerned officers of BHEL at the time, date and venue as specified in the tender notice.

A.7.0 The tenderer shall closely pursue all the clauses, specifications and drawings indicated in the Tender Documents before quoting. Should the tenderer have any doubt about the meaning of any portion of the Tender Specifications or find discrepancies/omission in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, scope of work etc. he shall at once contact the authority inviting the tender for clarification before the submission of the tender.

A.8.0 Before tendering, the tenderer are advised to inspect the site of work & the environments and be acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour. No claim will be entertained later on the grounds of lack of knowledge.

A.9.0 Tenderer must fill up all the schedules and furnish all the required information as per the instructions given in various sections of the tender specification. Each and every page of the Tender Specification must be SIGNED AND SUBMITTED ALONG WITH THE OFFER by the Tenderer in token of complete acceptance thereof. The information furnished shall be complete by itself.

A.10.0 The tenderer shall quote the rates in English Language and international numerals. Total price offered should be entered in figures as well as in words. In case of difference in price between words & figures, the price in words will be treated as valid price. For the purpose of the tender, the metric system of units shall be used.

A.11.0 All entries in the tender shall either be typed or be written in ink. Erasers and overwriting are not permitted and may render such tender liable to summary rejection. All cancellations and insertions shall be duly attested by the tenderer.

A.12.0 **DATA TO BE ENCLOSED:**

A.12.1 An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor, shall be attached.

A.12.2 IN CASE OF INDIVIDUAL: His full name, experience, address and nature of business.

OR

IN CASE OF PARTNERSHIP FIRMS: The names of all the partners with address and their experience. A copy of the partnership deed/instrument of partnership duly certified by the Notary shall be enclosed.

OR

IN CASE OF COMPANIES: Date & place of registration including date of commencement certificate in case of Public Companies and the nature of business carried on by the company. Certified copies of Memorandum and Articles of Association are also to be furnished. Also indicate names, addresses and experience of the Directors.

A.12.3 Three years financial turn over (certified), present commitments with all orders in hand, value of total order, value completed, and balance with completion dates as per ANNEXURE-A.

A.12.4 **ORGANIZATION CHART & METHODS STATEMENT:**

The organization pattern and the manpower that are totally available with him & that will be deployed by the tenderer for this work in the form of month wise and category wise deployment plan duly indicating the number of Engineers, Supervisors, Skilled and Unskilled Workers etc. as per proforma at ANNEXURE-B shall be submitted. Work schedule (detail bar chart) and a methods statement showing how the contractor proposes to mobilise (considering the difficulties in work that may be encountered) and complete the jobs giving an idea of extent of proposed mechanisation for the execution of the jobs shall also be submitted along with ANNEXURE-B.

A.12.5 A list of machines, tools and tackles that the tenderer is having and those that will be deployed on this job giving proof of ownership or any tie-up of equipment as per proforma enclosed at ANNEXURE-C.

A.12.6 Analysis of unit rate quoted as per proforma enclosed at ANNEXRE-D.

A.12.7 Declaration sheet as per proforma enclosed at ANNEXURE-E.

A.12.8 Check-list as per proforma enclosed at (ANNEXURE-F).

A.12.9 Certificate from Schedule Bank to prove his financial capacity to undertake the work or Solvency Certificate from the concerned Government Authority.

A.12.10 A certificate of Income Tax / Sales Tax verification from the appropriate authority in the forms prescribed duly indicating annual turnover. These certificates shall be valid for one year from the date of issue or for the period prescribed therein for all tenders submitted during the period.

A.12.11 In addition to the above, the particulars required elsewhere in the tender documents.

A.12.12 NOTE: In terms of clauses A.12.1 to A.12.11 above, all the data required to be enclosed with the tender need to be furnished neatly typed, signed & stamped in the given formats only (in the form of separate sheets) failing which the tender may be considered as incomplete and is liable for rejection. Documentary proof wherever necessary also need to be enclosed.

A.13.0 **EARNEST MONEY DEPOSIT:** **For EMD Clause Please refer Annexure to GCC for Civil work**

Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) mentioned in NIT

1. Mode of EMD deposit:

EMD can be submitted in any one of the following modes:

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

ii) Electronic Fund Transfer credited in BHEL account (before tender opening). Details of BHEL account mentioned in tender document.

iii) Banker's cheque/Pay order/Demand Draft, in favour of `BHEL' and payable at New Delhi (Along with offer)

iv) Fixed Deposit Receipt (FDR) issued by schedule Banks/Public Finance Institutions as defined in the companies ACT (FDR should be in the name of the contractor, a/c BHEL

v) In case total EMD amount is more than Rs. 2 Lakh, the amount in excess of Rs. 2 lakh may be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.

No other form of EMD remittance shall be acceptable to BHEL.

2. Forfeiture of EMD

EMD by the bidder will be forfeited as per NIT conditions, if

i) After opening the tender and within the offer validity period, the bidder revokes his tender or makes any modification in his tender which is not acceptable to BHEL.

ii) The contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/contract.

3. EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provision of extant “Guidelines on Suspension of business dealing with supplier/contractors” and forfeited/ released based on the action as determined under these guidelines.

4. In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after award of work.

5. EMD shall not carry any interest.

6. EMD of successful bidder shall be retained as part of Security Deposit.

7. Bidders may please note that “One Time EMD” provision stands deleted. Hence, bidders who have deposited Rs. 2 Lakh as `One Time EMD' with BHEL are also required to submit the requisite amount of EMD.

8. **No MSE benefits shall be given to MSEs bidder for WORKS CONTRACT. Please refer clause no. P (facilities provided to MSEs) for detail.**

A.14.0 **AUTHORIZATION AND ATTESTATION:**

Tenders shall be signed by persons duly authorized/empowered to do so. Certified copies of such authority & relevant documents shall be submitted along with the tenders.

A.15.0 **VALIDITY OF OFFER:**

THE OFFER SHALL BE KEPT OPEN FOR ACCEPTANCE FOR A MINIMUM PERIOD OF **FOUR MONTHS** FROM THE DATE OF OPENING OF TENDERS. In case BHEL calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderer.

A.16.0 **EXECUTION OF CONTRACT:**

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by BHEL. The successful tenderer shall be required to execute an agreement in the prescribed form as per ANNEXURE-G with BHEL within a reasonable time after the acceptance of his tender and in any case before submitting the first bill for payment. The expenses for completion, stamping and registration of the agreement with prescribed authority if necessary, shall be borne by the contractor.

A.17.0 **SECURITY DEPOSIT:** **For Security Deposit clause Please refer Annexure to GCC for Civil work**

Security Deposit means the security provided by the Contractor towards fulfilment of any obligations in terms of the provision of the contract.

1. Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work. **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.**

2. Mode of Security deposit:

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

"Bidders agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of Performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT / Contract, from the bills along with due interest".

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

i) Cash (as permissible under the extant Income Tax Act)

ii) Local cheques of scheduled banks (subject to realization) / Pay Order / Demand Draft / Electronic Fund Transfer, in favour of BHEL.

iii) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit is enclosed.

iv) 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 and duly discharged on the back.

v) Securities available from Indian 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 endorsed/hypothecated/pledged, as applicable, in favour of BHEL and duly discharged on the back).

(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)

3. Submission of Security Deposit:

i) At least 50 % of the required Security Deposit, including the EMD, shall be submitted before start of work. Balance of the Security Deposit can be submitted by way of deduction of 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.

ii) If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or it shall be recovered from payment/s due to the Contractor.

iii) 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, at the discretion of BHEL.

4. The BG shall be submitted only through the Banker. Along with the BG, the Bank shall also furnish a letter of confirmation (in the prescribed formats enclosed with general conditions of contract).

5. The validity of the Bank Guarantee furnished towards Security Deposit shall be up to three months more than the period of completion of work as stipulated in the LOI and the same will be kept valid by proper renewal till the completion of the work.

6. 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 fulfil any of the contractual obligations or in the event of termination of contract as per terms and conditions of the contract. BHEL reserves the right to set off the Security Deposit, against any claims of any other contracts with BHEL.

7. Conditions for acceptance of bank guarantees

Contractors are advice to obtain Bank Guarantee preferably from any of the following BHEL consortium banks

Sl. No.	Nationalized Bank	Sl. No.	Public Sector Banks
1	Allahabad bank	20	IDBI
2	Andhra bank		
3	Bank of Baroda		**Foreign bank**
4	Canara Bank		
5	Corporation bank	21	CITI Bank N.A
6	Central bank of India	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Limited
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental bank of Commerce	25	J P Morgan
10	Punjab National Bank		
11	Punjab & Sindh Bank		**Private bank**
12	State Bank of India	26	Axis Bank
13	State Bank of Hyderabad	27	The Federal Bank Limited
14	Syndicate Bank 28 HDFC		
15	State Bank of Travancore	29	Kotak Mahindra Bank
16	UCO Bank	30	ICICI
17	Union Bank of India	31	Indusind Bank
18	United Bank of India	32	Yes Bank
19	Vijaya Bank		

Bank Guarantees from Banks outside BHEL's consortium shall be as below:

The Bank Guarantees of all Public sector banks can be accepted (in addition to consortium banks)

The Bank Guarantees of Co-operative banks shall not be accepted.

Bank Guarantees of other than consortium bank and public sector bank can be accepted subject to an overall exposure limit (at New Delhi) of Rs. 10 crores for banks with networth of more than Rs. 500 crores as on last balance sheet date and Rs 5 crores for banks with net worth between Rs. 350 to Rs 500 crores (A certificate and copy of latest Balance Sheet to be given by the Bank at the time of submission of Bank Guarantees).

In case of private sector banks a clause to be incorporated in the text of Bank Guarantee that it can be enforceable by being presented at any branch of the bank.

In case of foreign vendors the bank guarantees issued by foreign banks may be confirmed by our consortium bank in India.

In case of Bank Guarantees given by Non-Consortium banks (Private sector or Public sector), the Bank Guarantees are to be enforceable in New Delhi or the town/ city in which the sector office is located.

1. **RETURN OF SECURITY DEPOSIT:**

If the contractor duly performs and completes the work in all respects to the entire satisfaction of BHEL and presents an absolute "No demand certificate", returns properties belonging to BHEL, taken, borrowed or hired by him for carrying out the said works, and furnishes performance bond BG in the prescribed proforma as per ANNEXURE-J, Security Deposit will be released to the contractor after deducting all costs, expenses and other amounts that are to be paid to BHEL under this contract or other contracts entered into with the contractor. It may be noted that in no case the Security Deposit shall be refunded/released prior to passing of final bill.

A.18.0 No interest shall be payable by BHEL on EMD, Security Deposit or on any money due to the contractor.

A.19.0 **REJECTION OF TENDER & OTHER CONDITIONS:**

A.19.1 The decision of 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 Tenderer.
(c) To award the work in part.
(d) In either of the contingencies stated in (b) and (c) above to modify the time for completion suitably.

A.19.2 Conditional and unwitnessed tenders, tenders containing absurd or unworkable rates & amounts, tenders which are incomplete or otherwise considered defective and tenders not in accordance with the tender conditions, specifications etc. are liable to be rejected.

A.19.3 In case of any adverse information is received concerning performance, capability or conduct of the tenderer after issue of tender enquiry, BHEL reserves the right to reject the offer at any stage as deemed fit.

A.19.4 Offers with inadequate Tools & Plants, Manpower Deployment Plan, Method Statement are liable for rejection.

A.19.5 In case the present commitments of the tenderer is such that award of further work is likely to affect performance in the work under this tender, its offer is liable for rejection.

A.19.6 Offers from tenderer are liable for rejection if the tenderer is not found suitable after preliminary/ final assessment by BHEL.

A.19.7 If a tenderer expires after the submission of his tender or after the acceptance of his tender, BHEL may at its discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at its discretion unless the firm retains its character.

A.19.8 BHEL will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. BHEL 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.

A.19.9 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 moneys due.

A.19.10 Canvassing in any form in connection with the tender is strictly prohibited and the tenders submitted by the contractors who resorts to canvassing are liable to be rejected.

A.19.11 Should a tenderer or contractor or in the case of a firm or company of contractors/ one or more of its Partners/ Share holders/ Directors have a relation or relations employed in BHEL, the authority inviting tender shall be informed to the fact along with the offer, failing this, BHEL may, at its sole discretion reject the tender or cancel the contract and forfeit the Earnest Money/ Security Deposit.

A.19.12 The successful tenderer should not sub-contract the part or complete work detailed in the tender specifications without written permission of BHEL. The tenderer is solely responsible to BHEL for the work awarded to him.

A.19.13 NO DEVIATIONS ARE ACCEPTABLE. OFFERS WITH DEVIATIONS ARE LIKELY TO BE REJECTED. HOWEVER, IF THE BIDDER INSISTS ON ANY TECHNICAL OR COMMERCIAL DEVIATIONS FROM THE SPECIFICATIONS AND / OR TENDER CONDITIONS, **THE PRICE IMPLICATION, IF ANY, OF WITHDRAWING THE DEVIATIONS MUST BE SUBMITTED ALONG WITH THE PRICE BID IN A SEPARATE SEALED ENVELOPE** SUPER-SCRIBED "PRICE IMPLICATION FOR WITHDRAWAL OF DEVIATIONS". NO PRICE IMPLICATION FOR WITHDRAWAL OF DEVIATION SHALL BE ACCEPTED AT A LATER DATE, AFTER OPENING OF TECHNICAL BID.

ANNEXURE - A

DETAILS OF WORK EXECUTED/BEING EXECUTED

A) WORK EXECUTED

Sl. No.	Financial Year	Customer	Description of work	Total order value	Remarks

B) WORK BEING EXECUTED

Sl. No.	Customer	Description of work	Total Value	Value of the portion completed	Actual start date	Expected completion date	Remarks

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - B

(A) **PROPOSED MANPOWER (ENGINEERS/ SUPERVISORS) RESOURCES FOR EXECUTION OF WORK**

Sl. No.	Name of the staff	Qualification	Experience in years	Remarks

(B) **MONTH WISE MANPOWER DEPLOYMENT PLAN**

Sl. No.	Category	Indicate No. of persons to be deployed in each month								
		1st	2nd	3rd	4th	5th	6th	7^{th}	8^{th}	and so on

(C) **Total man days planned to be deployed for the work ..... Man days**

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - C

(A) **STATUS OF TOOLS, PLANTS & INSTRUMENTS**

Sl. No.	Name of Equipment	Quantity owned	Registration No.	Documents enclosed for proof of Ownership / tie-up	Present Location	Quantity proposed to be deployed for this job

B) **MONTH WISE TOOLS, PLANTS & INSTRUMENTS DEPLOYMENT PLAN**

Sl. No.	Description of Tools, Plants & Instruments	Indicate Nos. to be deployed in each month							
		1st	2nd	3rd	4th	5th	6th	7th	and so on

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - D

ANALYSIS OF UNIT RATE

Sl. No.	Description	Percentage of the unit rate	Remarks
01.	Salary and wages for staff and works		
02.	Materials a) ..... b) ..... c) ..... d)		
03.	Depreciation and maintenance for Tools and Plants		
04.	Depreciation and maintenance for other items		
05.	Establishment and administrative expenses of site		
06.	Overheads		
07.	Profit		

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - E

DECLARATION SHEET

I ..... hereby certify that all the information and data furnished by me with regard to this Tender Specification No..... are true and complete to the best of my knowledge. I have gone through the specification, conditions and stipulations in detail and agree to comply with the requirements and intent of specifications.

I further certify that I am the duly authorised representative of the under mentioned tenderer and a valid power of attorney to this effect is also enclosed.

TENDERER'S NAME AND ADDRESS

AUTHORISED REPRESENTATIVE'S SIGNATURE WITH NAME AND ADDRESS

ANNEXURE - F

CHECKLIST & SCHEDULE OF GENERAL PARTICULARS

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

1.	Name & Address of the Tenderer	:	
2.	Phone/Fax No. (Office)	:	
3.	email ID	:	
4.	Name & designation of the official of the tenderer to whom all the references shall be made	:	
5.	Tenderer's Proposal No. & date	:	
6.	Whether EMD submitted (by cash/ Bank Guarantee/Bank Draft)	:	By.....
7.	Validity of offer/rates quoted for six months from the date of opening of tender	:	Yes/No
8.	Attested copy of power of attorney as per Clause-A.12.1	:	Yes/No
9.	Solvency Certificate submitted as per Clause-A.12.9	:	Yes/No
10.	Income Tax/Sales Tax Certificate submitted as per Clause-A.12.10	:	Yes/No
11.	Details of work executed/being executed as per Annexure-A	:	Yes/No
12.	Month wise & Category wise manpower deployment plan as per Annexure-B	:	Yes/No
13.	Status of Tools, Plants and Instruments & their month wise deployment plan as per Annexure-C	:	Yes/No
14.	Analysis of unit rate quoted as per Annexure-D	:	Yes/No
15.	Declaration sheet as per Annexure-E	:	Yes/No
16.	Request for registration (for new tenderers) submitted	:	Yes/No

Date ..... (SIGNATURE OF TENDERER)
WITH STAMP

WITNESS : (Signature with full particulars)

1.

2.

ANNEXURE - G

PROFORMA FOR C O N T R A C T A G R E E M E N T

CONTRACT NO. :
LETTER OF INTENT NO. :
WORK ORDER NO. :

1. The Contract Agreement entered into the day of ....., 20... (..... day of .....two thousand and……. ....) at New Delhi, between M/S BHARAT HEAVY ELECTRICALS LIMITED, TRANSMISSION BUSINESS GROUP, New Delhi , having it's Registered Office at BHEL House, Siri Fort, New Delhi - 110 049 (hereinafter called the FIRST PARTY which expression shall include their executors, administrators, successors and permitted assigns)

AND

M/S ..... (hereinafter called the SECOND PARTY which expression shall include their executors, administrators, successors and permitted assigns).

2. And whereas the FIRST PARTY called for the offer for the work of..... as per approved specifications, drawings and quality plan at ..... as per Tender Specification No..... , dated .....

3. Whereas the SECOND PARTY submitted their offer No. ..... dated ..... against above.

4. Whereas the FIRST PARTY has accepted the offer referred to above & issued Letter of Intent No....., dt..... and also detailed Work Order No...., dt .....

5. Whereas the SECOND PARTY has agreed to work as Sub-Contractor of the FIRST PARTY on the conditions specified in the Tender Specifications at a contract price of Rs..... (Rupees.....) at .....

6. Now, therefore it is hereby mutually agreed to by and between the parties hereto as under :

   a) The SECOND PARTY shall execute the works of ..... at ..... on the conditions specified in Tender Specifications of FIRST PARTY and Letter of Intent referred to herein before at a total contract price of Rs..... (Rupees .....)

   b) That the SECOND PARTY shall organise all activities and mobilisation of facilities so that the work specified herein before is completed by .....as per the time bound programme mentioned in the Tender Specifications.

c) That all disputes arising out of or relating to this agreement shall be referred to the sole Arbitrator as per arbitration clause mentioned in the Tender Specifications. The Arbitrator from time to time with the consent of the parties enlarge the time for making and publishing award without reference to the court for the purpose.

d) That the jurisdiction in all suits or claims arising out of this agreement shall be of New Delhi Courts only.

e) The Following documents shall form part of this agreement: -

i)

ii)

iii)

iv)

v)

vi)

7. Deviation Limit : The contract value is subject to deviations depending upon the actual requirement within plus or minus 30%. Quantities of individual items may vary to any extent or may get deleted.

8. Terms of Payment : The terms of payment applicable to this contract shall be those covered under Point No.... of Work Order dt. ..... and as per Tender Specifications.

9. Abandoning the work : In the event of the SECOND PARTY abandoning the work, FIRST PARTY reserves the right to get the unfinished work done at the risk and cost of the SECOND PARTY.

10. All other terms and conditions shall be as stipulated in the Tender Documents.

11. This contract agreement consists.... pages.

IT WITNESS WHEREOF, the parties have signed this agreement on the date, month and year first above written in presence of

For and on Behalf of
(FIRST PARTY)

WITNESS (WITH ADDRESS)

For and on Behalf of
(SECOND PARTY)

1.
2.

ANNEXURE - H

PROFORMA FOR BANK GUARANTEE (FOR SECURITY DEPOSIT)

1. In consideration of the Bharat Heavy Electricals Limited, having its Registered Office at BHEL House, Siri Fort, New Delhi-110 049 through its Unit/Division at Industry Sector-TBG, New Delhi hereinafter called BHEL, having agreed to exempt..... (hereinafter called "the said contractor(s)") from the demand, under the terms and conditions of the LOI/WO, dated ... made between BHEL and M/s..... for the work ..... of (Name of work) (hereinafter called "the said Agreement") of Security Deposit / mobilisation advance for the due fulfilment by the said contractor(s) of the terms and conditions contained in the said Agreement, on production of Bank Guarantee for Rs.... (Rupees..... only). We, ... (indicate the name of the Bank) (hereinafter referred to as "Bank") at the request of the contractor(s) do hereby undertake to pay to BHEL an amount not exceeding Rs..... against any loss or damage caused to or suffered or would be caused to or suffered by BHEL, by reason of a breach by the said contractor(s), of any of the terms of conditions contained in the said agreement.

2. 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 BHEL, stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by BHEL by reason of breach by the said contractor(s) of any of the terms or condition(s) failure to perform the said agreement or by reason of the contractor(s) failure to perform the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.....

3. We, ... (Indicate the name of the Bank) undertake to pay BHEL any money so demanded not withstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any court or Tribunal relating there to, our liability under these presents being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) shall have no claim against us for making such payment.

4. We, ...(indicate the name of the Bank) further agree that the guarantee herein after contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement & that it shall continue to be enforceable till all the dues of BHEL under or by virtue of the

said agreement have been fully paid and its claims satisfied or discharged or till BHEL certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s) & accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before..... we shall be discharged from all liability under this guarantee thereafter.

5. We,.....(indicate the name of the Bank) further agree with BHEL that BHEL shall have the fullest liberty without our consent & without affecting in any manner our obligations hereunder to vary any of the terms & conditions of the said agreement or to extend time 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 BHEL against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement & we shall not be relieved from our liability by 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 BHEL or any indulgence by BHEL to said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effected of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, ...(indicate the name of the Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of BHEL in writing.

Dated the ..... Day of .....20...

For .....(indicate the name of the Bank)

WITNESS : 1)

2)

(SIGNATURE OF BANK REPRESENTATIVE WITH SEAL)

NOTE

1. The above format is drawn upon the model form jointly evolved by the Reserve Bank of India, the Indian Banks Association and the Ministry of Finance, Government of India as circulated by Indian Banks Association, Bombay vide their letter No. LA/14-61/808, dated 01.05.1980.

2. As such no deviations are acceptable.

ANNEXURE – I

PROFORMA FOR PERFORMANCE GUARANTEE

(to be used in appropriate value non - judicial stamp paper)

1. This deed of guarantee made this ..... day of ..... 20… by ..... Bank Limited ..... in favour of Bharat Heavy Electricals Limited having their registered office at BHEL House, Siri Fort, New Delhi - 110 049.

2. Whereas M/s ..... (hereinafter called the CONTRACTOR / SELLER have entered into a Contract bearing No. ..... dated..... (hereinafter called the CONTRACT) for supply / civil works /erection, testing and commissioning of M/s Bharat Heavy Electricals Limited (hereinafter called the COMPANY).

3. And whereas the said CONTRACT Inter - alia provides that the CONTRACTOR / SELLER shall pay to the COMPANY a sum of Rs. ..... only towards Performance Guarantee in the form and manner therein specified.

4. And whereas the SELLER / CONTRACTOR have approached ..... Bank Limited (hereinafter referred to as the GUARANTOR) and at their request 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.

NOW THIS DEED WITNESSES AS FOLLOWS:

5. The GUARANTOR by the hand of Mr. ..... and its lawfully and fully constituted attorney and do hereby guarantee the due and faithful performance of the said CONTRACT and do hereby irrevocably undertake and promise to pay the COMPANY without any demur merely on demand made by them a sum not exceeding Rs. ..... only in case the COMPANY sustains any loss or damage by reason of any breach, default by the CONTRACTOR / SELLER of any of the terms, conditions, stipulations or undertakings or any one of them contained in the said CONTRACT and the tender documents attached hereto and for payment of any moneys payable by the CONTRACTOR / SELLER to the COMPANY under the terms and conditions of the said CONTRACT. The decision of the COMPANY regarding the breach, default, loss, damage and payment shall be conclusive and binding in the GUARANTOR, irrespective of the fact whether the CONTRACTOR / SELLER admits or denies such claims or questions its correctness in any court, tribunal or arbitration proceedings or before any other authority.

6. The COMPANY shall have the fullest liberty without effecting 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 by the SELLER / CONTRACTOR or to postpone for any time and from time to time any of the powers exercisable by its against the SELLER / CONTRACTOR and either to enforce or forbear from enforcing any of 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 reason of time being given to the SELLER or any other forbearance, act or omission on the part of the COMPANY or any indulgence by the COMPANY to the SELLER / CONTRACTOR or of 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 / CONTRACTOR from its liability under this Guarantee.

7. This Guarantee shall remain in full force and effect and the GUARANTOR shall be liable under the same irrespective of any concession or time being granted by the COMPANY to the CONTRACTOR in or for fulfilling the said CONTRACT and this Guarantee shall remain in full force irrespective of any change in terms and conditions, stipulations or any variations in the terms of CONTRACT irrespective of whether notice of such change and / or variation is given to the GUARANTOR or not and the claim to receive such notice of any change and or variation of the terms / or conditions of the CONTRACT is hereby specially waived by the GUARANTOR.

8. The GUARANTEE herein contained shall not be determined, prejudiced or effected by the liquidation or winding up or insolvency of or change in the constitution of the CONTRACTOR but shall in all respects and for all purposes be binding and operative until all payments or all moneys due or that may hereafter become payable to the COMPANY are paid in respect of any liability or obligation of the CONTRACTOR under the CONTRACT.

9. The GUARANTOR further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the commencement of the CONTRACT till end of the CONTRACT and its claim satisfied or discharged and till the COMPANY certified that the terms and conditions of the CONTRACT have been fully and properly carried out by the SELLER and accordingly discharges this guarantee, subject, however, that the COMPANY shall have no claim under this Guarantee after ..... months from the date of completion of the Guarantee has been served on the

GUARANTOR before the expiry of the said period in which case the same shall be enforceable against GUARANTOR not withstanding the fact that the same is enforced after expiry of said period.

The GUARANTOR undertake not to revoke this Guarantee during the period it is in force except with the previous consent of the COMPANY in writing and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the SELLER or the GUARANTOR shall not discharge the GUARANTOR's liability here under.

It shall not be necessary for the COMPANY to proceed against the SELLER before proceeding against the GUARANTOR and the Guarantee herein contained shall be enforceable against them not withstanding any security which the company may have obtained or obtained from the SELLER shall at the time when proceedings are taken against the GUARANTOR here under be outstanding or unrealized.

The GUARANTOR hereby declare that it has power to execute this Guarantee and the executant has full powers to do so on its behalf under the proper authority granted to him/them by of the GUARANTOR.

10. Not withstanding anything herein before contained, our liability under this Guarantee is restricted to Rs. ..... (Rupees .... only) and will expire on ..... and unless a claim in writing is presented to us or an action or suit to enforce the claim is filed against us, within six months from the date, all our rights shall be forfeited and we shall be relieved and discharged from all our liabilities thereunder.

IN WITNESS whereof the ..... (Bank) have hereunto set and subscribed their hands the day, month and year first above written.

SIGNED FOR AND ON BEHALF OF THE BANK

WITNESS:

NAME AND ADDRESS **SIGNATURE**

1.

2.

ANNEXURE - J

REVISED PRICE OFFER IN LIEU OF WITHDRAWAL OF DEVIATIONS/ CLARIFICATIONS OFFERED BY BHEL

Sl. No.	Clause Ref.	Description of Deviation/ Clarification	Whether Increase/ Decrease in Price	Unit Rate (if applicable)	Total Increase/ Decrease	Remarks

NOTE: Total increase or decrease in total price shall be indicated either in percentage or in value (Rs.).

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - K

LIST OF LABORATORY TEST EQUIPMENTS

SL. NO.	DESCRIPTION OF APPARATUS	CODE REF.
01.	VICATS APPARATUS	IS-5513
02.	LE-CHATELIER'S TEST APPARATUS	IS-5514
03.	MOULD (CEMENT)	IS-10086
04.	CEMENT MORTAR MOULD VIBRATOR	IS-10078
05.	CONCRETE CUBE MOULDS	IS-10086
06.	COMPR. STRENGTH TEST M/C	IS-2505
07.	CONCRETE SLUMP CONE	IS-7320
08.	COARSE AGGR. SIEVES	IS-383
09.	FINE AGGR. SIEVES	IS-383
10.	AGGR. IMPACT TEST M/C	IS-9377
11.	(a) SOIL CORE COMPACTOR	IS-2720
	(b) PROCTOR COMPACTION	IS-29
12.	REBOUND HAMMER	
13.	THEODOLITE	
14.	DUMPY LEVEL WITH STAFF	
15.	OVEN	
16.	PHYSICAL BALANCE	
17.	AIR ENTERTAINMENT METER	ST-1199

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - L

(On Banks Letter Head)

To:

DGM (Finance)
Transmission Business Group,
2nd floor, Bharat Heavy Electricals Limited,
Integrated office Complex, Lodhi Road,
New Delhi 110 003

Ref & Date :

Sub : Confirmation of Bank Guarantee no. <<BG No. >>

We are a Scheduled Bank other than Co-operative Bank under the RBI Act 1934. The aforesaid BG No. << BG No. >> for Rs. <<BG Amount>>/ (In Words Also) and valid upto <<validity date>> is issued by us on behalf of M/s <<Beneficiary's Name>> in favour of BHARAT HEAVY ELECTRICALS LTD. – TRANSMISSION BUSINESS GROUP.
The format of the Bank Guarantee is strictly as per the format prescribed by M/s BHEL and the stamp paper forming part of the BG are as per the state rules extant.

The signatories to the Bank Guarantee are duly authorised.

Thanking You,

For and On Behalf of
Name of the Bank & Seal

(Please Sign Here)

SECTION-B

GENERAL TERMS AND CONDITIONS

SECTION - B
GENERAL TERMS AND CONDITIONS

B.1.0 The following terms shall have the meaning hereby assigned to them except where the context requires otherwise:-

B.1.1 BHEL (or B.H.E. Ltd.) shall mean Bharat Heavy Electricals Limited, a Company registered under Indian Companies Act 1956, with its Registered Office at BHEL House, Siri Fort, New Delhi-110 049 or its Authorised Officers or its Engineers or other employees authorised to deal with any matters with which these persons are concerned.

B.1.2 "GENERAL MANAGER" shall mean the Officer in Administrative charge of the Contracting Unit of BHEL.

B.1.3 “ENGINEER" OR "ENGINEER-IN-CHARGE" shall mean Engineer deputed by BHEL. The term includes "Deputy General Manager, Construction Manager, Resident Engineer, Assistant Site Engineer of BHEL/at the site as well as the officers in charge at Head Office.

B.1.4 “SITE” shall mean the place or places at which the plants/equipment are to be erected and services are to be performed as per the specification of this tender.

B.1.5 "CLIENTS OF BHEL" or "CUSTOMER/OWNER" shall mean the organization to whom BHEL is responsible for this work.

B.1.6 "CONTRACTOR" shall mean the individual, firm or Company who enters into this Contract with BHEL and shall include their executors, administrators, successors and assigns.

B.1.7 "CONTRACT” or "CONTRACT DOCUMENT” shall mean and include the agreement, the work order, the accepted appendices of rates, Schedules of Quantities, if any, General Terms and Conditions of Contract, Special Conditions of Contract, Instructions to Tenderers, the drawings, the Technical Specifications, the Special Specifications, if any, the tender documents and the Letter of Intent\Accepting Letter issued by BHEL. Any conditions or terms stipulated by the tenderer 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 and incorporated in the Agreement.

B.1.8 "GENERAL CONDITIONS OF CONTRACT" shall mean the "Instructions and Information for Tenderers and General terms and Conditions" pertaining to the work detailed.

B.1.9 TENDER SPECIFICATIONS" shall mean the Special Conditions, Technical Specifications, Appendices, Site Information and drawings pertaining to the work for which the tenderers are required to submit their offer. Individual Specification Numbers will be assigned to each tender specification.

B.1.10 "TENDER DOCUMENTS" shall mean the General Conditions of Contract and Tender Specifications.

B.1.11 "LETTER OF INTENT" shall mean the intimation by a letter/telegram/telex/ fax 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 the terms and conditions of contract are applicable from this date.

B.1.12 "COMPLETION TIME" shall mean the period by date specified in the Letter of Intent/Work Order or date mutually agreed upon for handing over of the erected equipment/plant which are found acceptable by the Engineer being of required standard and conforming to the specifications of the contract.

B.1.13 "ZERO DATE" shall mean the planned commencement date of work under this tender and shall be date of issue of Letter of Intent.

B.1.14 "PLANT" shall mean and connote the entire assembly of the plant and equipment covered by the contract.

B.1.15 "EQUIPMENT" shall mean all equipment, machineries, materials, structural, electricals and other components of the plant covered by the contract.

B.1.16 "TESTS" shall mean and include such test or tests to be carried out by 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 contracted work or part thereof.

B.1.17 "APPROVED" "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

B.1.18 "WORK OR CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles required for complete and satisfactory site transportation, handling, stacking, storing, civil and electrical works, erection, testing and commissioning of the equipment to the entire satisfaction of BHEL.

B.1.19 "SINGULAR AND PLURAL" etc. words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting masculine gender shall be taken to include the feminine gender and words imparting persons shall include any Company or Association or Body or Individuals, whether incorporated or not.

B.1.20 "HEADINGS" The headings in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation of construction thereof or the contract.

B.1.21 "MONTH" shall mean calendar month.

B.1.22 "WRITING" shall include any manuscript typewritten or printed statement under the signature or seal as the case may be.

B.2.0 **LAW GOVERNING THE CONTRACT AND COURT JURISDICTION:**

The Contract shall be governed by the Law for the time being enforce in the Republic of India. The Civil Court at Delhi having ordinary Original Civil Jurisdiction shall alone have exclusive jurisdiction in regard to all claims in respect of this contract.

B.3.0 **ISSUE OF NOTICE:**

The contractor shall furnish to the Engineer, the name, designation and address of his authorised agent and all complaints, notices, communications and references shall be deemed to have been duly given to the Contractor, if delivered to the Contractor or his authorised agent and shall be deemed to have been so given in the case of posting on the day on which they would have reached such address in the ordinary course of post or at which they were so delivered or left.

B.4.0 **USE OF LAND:**

No land belonging to BHEL or its customer under temporary possessions of BHEL shall be occupied by the contractor without the written permission of BHEL.

B.5.0 **COMMENCEMENT OF WORK:**

B.5.1 The contractor shall commence the work within fifteen days of Letter of Intent or the time indicated in the Letter of Intent/Work Order and shall proceed with the same with due expedition without delay.

B.5.2 If the successful tenderer fails to commence the work within the stipulated time, BHEL, at its sole discretion will have the right to cancel the Letter of Intent/Contract. His Earnest Money and/or Security Deposit 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.

B.5.3 All the works shall be carried out under the direction and to the satisfaction of BHEL/Customer/Owner.

B.5.4 The transported equipment, erected/constructed plant or work performed under the contract, as the case may be, shall be taken over when it has been completed in all respect and/or satisfactorily put into operation at site.

B.6.0 **MEASUREMENT OF WORK AND MODE OF PAYMENT:**

B.6.1 All payments due to the contractor shall be made only by "Account Payee Cheques".

B.6.2 For progress/running bill payments, the contractor shall present detailed measurement sheets in triplcate duly indicating all relevant details based on technical documents, protocols & material test reports and connected drawings for the work done during the calendar month/period under different categories in line with terms of payment & as per Letter of Intent. The basis of arriving at the quantities/weights shall be the relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with Engineers of BHEL and signed by all parties.

B.6.3 The measurement sheets will be checked by the Engineer and quantities & percentage eligible for payment under different groups shall be decided by him. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in the Measurement Book & signed by both the parties. Where required counter signature of Customer/Owner shall have to be taken.

B.6.4 Based on the above quantities, contractor shall prepare the bills in the prescribed proforma and work out the financial value. These will be entered in the measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the Contractor.

B.6.5 All recoveries due from the contractor for the month/period shall be effected in full from corresponding running bills unless specific approval from Competent Authority is obtained to the Contrary.

B.6.6 Measurement shall be taken jointly by person duly authorised by BHEL, Owner and the Contractor.

B.6.7 The Contractor shall bear the expenditure involved, if any, in taking the measurements & testing of materials to be used in the works. The Contractor shall without extra cost to BHEL, provide all the assistance with appliances and other things necessary for measurement.

B.6.8 If at any time due to any reason whatsoever, it becomes necessary to remeasure the work done, in full or in part, the expenses towards such re-measurement shall be borne by contractor.

B.6.9 Passing of bills covered by such measurement does not amount to acceptance by BHEL of the completion of the work measured. Any left out work has to be completed by the Contractor, as directed by BHEL.

B.6.10 Final measurement bill shall be prepared in the proforma prescribed for the purpose, based on the certificate issued by the Engineer that the entire work as stipulated in the tender specification has been completed in all respects to the entire satisfaction of BHEL.

The contractor shall give unqualified "No claim" and "No Demand" certificates. All the tools and tackles loaned to him should be returned in condition satisfactory to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Book and signed by both the parties. The final bill shall be paid after completion of all the defects/deficiencies etc. pointed out by BHEL. The Contractor should submit all the original documents such as material consumption, site order book etc. maintained at site. After payment of final bill, only guarantee obligation percentage value shall remain unpaid, which shall be released in accordance with Clause A.17.7.

B.7.0 **RIGHTS OF BHEL:**

Refer Annexure to GCC for Civil works

B.8.0 **RESPONSIBILITY 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.

B.8.1 As far as possible, unskilled workers shall be engaged from the local areas in which the work is being executed. In case of any necessity is felt by the contractor to bring labourers from out side State, provisions of law governing such immigration by the concerned State are to be followed.

B.8.2 The Contractor at all times during the currency of this contract, shall in all his dealings with the local labour for the time being employed on or in connection with the work, have due regard to all local festivals, religious and other customs.

B.8.3 The contractor shall comply with all State and Central Laws, Statutory Rules, Regulations etc., such as: The payment of wages to, The Minimum Wages Act, The Workmen Compensation Act, The Employees Liability Act, The Industrial Dispute Act, The Employees Provident Fund Act, Employees State Insurance Scheme, The Contract Labour (Regulations and Abolition) Act 1970 and other Acts, Rules & Regulations for labour as may be enacted by the Government during the tenure of the contract and having in force or jurisdiction at site. The Contractor shall give to the local Governing Body, Police and other concerned Authorities all such notice as may be required under law.

B.8.4 The contractor, as required, will obtain independent license under the Contract Labour (Regulations & Abolition) Act 1970 from the concerned authorities based on the certificate (Form-V) issued by the Principal Employer/Customer.

B.8.5 The Contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalty, commissions or other charges which may be Leviable on account of any of his operations connected with this contract. The Contractor is responsible to furnish documentary evidence towards GST Registration of the State wherein the site is located and any other documents as per GST Act which may be be required from time to time by BHEL.The contractor should have to get the contract registered immediately after award of works as per rules and regulations of the State Government. The contractor shall file regular return as per statute of the State/Centre and should provide all information to BHEL as required for the assessment of the project concerned. In case BHEL is forced to make any of such payments, BHEL shall recover the same from the contractor either from moneys due to him or otherwise as deemed fit.

B.8.6 Arrangements for the periodical visits of inspection agencies such as Electrical Inspector etc. to site, inspection certificates etc. will have to be made by the contractor at his cost. The contractor will also meet all expenses in connection with his welder's qualification/ re-qualification tests etc.

B.8.7 The contractor shall be responsible for provision of health and sanitary arrangements {more particularly described in the Contract Labour (Regulation & Abolition) Act 1970} & safety precautions as may be required for safe and satisfactory execution of the contract.

B.8.8 The Contractor shall be responsible for proper accommodation including adequate medical facilities for the personnel employed by him.

B.8.9 The Contractor shall be responsible for the proper behaviour and observance of all regulations by the staff employed by him.

B.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 shall be the responsibility of the contractor to make good the losses or compensate them.

B.8.11 All the properties/equipment/components of BHEL/its customer loaned with or without deposit, to the contractor, shall remain the properties of BHEL/its customer. The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be taken in to good condition unless notified to the contrary by the contractor within 48 Hrs. The Contractor shall return them in good conditions as and when required by BHEL/ its customer. In case of non-return, loss, damage repairs etc., the cost thereof, as may be fixed by the Engineer, will be recovered from the contractor.

B.8.12 It shall not be obligatory on the part of BHEL to supply any tools and tackles or materials other than those specifically agreed to be given by BHEL. However, depending upon availability/possibility, BHEL/its customer's equipment and other materials may be made available to the contractor on payment of the hire charges as fixed by them, subject to the conditions laid down by BHEL/its Customer from time to time. Unless paid in advance, such hire and other charges shall be recovered from out of dues to the contractor or Security Deposit in one instalment. In case, BHEL provide the material like steel etc. for Subcontractors / Suppliers, handling charges @ 15% per annum or 1.25% per month or part thereof will be recovered from the contractor in addition to the actual procurement cost of material. The period for imposing handling charges is to be reckoned from the date of making payment/LR for lifting material to / by Subcontractor from authorized source, whichever is earlier to

a) The date of LR for dispatch of finished product by the supplier / fabricator.
b) Till date of consumption by the contractor as recorded in the MB.

B.8.13 The Contractor shall fully indemnify and keep indemnified BHEL/its customer against all claims of whatsoever nature arising during the course of execution of this contract.

B.8.14 In case the contractor is required to undertake any work outside the scope of this contract, the amount payable shall be as may be mutually agreed upon.

B.8.15 Any delay in completion of works or non-achievement of periodical targets, due to reasons attributable to the contractor, will have to be compensated by the contractor either by increased manpower and resources or by working extra hours or more than one shift at no extra cost to BHEL.

B.8.16 The contractor shall execute the work under the conditions usual to such construction work and in conjunction with numerous other operations at site and proceed in a manner that shall help in the progress of work at site as a whole.

B.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving details of all payments made to the workmen duly signed by the contractor's representative should be furnished to BHEL, with each running account bill.

B.8.18 In case of any class of work for which there is no specification laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

B.8.19 No levy, payment or charges made or imposed shall be impeached by reason of any clerical error or by reason of any mistake in the amount levied, demanded or charged.

B.8.20 No idle labour charges will be admissible in the event of any stoppage of work resulting in the contractor's workmen being rendered idle due to any reason any time.

B.8.21 The contractor shall take all reasonable care to protect the materials and the work till such time the place/equipment has been taken over by BHEL/its customer.

B.8.22 The contractor shall not stop work or abandon the site for whatsoever reason or dispute, excepting for force majeure conditions. All problems/disputes shall be separately discussed and settled without affecting the progress of work. Stoppage or abandonment of work, other than under force majeure conditions, shall be treated as breach of work of contract and dealt with accordingly.

B.8.23 The contractor shall keep the area of work clean and shall remove debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of works, 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 & 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.

B.8.24 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 instructions of the Engineers.

B.8.25 The contractor shall furnish progress reports on work at regular intervals as required by the Engineer.

B.9.0 RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF SAFETY OF MEN, EQUIPMENT, MATERIAL AND ENVIRONMENT:

B.9.1 All safety rules and codes applied by BHEL/its customer at site shall be observed by the contractor and his workmen without exception. The contractor shall be responsible for the safety of the equipment/materials and work to be performed by him and shall maintain all lights, fencing guards, signs etc. or other protections 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 etc. and suitable number of clerical staff, watch and ward, store keepers to take care of equipment, materials and construction tools & tackles shall be posted at site by the contractor till the completion of the work under this con tract. The contractor shall arrange for such safety devices as are necessary for this type of work & carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per usual standards and practices.

B.9.2 The contractor shall provide to its work force & ensure the use of required personal protective equipment as found necessary & as directed by the authorised BHEL officials.

i) Safety helmets conforming to IS-2925 : 1984.
ii) Safety belts conforming to IS-3521 : 1983.
iii) Safety shoes conforming to IS-1989 : 1978.

iv) Eye and face protection devices conforming to IS-8520 : 1977 and IS-8940 : 1978.

v) Hand and body protection devices conforming to IS-2573 : 1975, IS-6994 : 1973, IS-8807 : 1978 and IS-8519 : 1977.

B.9.3 All tools, tackles, fitting appliances, material handling equipment, scaffolds, cradles, safety nets, ladders, equipment, etc. used by the contractor shall be of safe design and construction and maintained in good condition. However BHEL officials shall have the right to ban use of any of them or get them tested at their discretion. All electrical equipment, connections & wiring for construction power, its distribution & use shall conform to the relevant requirements of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carry out electrical works.

B.9.4 All electrical appliances including portable electric tools used by contractor shall have safe plugging system to source of power and be appropriately earthed.

B.9.5 The contractor shall not use any hand lamp energised by electric power with supply voltage of more than 240 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 240 volts.

B.9.6 Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in the relevant Government Acts, such as Petroleum Act, Explosive Act, Petroleum & Carbides of Calcium Manual of the Chief Controller of Explosives, Government of India etc. Prior approval of the authorised BHEL official at the site shall also be taken by the contractor in all such matters.

B.9.7 The contractor shall arrange at his cost appropriate illumination as required at all work spots for safe working, when natural day light may not be adequate for clear visibility.

B.9.8 In case of a fatal or disabling injury/accident to any person at construction sites pertaining to this work, the victim and/or his/her dependents 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 the contractor & recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents.

Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

B.9.9 In case of any damage to property due to lapse by the contractor, BHEL shall have the right to recover the cost of such damages from the payments due to the contractor.

B.9.10 In case of any delay in the 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 the payments due to the contractor, after notifying the contractor suitably and giving him opportunity to present his case.

B.9.11 If 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 instructions regarding safety issued by the authorised BHEL official, BHEL shall have the right to take the corrective steps at the risk and cost of the contractor after giving appropriate notice indicating the steps that would be taken by BHEL.

B.9.12 The contractor shall submit report of all accidents, fires, property damaged and dangerous occurrences connected with his area of work or caused due to his action/inaction, to the authorised BHEL official immediately after such occurrence, but in any case not later than 12 hours of the occurrence.

B.9.13 During the course of construction, alteration or repairs scrap lumbers with protruding nails, sharp edges etc. and all other debris including combustibles scrap shall be kept cleared from working areas, passage ways and stairs in and around site.

B.9.14 Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally/negligently dropped, struck or permitted to strike each other violently. When cylinders are transported by powered vehicles, they shall be secured in a vertical position.

B.9.15 The contractor shall be responsible for the safe storage of his radioactive sources if same have been permitted to use.

B.9.16 All contractor's supervisory personnel and sufficient number of workmen shall be trained for fire fighting and first aid duties and shall be assigned specific duties. Enough number of such trained personnel must be available during the tenure of the contract.

B.9.17 Contractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, construction/erection site, other temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all times. Compliance of the above requirement under fire protection system at project site shall in no way relieve the contractor of any of his responsibilities and liabilities to fire accident occurring. In the event of fire safety measures being not to BHEL's satisfaction, BHEL shall have option to provide the same and recover the cost plus incidentals from contractor's bills and/or impose penalty as deemed fit by the Engineer.

B.9.18 Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with BHEL Engineer at site.

B.9.19 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 recognise the safety performance of the contractor may be considered by BHEL after completion of the job.

B.10.0 **CONSEQUENCES OF CANCELLATION:**

B.10.1 Whenever BHEL exercises its authority to terminate the contract / withdraw a portion of work, the work may be got completed by any other means at the contractor's risk and cost provided that in the event of the cost of completion (as certified by the Engineer which shall be final and binding on the contractor) being less than the contract value, the advantage shall accrue to BHEL. If the cost of completion exceeds the money due to the Contractor under the Contract, the Contractor shall either pay the excess amount demanded by BHEL or the same shall be recovered from the contractor. This will be in addition to the forfeiture of Security Deposit & recovery of liquidated damages as per relevant clauses.

B.10.2 In case BHEL completes the work under the provisions of this clause, the cost of such completion to be taken into account for determining the excess cost to be charged to the contractor shall consist of cost of materials purchased and/or labour provided by BHEL with an addition of such percentage to cover supervision and establishment charges as may be decided by BHEL.

B.11.0 **INSURANCE:**

B.11.1 BHEL/its customer shall arrange for insuring the project materials/properties of BHEL/its customer covering the risks during storage, construction, erection and commissioning.

B.11.2 It shall be the sole responsibility of the Contractor to insure his workmen against risks of accident and injury while at work as required by the relevant rules and to pay compensation, if any, to them as per Workmen's Compensation Act. The Contractor shall also insure his staff against accidents. The work will be carried out in a protected area and all the rules and regulations of BHEL/its client in the project area which are in force from time to time will have to be followed by the contractor.

B.11.3 If due to negligence and/or non-observance of safety and other precautions any accident/injury occurs to any other person/public, the contractor shall pay necessary compensation and other expenses, if so decided by the appropriate authority.

B.11.4 It shall be the responsibility of the contractor to provide security and insurance claim related information/reports etc. for the equipment/material belonging to BHEL/its customer and handed over to the contractor for transportation/erection/construction till these are taken over by BHEL after erection/construction or are returned to BHEL/its customer's store.

B.11.5 If due to Contractor's carelessness, negligence, non-observance of safety precautions, improper security arrangements or due to non-compliance of paper work needed for lodging insurance claim, damage to BHEL/its Customer's property and/or personnel should occur, and if BHEL is unable to recover its claim from the Insurance Company, the deficit will be recovered from the Contractor.

B.12.0 **STRIKES & LOCKOUTS:**

B.12.1 The Contractor will be solely responsible for all disputes & other issues connected with his workmen. In the event of the contractor's workmen resorting to strike or the contractor resorting to lockout & if the strike or the lockout so declared is not settled within a period of one month, BHEL shall have the right to get the work executed by employing its own men or through other agencies or both. The cost incurred by BHEL in this regard shall be recovered from the Contractor.

B.12.2 For any purpose whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL/its Customer.

B.13.0 **FORCE MAJEURE:**

B.13.1 The following shall amount to force majeure conditions:-

Acts of God, Act of any Government, war, Sabotage, riots, civil Commotion, Police Action, Revolution, Flood, Fire Cyclone, Earthquake, Epidemic & other similar causes over which the contractor has no control.

B.13.2 If the contractor suffers delay in the due execution of the contract, due to delays caused by force majeure conditions, as defined above, the agreed time of completion of the work covered by this contract may be extended by a reasonable period of time in consultation and after agreement of BHEL's clients/owner, provided that on the occurrence of any such contingency, the Contractor immediately reports to BHEL in writing the causes of delay. The Contractor shall not be eligible for any compensation on this account.

B.14.0 **GUARANTEE:**

The guarantee and defect liability period shall be 12 months from the date of commissioning of switchyard or handing over of entire civil works, whichever is later.

B.15.0 **ARBITRATION:**

(i) Except as provide elsewhere in this Contract, in case amicable settlement is not reached between the Parties, 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 relation to interpretation of any provision of the Contract; or, in any manner touching upon the contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL Unit/Region/Division issuing the Contract.

The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be New Delhi.

The cost of arbitration shall be borne as per the award of the Arbitrator.

Subject to the arbitration in terms of clause L above, the court at New Delhi shall have exclusive jurisdiction over nay matter arising out of or in connection with this Contract.

Notwithstanding the existence or 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 except where the contract has been terminated by either Party in terms of this contract.

(iI) In the event of 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 as mentioned in DPE OM No.4(1)/2013-DPE9GM)/ FTS-1835 dated 22.05.2018.

SECTION-C

SPECIAL CONDITIONS OF CONTRACT

SECTION - C-1

SPECIAL CONDITIONS OF THE CONTRACT

C-1.0 **INSTRUCTIONS TO TENDERERS:**

C-1.1 The tenderers are advised to physically visit the site and fully acquaint themselves with site conditions, transportation routes, various distances etc. No claim will be entertained by BHEL on ground of lack of knowledge and the contractor's rates shall be deemed to have taken this into account.

C-1.2 All temporary structures, hutments etc. set up by the contractor or their workmen during execution shall be removed prior to submission of final bill by the contractor.

C-1.3 The contractor in the event of this work awarded to him, shall establish an office at site and keep posted an authorised, responsible officer with a valid power of attorney for the purpose of the contract. Any order or instructions of the "Engineer" or his duly authorised representatives, communicated to the contractor's representative at site will be deemed to have been communicated to the contractor at his official address.

C-1.4 The contractor is required to commence the work within two weeks from the date of issue of Letter of Intent or as indicated in the LOI/Work Order, failing which the LOI/contract is liable to be cancelled and EMD/SD shall be forfeited.

C-1.5 BHEL reserves the right to split up the work and to award to more than one contractor or award only a part of the work to a contractor.

C-2.0 **PERFORMANCE BOND:**

The contractor shall submit Bank Guarantee of an approved Nationalised Bank as per BHEL proforma for an amount equal to 2.5% of the contract value as performance bond to get his balance 2.5% payment released at the discretion of the engineer as per the general conditions of contract. The performance Bank Guarantee shall remain valid up to successful completion of performance and guarantee tests of the station and taking over of the plant by BHEL/client of BHEL. Not withstanding the provisions of any other clause(s) of General Conditions of Contract, the contractor shall continue

to be responsible to execute all such works of repair, rectification and making good of defects, imperfections of other faults as may be required of the contractor in writing by the Engineer for the period as stated above. The proforma for submission of the BG shall be as per Annexure I.

Above clause no. C-2.0 shall be read in conjunction with clause no. C-29.5.2.

C-3.0 **SITE DRAINAGE:**

All water which may accumulate on the site during the progress of the works, or in trenches and excavations, including monsoon period shall be removed by the contractor from the site to the satisfaction of the Engineer at the contractor's expense.

C-4.0 **EXECUTION OF THE WORK:**

C-4.1 The work will be executed in a workman like manner and to the entire satisfaction of the Engineer and as per technical specifications of this tender, IS Codes, CPWD specifications etc. as applicable. In case of conflict regarding interpretations the decision of the Engineer shall be final and binding.

C-4.2 The Engineer will communicate or confirm his instructions to the contractor in respect of the execution of the work in a "Site Order Book" maintained at his office and confirm issue of such instructions by signing the relevant entries in this book. Such entries will rank as order or notices in writing within the intent and meaning of these conditions.

C-5.0 **INSPECTION AND STAGE APPROVAL OF THE WORK:**

C-5.1 BHEL/BHEL's Client or the owner or his duly authorised representative shall have at all reasonable times access to the contractor's premises of works and shall have the power to inspect drawings or any portion of the work, examine the materials and workmanship and shall have the authority to reject any work. This would be implemented through joint inspection by the representatives of the owner and BHEL and in the form the joint protocol without any extra claim of time and amount.

C-5.2 All work embracing more than one process shall be subject to examination and approval at each stage thereof and the contractor shall give due notice in writing to the Engineer when each stage is ready. In default of such notice being received, Engineer shall be entitled to approve the quality and extent thereof at any time he may choose and in the event of any dispute, the decision of the Engineer thereon shall be final and conclusive.

C-6.0 **COMPLETION OF WORK:**

C-6.1 The works shall be completed to the entire satisfaction of the Engineer and in accordance with the completion schedule as specified & agreed in the contract, and all unused stores and materials, tools, plant and equipment, temporary buildings and things shall be removed and the site work cleared of rubbish and all waste materials and delivered up clean and tidy to the satisfaction of the Engineer at the contractor's expenses.

C-6.2 BHEL shall have power to take over from the contractor from time to time such sections of the work as have been completed to the satisfaction of the Engineer. Such works however shall not be treated as have been completed until the entire works are executed to the satisfaction of the Engineer. The Guarantee period shall commence only after handing over the entire works.

C-7.0 **UNCOVERING AND ADJUSTMENT OF ERRORS:**

The contractor shall uncover any part of the works and/or make openings in or through the same as the Engineer may from time to time direct for his verification and shall reinstate and make good such part to the satisfaction of the Engineer. If any such part has been covered up or put out of view after being approved by the Engineer and is subsequently found on uncovering to have been executed in accordance with the contract, the expenses of uncovering and/or making opening in or through, reinstating and making good the same shall be borne by BHEL. In any other case all such expenses shall be borne by the contractor.

C-8.0 **DISCREPANCIES AND ADJUSTMENT OF ERRORS:**

C-8.1 The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawings & figures dimensions in preference to scale & special conditions in preference to general conditions.

C-8.2 In case of discrepancies between schedule of quantities, the specification and/or the drawings the following order of preference shall be observed :

a) Description in Schedule of Quantities.
b) Special Conditions.
c) Drawings.
d) Technical Specifications.
e) General Conditions of Contract.

C-8.3 If there are varying or conflicting provisions made in any one document forming part of the contract, the Engineer shall be the deciding authority with regard to the document.

C-8.4 Any error in the description, quantity in schedule of quantities or any omission there from shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to the drawings and specifications or from any of his obligations under the contract.

C-8.5 If on check there are found to be differences between the rates given by the contractor in words and figures or in the amount worked out by him in the schedule of quantities and general summary, the same shall be adjusted in accordance with the following rules :

a) In the event of discrepancies between description in words and figures quoted by tenderer, the description in words shall prevail.

b) In event of an error occurring in the amount column of schedule of quantities as a result of wrong extension of the unit rate and the quantity, the unit rate shall be regarded as firm and extension shall be amended on the basis of the rates.

c) All errors in totalling in the amount column and in carrying forward totals shall be corrected.

d) The totals of sections of bill of quantities amended shall be carried over to the general summary and the tendered sum amended accordingly. The tendered sum so altered shall, for the purpose of tender, be substituted for the sum originally tendered and considered for acceptance instead of the original sum quoted by the tenderer. Any rounding of quantities or in sections of bill of quantities or in general summary, by the tenderer, shall be ignored.

C-8.6 If neither drawings nor specifications contain any mention of minor details of construction which in the opinion of the Engineer, whose decision shall be final and conclusive, are reasonable and obviously and fairly intended for satisfactory completion of work, such details shall be provided by the contractor without any extra cost, as if they were specially mentioned and shall be deemed to be included in the contract.

C-9.0 **DEVIATIONS:**

C-9.1 The contractor shall not make any alternation in, addition to or omission from the work as described in the tender documents except in pursuance of the written instructions of the Engineer. No such deviation from the work described in the tender documents shall be valid unless the same has been specially confirmed and accepted by the Engineer in writing and incorporated in the contract.

C-9.2 The engineer may deviate, either by way of addition or deletion, from the work so described, provided that the contract sum be not thereby varied on the whole by more than the percentage set out in the tender documents. The value of all additions and deletions shall be added to or deleted from the contract sum.

C-9.3 Any objections by the contractor to any matter concerning the order shall be notified by him in writing to the Engineer within 7 (seven) days from the date of such order, but under no circumstances shall the work be stopped (unless so ordered by the Engineer) owing to differences or controversy that may arise from such an objection. In the absence of such a notification of objection by the contractor, he will be deemed to have accepted the order and conditions stated therein.

C-10.0 **VALUATION OF DEVIATIONS:**

C-10.1 If the rates for the additional, altered or substituted work are specified in the contract for the work either in the same section or in the other section of the BOQ of the same work, the contractor is bound to carryout the additional, altered or substituted work at the same rates as are specified in the contract for the work.

C-10.2 For item which are required for successful completion of work but not covered in the BOQ:- if items are available in DSR -2016, then valuation shall be done at DSR rate (DSR 2016) along with applicable % as per contract and same shall be binding to the bidder.

C10.2.1 EXTRA/ ADDITIONAL ITEMS OF WORK

If any extra or additional items, which are not incorporated in the BOQ schedule, have to be executed by the contractor, the rate of such extra or additional work shall be as per the following:

C10.2.2 If the items are not covered under price schedule, the rates have to be agreed upon mainly 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.

C-10.2.3 Under no circumstances the contractor shall suspend the work on the plea of non- settlement of rates falling under the clause or claim any compensation on that account.

C-10.2.4 BHEL reserves the right to carry out such extra/additional items of work through any other contractor or in such a manner as he considered advisable.

C-10.2.5 The contractor, on receipt of drawing from BHEL, shall inform BHEL (within 15 days) the rate / rates of item/items for carrying out the extra/additional item of work. This shall be supported by analysis of rates including prevailing market rates.

C--10.2.6 If the rate for additional, altered or substituted work is available in DSR 2016 then the rate shall be settled as per clause no. C-10.2.

C-10.3 Variation in quantity of work: - There may be variations in the individual item in the schedule during actual execution of the work. However, tendered unit rates shall remain firm up to a variation of ± 30% of the total value of the contract irrespective of variations in the quantity of individual items.

C-11. RECORD AND MEASUREMENT:

C-11.1 All items having a financial value shall be entered in BHEL measurement book so that a complete record is obtained of all works performed under the contract.

C-11.2 Work which fails to be measured in details shall be measured physically without reference to any local custom that may obtain excepting where it may otherwise be directed in the tender documents. The measurements shall be taken jointly by any person duly authorised on the part of BHEL and the contractor.

C-11.3 The contractor shall, without extra charge, provide assistance with appliances and other things necessary for measurement and shall bear all the cost of measurement of his work.

C-11.4 Measurement shall be entered in BHEL measurement book and signed and dated by both parties at the site on completion of measurement. If the contractor objects to any of the measurements recorded on behalf of BHEL, a note to that effect will be made in BHEL measurement book or against the item or items objected to and such note shall be signed and dated by both the parties engaged in taking the measurement.

C-11.5 If, as result of such objection, it becomes necessary to remeasure the work wholly or in part, the expense of such measurement shall be borne by the contractor.

C-11.6 If the contractor's representative fails to attend when required, the engineer shall have power to proceed by himself to take measurements & in that case these measurements shall be accepted by the contractor as final.

C-11.7 The contractor shall, once in every month, submit to the Engineer details of his claims for the work done by him up to and including the previous month, which are not covered by this contract agreement in any of the following respects:

a) Deviations from items and specifications provided in the contract documents.
b) Extra item/new items of work.
c) Quantities in excess of those provided in the contract schedule.
d) Items in respect of which rates have not been settled.

C-11.8 Contractor should, in addition, furnish a clear certificate to the effect that the claims submitted by him as aforesaid cover all his claims and that no further claims shall be raised by him in respect of the work done up to and including the period under report.

C-12.0 **CONTRACTOR'S SUPERVISION:**

C-12.1 The contractor shall either himself supervise the execution of the contract or shall appoint a competent agent approved by the Engineer to act in his stead.

C-12.2 The contractor, shall employ an engineer/agent having qualification in Civil Engineering from a recognised Institute for any work with a contract value exceeding Rs. Two Lakhs.

C-12.3 If the contractor fails to appoint a suitable engineer/agent as aforesaid, the Engineer shall have full powers to suspend the execution of work & stop payment of any amount that may have become due until such date as a

suitable engineer/agent is appointed and the contractor shall be held responsible for the delay caused to the work & no extension of time on this account shall be given to him.

C-12.4 Orders given to the contractor's engineer/agent shall be considered to have the same force as they had been given to the contractor himself.

C-12.5 The contractor or his agent shall be in attendance at the site during all working hours and shall superintend the execution of work with such additional assistance in each trade as the Engineer may consider necessary.

C-12.6 The contractor or his agent shall attend, when required and without making claim for doing so, either the office of the Engineer or work site to receive instructions.

C-12.7 The Engineer shall have full powers, and without assigning any reason, to require the contractor immediately to cease to employ in connection with this contract any agent, servant or employee whose continued employment, in his opinion, undesirable.

C-13.0 **LABOUR AND SUPERVISION STAFF:**

C-13.1 The contractor shall engage experienced supervisory staff and specially skilled labour for work under this contract.

C-13.2 The contractor shall have to make his own arrangement for maintenance of his T and P so as to minimise the down time.

C-13.3 The supervisory staff employed by the contractor shall ensure proper out-turn of the work and discipline on the part of the labour put on the job. The contractor in general should see that the works are carried out in a safe and proper manner and in coordination with the staff employed directly by BHEL or other contractors of BHEL or its client.

C-13.4 It shall be the responsibility of the contractor to ensure safe working, taking due precautions to avoid any accident and damage to other equipment and personnel. He shall be liable for all accidents, damages etc. to personnel and equipment etc. during the execution of the work.

C-13.5 The work shall be executed under the usual conditions like rain, insufficient space, improper approach roads etc. affecting major construction work and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with the others and proceed in a manner that shall

not delay or hinder the progress of work as a whole nor claim any compensation on such grounds.

C-13.6 The contractor will arrange necessary accommodation for his supervisory and workmen at his own cost. However, BHEL will approach customer for accommodation for contractor's staff and labour on chargeable basis, if possible.

C-14.0 **PLANT AND EQUIPMENT AT SITE:**

C-14.1 The contractor shall, at his own expenses, supply all tools, plant and equipment (hereinafter referred as T and P), testing instruments and consumables required for the execution of the contract.

C-14.2 All tools, plant & equipment brought to the site shall become the property of the BHEL & shall not be removed from the site without the written approval of the Engineer. When the work is finally completed or the contract is terminated for reasons other than the default of the contractor, he shall forthwith remove from the site all tools, plant, equipment etc. (other than those as may have been provided by BHEL) and upon such removal, the same shall revert in & become the property of the contractor.

C-15.0 **COMPLIANCE TO REGULATIONS AND BY LAWS:**

C-15.1 The contractor shall confirm to the provisions at any statute relating to the work and regulations and bylaws of any local authority and of any water and lighting companies or undertaking with whose system the work is proposed to be connected. He shall before making any variation from the drawings or the specifications that may be necessitated for such connections give the Engineer, notice specifying the variation proposed to be made & the reasons thereof & shall not carry out any such variation until he has received instructions from the Engineer in respect thereof. The contractor shall be bound to give all notices required by statute, regulations or by laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

C-16.0 **MATERIALS OBTAINED FROM EXCAVATION:**

C-16.1 Materials of any kind obtained from excavation on the site shall remain in property of BHEL & shall be disposed of as the Engineer may direct, at no extra cost.

C-17.0 **TREASURE, TROVE, FOSSILS, ETC:**

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the absolute property of BHEL and the contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing, shall immediately upon discovery thereof and before removal acquaint the Engineer with such discovery and carry out the Engineer's directions as to the disposal of the same.

C-18.0 **PROTECTION AND SECURITY:**

The contractor shall provide and maintain at his own expenses all lights, guards, fencing and Watch & Ward when and where necessary or required by Engineer for the protection and security of the works or for the safety and convenience of those employed on the works or the public.

C-19.0 **SITE OFFICE AND STORES:**

C-19.1 BHEL shall provide to the restricted extent, open space as made available to BHEL by its customer in as is where is basis for site office and stores, free of charge.

C-19.2 The contractor shall provide, construct and maintain at his own expenses the site office, material testing laboratory, stores & shall make his own arrangements for water, sanitation, access roads, electrification and cleanliness required for proper and efficient execution of work. The planning, setting and construction of these buildings shall have the approval of the Engineer & the contractor shall keep them tidy, clean and in sanitary condition to the satisfaction of Engineer.

C-19.3 After completion of work the contractor shall promptly dismantle, the distribution and other facilities that may have been erected, at his own cost and clear the area to the satisfaction of the Engineer and hand over the same to the Engineer.

C-20.0 **POWER & WATER :-** **DELETED**

C-20.1 The Construction Power shall be provided at one point on chargeable basis and recovery shall be made on actuals at the rate prevailing at the time of drawl of

power from RA bills as per Customer/BHEL norms. The contractor shall have to make their own arrangements, at their cost for distribution to various locations for their works including proper switch/fuse units, distribution boards, cables, poles etc. to ensure safety of men and equipment. Where required, the contractor shall employ diesel operative equipment in addition to electric operated ones to ensure timely completion of work.

In case BHEL is not able to supply power, contractor has to make his own arrangement and take a separate connection for all construction works.

BHEL shall not be responsible for any inconvenience caused due to any failure of lighting and power supply and no compensation for delay in works can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds. The contractor should ensure that the work in critical areas is not held up in the event of lighting and power breakdown and for the same he should have some stand by arrangement at his cost. 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 after restoration of electric supply so that over all progress of work is not affected. The contractor shall make proper arrangement of illumination at work place while working in late hours or in darkness.

C-20.2 Unless stated otherwise in the scope, The contractor shall make his own adequate arrangement for procuring clear water to be used in works at his own cost. However, water if available may be supplied to the contractor at one point on chargeable basis and recovery shall be made on actuals at the rate prevailing at the time of drawl of water from RA bills as per Customer/BHEL norms.

C-21.0 **TEMPORARY WORKSHOP, STORES, CONSUMABLES ETC:**

The contractor shall during the progress of work, provide, erect and maintain at his own expenses all necessary temporary workshops, stores, consumables, offices etc. required for the proper and efficient execution of the work. The planning, setting & erection of these buildings shall have the approval of the Engineer and the contractor shall at all time keep them tidy & in a clean and sanitary condition on to the entire satisfaction of the Engineer.

C-22.0 **MATERIALS:**

C-22.1 The contractor shall at his own expenses, provide all materials required for the work. All materials to be provided by the contractor shall be in conformity with the specifications laid down in the contract & the contractor shall, if

requested by the Engineer, furnish proof to the satisfaction of the Engineer that the materials so comply.

C-22.2 The contractor shall, at his own expenses and without delay, supply to the Engineer samples of materials proposed to be used in the works. The Engineer shall within seven days of supply of samples or within such further period as he may require, intimate to the contractor in writing, whether samples are approved by him or not. If samples are not approved, the contractor shall forthwith arrange to supply to the Engineer for his approval fresh samples complying with the specifications laid down in the contract. Any delay in approval of samples (original or fresh ones) shall not make the contractor eligible for any compensation.

C-22.3 The Engineer shall have full powers to require removal of any or all of the materials brought to site by the contractor which are not in accordance with the contract specifications or do not conform in character or quality to samples approved by him. In case of default on the part of contractor in removing rejected materials, the Engineer shall be at liberty of have them removed by other means. The Engineer shall have full powers to procure other proper materials to be substituted for rejected materials and in the event of the contractor refusing to comply, he may cause the same to be supplied by other means. All costs, which may attend upon such removal and/or substitution shall be borne by the contractor**.** In such cases, handling charges @ 15% per annum or 1.25% per month or part thereof will be recovered from the contractor in addition to the actual procurement cost of material. The period for imposing handling charges is to be reckoned from the date of making payment / LR for lifting material to / by Subcontractor from authorized source, whichever is earlier to

a) The date of LR for dispatch of finished product by the supplier / fabricator.
b) Till date of consumption by the contractor as recorded in the MB.

C-22.4 The contractor shall indemnify BHEL, its representative or employees against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties or other charges which may be payable in respect of any article or materials or part thereof included in the contract. In the event of any claim being made or action being brought against BHEL or any agent, servant or employee of BHEL in respect of any such matters as aforesaid, the contractor shall immediately be notified thereof, provided that such indemnity in complying with the specific directions issued by BHEL but the contractor shall by any royalties or other charges payable in respect of any such use, the amount so

paid being reimbursed to the contractor only if the use was the result of any drawings and/or specifications issued after submission of the tender.

C-22.5 All charges on account of octroi, royalty and all other taxes & duties on materials obtained for the works from any source shall be borne by the contractor.

C-22.6 The Engineer shall be entitled to have tests carried out as specified in the contract for any materials supplied by the contractor other than those for which, as stated above, satisfactory proof has already been furnished, at the cost of the contractor & the contractor shall provide at his expenses all facilities which the Engineer, may require for the purpose. If no test are specified in the contract, and such tests are required by the engineer, the contractor shall provide all facilities required for the purpose and the charges for these tests shall be by the contractor only. The cost of materials consumed in tests shall be borne by the contractor in all cases except when otherwise provided.

C-23.0 **GENERAL:**

C-23.1 Material required for works, shall be stored by the contractor only at places approved by the Engineer. Proper storage and safe custody of material including construction stores shall be the responsibility of the contractor for which no charges shall be claimed by the contractor.

C-23.2 BHEL's officials concerned with the contract shall be entitled at any time to inspect and examine any materials intended to be used in or on the works, either on the site or at factory or workshop or other place(s) where such materials are assembled, fabricated, manufactured or at any place(s) where these are laying or from which these are being obtained and the contractor shall give such facilities as may be required for such inspection and examination.

C-23.3 All materials brought to the site shall become and remain the property of BHEL and shall not be removed off the site without the prior written approval of the engineer. But whenever the works are finally completed and advance, if any, in respect of any such material is fully recovered, the contractor shall at his own expense forthwith remove from the site all surplus material originally supplied by him and upon such removal, the same shall revert in and become the property of the contractor.

C-24.0 **DELAY AND EXTENSION OF TIME:**

If, in the opinion of the Engineer, the work is delayed

i) by reason of abnormally bad weather, or

ii) by reason of serious loss or damage by fire, or

iii) by reason of civil commotion, local combination of workmen, strike or lockout, affecting any of the trades employed on the work, or

iv) by delay on the part of the agency or tradesman engaged by the BHEL in executing work not forming part of the contract, or

v) by reason of any other cause which in the absolute discretion of the Engineer is beyond the contractor's control, then in any such case, the Engineer (or higher authority) may make fair and reasonable extension in the completion dates of the individual items of work of the contract as whole. Such extension which will be communicated to the contractor by the Engineer in writing shall be final and binding on the contractor. No other claim in this respect for compensation, idle labour or otherwise howsoever is admissible. Upon the happening of any such event causing delay the contractor shall immediately give notice thereof in writing to the Engineer but shall nevertheless use constantly his best endeavour to prevent or make good the delay and shall do all that may reasonably be required to the satisfaction of the Engineer to proceed with the work.

Above clause No. C-24.0 stands deleted. Please refer Annexure to conditions of contract for civil

C-25.0 **COMPENSATION/ PENALTY FOR DELAY IN COMPLETION:**

If the contractor fails to complete the works within the specified contractual period or extension of time granted by the Engineer, the BHEL shall have the right to deduct liquidated damage/penalty @ 0.5% of the contractual value per week of delay or part thereof, subject to a maximum of 10% of the contract value . Once the maximum limit of delay is reached (i.e. 20 week of delay) BHEL may consider termination of the contract and forfeit the Security deposit without prejudice to the other remedies under the contract. Amended/ revised contract value (Excluding ORC, Extra Works, Supplementary/ Additional Items and PVC) shall be considered for calculating LD/ penalty.

C-26.0 PRICE VARIATION:

DELETED

DELETED

Above clause No. C-26.0 stands deleted. Please refer Annexure to conditions of contract for civil works.

C-27.0 **OVER RUN CHARGES:**

C-27.1 DELETED

Above clause No. C-27.0 stands deleted. Please refer Annexure to conditions of contract for civil works.

C-28.0 **OCTROI AND OTHER DUTIES:**

C-28.1 All charges on account of Octroi and/or other duties on materials obtained for the work shall be borne by the contractor.

C-29.0 **TERMS OF PAYMENT:**:

C-29.1 The contractor shall be paid monthly running bill to a maximum of 95% (retaining 5% from each running bill) of value of the works actually executed on site provided the work has been executed to the satisfaction of the Engineer. ~~The payment for tender work shall be admitted progressively on completion of work. However, work is to be executed as per time schedule prescribed by Engineer-In-Charge. In case of delay due to contractor, payment made equivalent to amount of work done in tower, equipment and trenches will be withheld from successive bills~~. From payable amount recoveries such as security deposit, income tax etc. would be made as per rule. The certificate of the Engineer regarding such approval and passing of sums so payable shall be final and conclusive against the contractor

C-29.2 The Engineer shall after a measured bill allow and certify payment to the contractor on the basis of abstract measurement bill submitted by contractor. However, the usual recoveries would be effected from bill.

C-29.3 Any certificate relating to the work done may be modified by any subsequent interim certificates or by the final certificate and no certificate of the Engineer supporting an advance payment shall of itself be conclusive evidence that any work or materials to which it relates are in accordance with the contract.

C-29.4 All intermediate payments shall be regarded as advance against the final payment only and shall not be considered as an admission of the due performance of the contract or any part thereof in any respect of the occurring of any claim whatsoever. Such intermediate payments shall not conclude, determine or effect in any way the powers of the Engineer as to the final settlement and adjustment of the account of otherwise, or in any way vary of affect the contract. To this affect the contractor shall submit the final bill, which shall contain the complete up-to-date measurements for the total work done.

C-29.5 The conditions for the release of last 5% retention money shall be as follows:

C-29.5.1 2.5% payment shall be released along with the final bill on completion of total work as certified by BHEL site.

C-29.5.2 Balance 2,5% of payment shall be released on completion of guarantee period. However these retention money can be released on submission of B.G. of equivelent amount valid till guarantee period.

The contractor shall guarantee the work under the scope of the contract for a period of 12 months from the date of start of the guarantee period as certified by BHEL site (i.e completion of total work under the scope and or taking over by BHEL/owner),and shall rectify free of cost all defects due to faculty supply or work done. In case the contractor fails to repair/ replace the defective work within the time specified by BHEL, BHEL may proceed to undertake such repair/replace such defective work at contract's risk and cost without prejudice to any other right and recover the sum from security deposit/BG/ any dues.

Above clause No. C-29.5.2 shall be read in conjunction with clause no. C-2.0.

C-29.6 Income Tax at the prevailing rate on gross value of work done and applicable surcharge shall be deducted from the running account bills unless exempted by the Income Tax Office.

C-29.7 **The prices to be quoted by bidder should be EXCLUSIVE of GST**

Please refer Annexure to conditions of contract for civil works for detail terms and conditions of taxes & duties.

C-30.0 **CEMENT AND STEEL: (Pl. also refer Annexure to conditions of contract for civil works for issue of Cement and steel in case of BHEL supply as mentioned in BOQ)**

C-30.1 The theoretical quantity of cement to be used in works shall be calculated on the basis of the designed mix concrete and as per CPWD norms for all the other items based on latest edition in use in CPWD works Delhi at the time of submitting tender.

C-30.2 The theoretical weight of reinforcing steel shall be derived on the basis of sectional weights as per relevant Indian Standards & the lengths for purpose of consumption/reconciliation and payment. No claim shall be entertained from the contractor as such for the difference in theoretical/actual weight of steel during reconciliation or payment for fixing.

C-30.3 Clogging of cement and rusting of steel should be avoided to the maximum extent possible without hampering the continuity of construction/erection. In case due to any cause, attributable to contractor such clogging of cement and/or rusting of steel occurs rendering the same unusable, the contractor shall remain responsible to make good the loss at his own cost.

C-30.4 The contractor shall plan & arrange procurement of steel, cement and other materials as required every month in consultation with the Engineer. Failing compliance to this requirements, further execution of work of the contractor by the BHEL may be suspended and no compensation for delay in the execution of the work or suspension of the works caused on account of the above shall be entertained.

C-30.5 No materials shall be issued to the contractor except for those specified in Section C-22.0. Contractor shall maintain record of day to day issue and consumption of materials at site like cement, bitumen, lead, paint etc. The contractor will have to make his own arrangements at his own cost for procurement of all materials as required for the works and of such quality as per specification and acceptable to the Engineer.

C-30.6 In case any additional expenditure is incurred in work arising out of the faulty execution of such work by the contractor, such additional expenditure shall be borne by the contractor.

C-31.0 **QUALITY ASSURANCE:**

C-31.1 The contractor has to establish at site the field testing facilities for testing of civil construction materials & concrete cubes and other works as required under the approved Field Quality Plan of BHEL/its customer for ensuring the proper quality, grade and strength of the materials used in the construction. If further test is required by the Engineer to be carried from outside laboratory, the cost of the same shall be borne by contractor (copies of the Field Quality Plan & other Inspection & Test procedures to be followed shall be issued after mobilisation by the sub-contractor).

C-31.2 The contractor has to arrange for calibration of all test equipment/instruments brought by him as per the requirement of BHEL calibration procedure as directed by the Engineer. The test certificates/calibration certificates shall have to be submitted. BHEL site shall control use of these equipment/ instruments by allotting control number and permitting use of only those equipment/ instruments which are under calibrated status.

C-32.0 **CLEARANCE OF SITE AND REPAIRS:**

C-32.1 The contractor has to clear the site/area where mechanical and electrical erection work is to be commenced/or in progress. The contractor shall remove construction materials and equipment lying in the vicinity and causing

obstruction in the erection work within 24 hours notice. In case, he fails to clear the site, this will be done at his risk and cost by BHEL. For the works executed by the contractor, the deficiencies pointed out must be attended within specified period.

C-33.0 **PROTECTION OF WORK:**

C-33.1 The contractor shall have total responsibility of protecting his works till it is finally taken over by the Engineer. No claim will be entertained by the Engineer for any damage or loss to the contractor's works and the contractor shall be responsible for the complete restoration of damaged works to its original condition to comply with specifications and drawings. Should any such damage to the contractor's works occur because of other party not under his supervision or control, the contractor shall make his claim directly with the party concerned. The contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such disputes. The contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such disputes.

C-34.0 **RECORD FOR MATERIALS CONSUMED:**

C-34.1 The contractor has to maintain and furnish to the Engineer the record of materials procured and consumed in the works for each activity. The statement showing the theoretical vis-s-vis actual consumption of specified materials, such as structural/reinforcement steel, cement, bitumen, lead, paint etc. shall be enclosed along with the running bills submitted by the contractor. Contractor has to also furnish the test results of the concrete cubes, bricks, stone aggregate and other materials used in work as per IS specifications along with the running bills.

C-35.0 **SECURED ADVANCE ;**

C-35.1 DELETED

a)
b)
c)
d)
e)
f)

C-35.2

DELETED

Above clause No.C-35.0 stands deleted. Please refer Annexure to conditions of contract for civil works

ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC AND CIVIL WORKS

The following terms and conditions shall form a part of the tender document. If any discrepancies found between below mentioned clauses and clauses in the Conditions of Contract for Erection (DOC. NO. – TB-ETC-GCC, REV.-02, dated 20th JUNE, 2005) and Civil Works (Doc. No. – TB-Civil-GCC, Rev.-02), the clauses mentioned in this annexure shall prevail.

A. Conditions of Contract for Erection & Civil works

A. 1.0 GENERAL INSTRUCTION

1.1 **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.

1.2. 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., tenderer 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.

A.2.0 PROCEDURE FOR SUBMISSION OF SEALED TENDERS

A.2.1 Bidders may please refer Cl no. 2 to Cl no. 4 of the Notice inviting tender.

A.2.2 The tenders received after the specified time of their submission shall be treated as 'Late Tenders' and shall not be considered under any circumstances.

A.2.3 Tenders shall be opened by the officers concerned of BHEL at the time, date and venue as specified in the tender enquiry. Tenderer or their authorized representative may witness the bid opening.

A.2.4 The tenderer shall closely pursue all the clauses, specifications and drawings indicated in the Tender Documents before quoting. Should the tenderer have any doubt about the meaning of any portion of the Tender Specifications or find discrepancies/omission in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, scope of work etc. he shall at once contact the authority inviting the tender for clarification before the submission of the tender.

A.2.5 Before submission of offer, the tenderers are advised to inspect the work & the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, sourcing 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 on any of these conditions/ resources.

A.2.6 Tenderer must fill up all the schedules and furnish all the required information as per the instructions given in various sections of the tender specification. Each and every page of the Tender Specification must be SIGNED AND SUBMITTED ALONG WITH THE OFFER by the Tenderer in token of complete acceptance thereof the information furnished shall be complete by itself.

A.2.7 The tenderer shall quote the rates in English Language and international numerals. Total price offered should be entered in figures as well as in words. For the purpose of the tender, the metric system of units shall be used.

A.2.8 T**he tenderer shall quote a percentage above/ below/At Par the rates shown in the "Bill of Quantities Cum Price Schedule (Annexure-I)" of subject tender.**

A.2.9 **The quoted percentage will apply to the individual items of "Annexure-I i.e Bill of Quantity Cum Price Schedule" uniformly.**

A.2.10 All entries in the tender shall either be typed or be written legibly in ink. Erasing and overwriting are not permitted and may render such tender liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

A.2.11 The tenderer must provide the registered e-mail of their registered office along with the addresses and authorised phone/mobile nos.

A.3.0 ADJUSTMENT PRICE DISCREPANCY (IES): - Not Applicable being e procurement.

A.4.0 EVALUATION OF TECHNICAL BIDS

4.1 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.

4.2 In case the same qualifying experience is claimed by more than one bidder due to subletting of work by main contractor to subcontractor (s) then following conditions shall be applicable.

a) For labour + consumable contract without material and T&P:
Benefit of work experience shall be given to the subcontractor who has actually executed job and not to the contractor offloaded down the line.

b) For contract with complete scope i.e. with materials, T&P, labour and consumable:

i) Benefit of work experience shall be given to the subcontractor who has actually executed job and not to the contractor offloaded down the line.

ii) If the contractor offloads the labour and/or T&P portion only, benefit of work experience shall be given to the main contractor and not to the subcontractor who has executed only as labour supply contractor

The bidder's qualification shall be subject to submission of documentary proof. BHEL

reserves the right to ask for further proofs including submission of TDS certificates/ for the said job

4.3 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/ form 26AS /bills for the said job.

4.4 Credentials of all the bidders participating in open tender will be scrutinized thoroughly by the nominated committee w.r.t. the pre-qualifying requirement for the tender.

4.5 Details of qualifying work(s) executed by the bidder will be forwarded to the principle employer for verification of the work with respect to completion, commencement & completion date, scope and value of the work executed. Performance feedback of the bidder will also be sought from the principle employer.

4.6 BHEL may conduct onsite verification of at least one of the qualifying works to verify completion of the work and evaluate capability and performance of the bidder.

4.7 The bidder representative may be called for the discussion with the committee. His originals may be verified by the committee. In addition to above their organization chart and detailed list of manpower, tools & plants and technical capability may be discussed and ascertained by the committee.

A.5.0 **EVALUATION OF PRICE BIDS**

5.1 Price Bids of unqualified bidders shall not be opened.

5.2 The offers will be evaluated on the basis of total price basis (refer "BILL OF QUANTITY AND PRICE SCHEDULE) as shown in the price bid.

5.3 Reasons for rejection of the bid shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unconditional acceptance of LOI /LOA from the successful bidder

5.4 In case of electronic Reverse Auction, the unqualified bidders shall not be allowed to participate in reverse auction.

A.6.0 DOCUMENTS TO BE ENCLOSED:

Full information shall be given by the tenderer in respect of the following.

6.1 Tenders shall be signed by persons duly authorized/empowered to do so. An attested copy of the Power of Attorney to be submitted in all cases except where the sole proprietor is the signatory to the tender documents

6.2 *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.

6.3 AUDITED *BALANCE SHEET AND INCOME TAX RETURN*:

Copy of Audited Balance sheets and income tax return for last three financial years (financial years as specified in PQR)

6.4 *SOLVENCY CERTIFICATE:*

If asked in NIT, bidder should submit solvency certificate (not older than 12 months from date of tender notification) issued by any scheduled bank.

6.5 *DOCUMENT RELATED TO INCORPORATION OF BUSINESS ENTITY:*

6.5.1 *IN CASE OF INDIVIDUALTENDERER:*
His/her full name, address and place & nature of business.

6.5.2 *IN CASE OF PARTNERSHIP FIRMS:*
The names of all the partners with address. A copy of the partnership deed/instrument of partnership duly certified by the Notary shall be enclosed.

6.5.3 *IN CASE OF COMPANIES:*
Date & place of registration including date of commencement certificate in case of Public Companies and the nature of business carried on by the company. Certified copies of Memorandum and Articles of Association are also to be furnished.

6.6 Offer forwarding letter over the letterhead

6.7 *Declaration sheets (As per Prescribed format) over the letter head*

6.8 *No Deviation certificates (As per Prescribed format) over the letterhead*

6.9 GST Registration certificate

All the data required to be enclosed with the tender need to be furnished neatly typed, signed & stamped in the given formats only (in the form of separate sheets) failing which the tender may be considered as incomplete and is liable for rejection. Documentary proof wherever necessary also need to be enclosed.

A.7.0 VALIDITY OF OFFER

The rates in the Tender shall be kept valid for acceptance for a minimum period of **Four Months** from latest due date of offer submission (including extension(s), if any). In case BHEL (Bharat Heavy Electricals Limited) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderer.

A.8.0 REJECTION OF TENDER & OTHER CONDITIONS:

8.1 The decision of 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 Tenderer as per NIT
(c) To award the work in part as per NIT
(d) In either of the contingencies stated in (b) and (c) above to modify the time for completion suitably.

8.2 Conditional tenders, unsolicited tenders, containing abnormally low/ unworkable rates & amounts, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc. are liable to be rejected.

8.3. 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 'NIT'. The decision of BHEL will be final in this regard.

8.4 In case of any adverse information is received concerning performance, capability or conduct of the tenderer after issue of tender enquiry or opening of tender or award of work, BHEL reserves the right to reject the offer at any stage as deemed fit.

8.5 Offers with inadequate Tools & Plants, Manpower Deployment Plan, and Method Statement are liable for rejection.

8.6 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at its discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at its discretion unless the firm retains its character.

8.7 BHEL will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. BHEL 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.

8.8 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 moneys due.

8.9 Canvassing in any form in connection with the tender is strictly prohibited and the tenders submitted by the tenderer who resorts to canvassing are liable to be rejected.

8.10 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 tender shall be informed to the fact as per specified format along with the offer, failing this, BHEL may, at its sole discretion reject the tender or cancel the contract and forfeit the Earnest Money/ Security Deposit.

8.11 The successful tenderer should not sub-contract the part or complete work detailed in the tender specifications without written permission of BHEL's Site In charge/ Sector Head. For this the contractor shall submit request application to site in charge supported by credentials (financial and technical) and resource mobilisation schedule of such sub-contractor. Such request is to be considered in consultation with end user/ultimate customer (if applicable) and subject to satisfactory credentials, fund flow arrangement between them, HSE and other contractual and statutory obligations. The tenderer is solely responsible to BHEL for the work awarded to him.

8.12 The Tender submitted by a 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.

8.13 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.

8.14 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.

A.9.0 **NO DEVIATIONS ARE ACCEPTABLE**: -

Offers with deviations are likely to be rejected. However, if the bidder insists on any technical or commercial deviations from the specifications and / or tender conditions, **the price implication, if any, of withdrawing the deviations must be submitted along with the price bid in a separate sealed envelope** super-scribed "**PRICE IMPLICATION FOR WITHDRAWAL OF DEVIATIONS**". No price implication for withdrawal of deviation shall be accepted at a later date, after opening of technical bid.

A.10.0 Consortium**/** JV bidding is not allowed under this NIT.

B. EARNEST MONEY DEPOSIT

Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) mentioned in NIT.

1. Mode of EMD deposit:

Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) mentioned in NIT.

EMD can be submitted in any one of the following modes:

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

ii) Electronic Fund Transfer credited in BHEL account (before tender opening). Details of BHEL account mentioned in tender document.

iii) Banker's cheque/Pay order/Demand Draft, in favour of 'BHEL' and payable at New Delhi (Along with offer)

iv) Fixed Deposit Receipt (FDR) issued by schedule Banks/Public Finance Institutions as defined in the companies ACT (FDR should be in the name of the contractor, a/c BHEL)

v) Insurance Surety Bonds

In addition to above, the EMD amount in excess of Rs Two lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.

For example: In case the EMD amount is Rs. 20,00,000/- and bidder want to submit EMD in form of BG then amount of Rs. 2,00,000/- atleast to be submitted in the form of modes mentioned in sl. No. i) to v) above and BG for balance Rs. 18,00,000/- can be submitted.

No other form of EMD remittance shall be acceptable to BHEL.

Note: The Submission of EMD is compulsory for subject tender. In case requisite Amount of EMD not submitted by the bidder along with offer or before technical bid opening, the offer shall not be considered for evaluation and the offer shall be rejected.

2. **Forfeiture of EMD**

EMD by the bidder will be forfeited as per NIT conditions, if

i) After opening the tender and within the offer validity period, the bidder revokes his tender or makes any modification in his tender which is not acceptable to BHEL.

ii) The contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/contract.

3. EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provision of extant "Guidelines on Suspension of business dealing with Supplier/contractors" and forfeited/ released based on the action as determined under these guidelines.

4. In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after award of work.

5. EMD shall not carry any interest.

6. EMD of successful bidder shall be retained as part of Security Deposit.

7. Bidders may please note that "One Time EMD" provision stands deleted. Hence, bidders who have deposited Rs. 2 Lakh as 'One Time EMD' with BHEL are also required to submit the requisite amount of EMD.

8. **No MSE benefits shall be given to MSEs bidder for WORKS CONTRACT. Please refer clause no. Q (facilities provided to MSEs) for detail.**

C. SECURITY DEPOSIT

Security Deposit means the security provided by the Contractor towards fulfilment of any obligations in terms of the provision of the contract.

1. Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work. **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.**

2. Mode of Security deposit:
The security Deposit should be furnished **before start of the work** by the contractor.

"Bidders agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of Performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder.

Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT / Contract, from the bills along with due interest".

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

i) Cash (as permissible under the extant Income Tax Act)

ii) Local cheques of scheduled banks (subject to realization) / Pay Order / Demand Draft / Electronic Fund Transfer, in favour of BHEL.

iii) 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 enclosed with general conditions of contract.

iv) 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 and duly discharged on the back.

v) Securities available from Indian 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 endorsed/hypothecated/pledged, as applicable, in favour of BHEL and duly discharged on the back).

vi) Insurance Surety Bonds.

(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)

3. **Submission of Security Deposit:**

   i) At least 50 % of the required Security Deposit, including the EMD, shall be submitted before start of work. Balance of the Security Deposit can be submitted by way of deduction of 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.

   ii) In case of delay in submission of performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder.

   iii) If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or it shall be recovered from payment/s due to the Contractor.

   iv) 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, at the discretion of BHEL.

4. The BG shall be submitted only through the Banker. Along with the BG, the Bank shall also furnish a letter of confirmation (in the prescribed formats enclosed with general conditions of contract).

5. The validity of the Bank Guarantee furnished towards Security Deposit shall be up to three months more than the period of completion of work as stipulated in the LOI and the same will be kept valid by proper renewal till the completion of the work.

6. 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 fulfil any of the contractual obligations or in the event of termination of contract as per terms and conditions of the contract. BHEL reserves the right to set off the Security Deposit, against any claims of any other contracts with BHEL.

7. **Conditions for acceptance of bank guarantees**

   Contractors are advice to obtain Bank Guarantee preferably from any of the following BHEL consortium banks

Sl. No.	Name of Bank	Sl. No.	Name of Bank
1	State Bank of India	11	Punjab National Bank
2	Canara Bank	12	Union Bank of India
3	IDBI Bank Limited	13	Yes Bank Limited
4	ICICI Bank Limited	14	RBL Bank Ltd.
5	HDFC Bank Limited	15	Standard Chartered Bank
6	Axis Bank	16	Indian Overseas Bank
7	IndusInd Bank Limited	17	Kotak Mahindra Bank Limited
8	Bank of Baroda	18	Federal Bank Limited
9	Exim Bank	19	Hongkong and Shanghai Banking Corporation Ltd
10	Indian Bank		

Bank Guarantees from Banks outside BHEL's consortium shall be as below:

The Bank Guarantees of all Public sector banks can be accepted (in addition to consortium banks)

The Bank Guarantees of Co-operative banks shall not be accepted.

Bank Guarantees of other than consortium bank and public sector bank can be accepted subject to an overall exposure limit (at New Delhi) of Rs. 10 crores for banks with net worth of more than Rs. 500 crores as on last balance sheet date and Rs 5 crores for banks with net worth between Rs. 350 to Rs 500 crores (A certificate and copy of latest Balance Sheet to be given by the Bank at the time of submission of Bank Guarantees).

In case of private sector banks, a clause to be incorporated in the text of Bank Guarantee that it can be enforceable by being presented at any branch of the bank.

In case of foreign vendors, the bank guarantees issued by foreign banks may be confirmed by our consortium bank in India.

In case of Bank Guarantees given by Non-Consortium banks (Private sector or Public sector), the Bank Guarantees are to be enforceable in New Delhi or the town/ city in which the sector office is located.

8. **RETURN OF SECURITY DEPOSIT:**

If the contractor duly performs and completes the work in all respects to the entire satisfaction of BHEL and presents an absolute "No demand certificate", returns properties belonging to BHEL, taken, borrowed or hired by him for carrying out the said works, and furnishes performance bond BG in the prescribed proforma, Security Deposit will be released to the contractor after deducting all costs, expenses and other amounts that are to be paid to BHEL under this contract or other contracts entered into with the contractor.
It may be noted that in no case the Security Deposit shall be refunded/released prior to passing of final bill

D. Bank Account Details for submission of EMD/ Security Deposit through electronic fund transfer mode.

NAME OF THE COMPANY	**BHARAT HEAVY ELECTRICALS LTD**
ADDRESS OF THE COMPANY	**TRANSMISSION BUSINESS GROUP,** **PLOT NO. *25*, SECTOR- 16A, NOIDA – 201301 (U.P.)**
NAME OF BANK	**STATE BANK OF INDIA**
NAME OF BANK BRANCH	**CAG-II NEW DELHI (17313)**
CITY	**NEW DELHI**
ACCOUNT NUMBER	**00000030206227732**
ACCOUNT TYPE	**CASH CREDIT**
IFSC CODE	**SBIN0017313**

E. <u>Payment terms:</u> Clause No. C.2.0 of ETC works and C.29.0 of CIVIL Works stands deleted. Now the Payment terms clause for this Contract shall be read as below.

(***Description of work in this section is made for payment purpose only and the scope is not limited to the activities mentioned below. Please refer technical documents for complete scope of work***)

1.1. No Mobilization Advance shall be paid.
1.2. For BOQ items Sl. No. A of BOQ -Annexure-I

1.2.1. 100% of the contract item price against completion of check survey, submission of invoice and certification/approval of Engineer incharge of BHEL.

1.3. **For BOQ items Sl. No. E & F of BOQ -Annexure-I – ETC WORKS (Complete scope of work)**

1.3.1. 10% of the contract item price on the monthly progressive bills on pro rata basis for receipt, material including arranging crane for unloading, maintaining proper records of receipt & storage in Field Quality Plans (FQPs) and as certified by BHEL Engineer.

1.3.2. 60% of the contract item price on the monthly progressive bills on pro rata basis after arranging necessary calibrated tools/tackles required for erection, submitting calibration reports, qualification/experience certificates of welder/Electrician/other staff, levelling, alignment, tightening and completion of erection including maintaining proper records of installation in FQPs and as certified by BHEL, Engineer.

1.3.3. 10% of the contract item price on the monthly progressive bills on pro rata basis on arranging calibrated testing equipment, submission of calibration reports, testing of equipment including maintaining proper records of testing in FQPs and as certified by BHEL, Engineer. BOQ items, which are not required to be tested as per FQP, shall be qualified for release of payment on prorate basis after completion of testing of all equipment's of corresponding bay (As per SLD/ layout)

1.3.4. 10% of the contract item price after completion of satisfactory commissioning and submission of complete records of erection/testing/commissioning /charging protocol as per FQPs for the corresponding bay.

1.3.5. Last 10% of the contract item price after all test reports as per contract are jointly witnessed and signed by BHEL/customer, "As Built" changes are incorporated in relevant drawings, material reconciliation and substation is handed over to the Owner / Customer. If the contract is for more than one sub-station, then the same will be released after successful handing over of each sub-station. If for any reason, the handing over is delayed for reasons beyond the control of the contractor, in such case this payment will be released against commissioning certificate issued by the BHEL / customer and against submission of final bill of individual substation.

1.4. For BOQ items Sl. No. B, C & D of BOQ -Annexure-I (Supply in contractor's scope)

1.4.1. 80% of the contract item price on the monthly progressive bills on prorate basis after supply, receipt of the material at site, unloading, proper storage and as certified by site in charge.

1.4.2. 10% of the contract item price on the monthly progressive bills on prorate basis after material erection as certified by BHEL site In-charge on prorate basis after erection.

1.4.3. Last 10% payment shall be released as per 1.3.5 above.

1.5. For BOQ items Sl. No. G of BOQ -Annexure-I – CIVIL WORKS

1.5.1. The contractor shall be paid monthly running bill to a maximum of **95% (retaining 5% from each running bill)** of value of the works actually executed on site provided the work has been executed to the satisfaction of the Engineer. From payable amount recoveries such as security deposit, income tax etc. would be made as per rule. The certificate of the Engineer regarding such approval and passing of sums so payable shall be final and conclusive against the contractor.

1.5.2. The Engineer shall after a measured bill allow and certify payment to the contractor on the basis of abstract measurement bill submitted by contractor. However, the usual recoveries would be effected from bill.

1.5.3. Any certificate relating to the work done may be modified by any subsequent interim certificates or by the final certificate and no certificate of the Engineer supporting an advance payment shall of itself be conclusive evidence that any work or materials to which it relates are in accordance with the contract.

1.5.4. All intermediate payments shall be regarded as advance against the final payment only and shall not be considered as an admission of the due performance of the contract or any part thereof in any respect of the occurring of any claim whatsoever. Such intermediate payments shall not conclude, determine or effect in any way the powers of the Engineer as to the final settlement and adjustment of the account of otherwise, or in any way vary of affect the contract. To this affect the contractor shall submit the final bill, which shall contain the complete up-to-date measurements for the total work done.

1.5.5. The conditions for the release of **last 5% retention money** shall be as follows:

1.5.5.1. 2.5% payment shall be released along with the final bill on completion of total work as certified by BHEL site.

1.5.5.2. Balance 2.5% of payment shall be released on completion of guarantee period. However, this retention money can be released on submission of B.G. of equivalent amount valid till guarantee period.

1.5.6. The contractor shall guarantee the work under the scope of the contract for a period of 12 months from the date of start of the guarantee period as certified by BHEL site (i.e. completion of total work under the scope and or taking over by BHEL/owner), and shall rectify free of cost all defects due to faculty supply or work done. In case the contractor fails to repair/ replace the defective work within the time specified by BHEL, BHEL may proceed to undertake such repair/replace such defective work at contract's risk and cost without prejudice to any other right and recover the sum from security deposit/BG/ any dues.

F. Overall Quantity variation-

The individual quantity can vary to any extent or may be deleted for which no compensation will be payable to the contractor and **the rates will remain firm**. Also, the rate of each item remains firm as long as the variation in the total value of work executed under the contract including extra items if any remains **within plus/minus 30 percent of the contract value**. In case the actual value of executed work including extra work on completion of work becomes less than 70% of the basic/original contract value than the following method shall be adopted.

The actual executed value shall be raised by 7 % (For arriving at the final payment against work executed) subject to the condition that total value of work executed plus increase by 7% as above shall be limited to 70% of the basic/original contract value. The rate quoted shall be firm irrespective of any upward variation in the contract price.

G. OVER RUN COMPENSATION:

This Clause is not applicable for this Contract.

H. Price Variation Clause: -

Price variation clause is not applicable for this contract.

I. ISSUE OF MATERIAL BY BHEL (IF APPLICABLE AS PER BOQ AND SCOPE): -

1	**ISSUE OF MATERIAL BY BHEL (IF APPLICABLE AS PER BOQ AND SCOPE)**
i)	**Issue of Cement:**
1	Cement is issued through Bag being supplied from manufacturer/stockiest; the same shall be stored in cement stores of batching plant and necessary assistance shall be provided by contractor.
2	Contractor to establish at Storage shed at site with adequate capacity as required for the projects. Contractor to get the prior approval from BHEL Site In charge for layout, capacity and location of the storage shed.
3	Cement is issued through bags as received from the manufacturer/stockiest. 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 the contractor on this notional weight only. No claim whatsoever will be entertained because of difference between theoretical and actual weight of the bags of cement.
4	The empty cement bags duly accounted for against issue shall be the contractor's property and the same shall be disposed as per statutory regulation prevailing in the project.
5	In case BHEL supplies cement through Bulker, Bidder has to store cement in Silos of Suitable capacities as decided by Engineer in charge. Silos Capacities shall be finalized mutually.
6	BHEL will not issue cement free of cost for factory made Product/BOI like Fly Ash Brick, Paver Block, Tiles, Hume Pipe etc. unless specified otherwise.
ii)	**Issue of Steel:**
1	**The steel shall be issued to the contractor on the following basis:** i. Structural Steel: Weighment basis (Unit – MT) ii. Reinforcement Steel and Earthing Rod: Weighment basis (Unit-MT) iii. MS Rails: Weighment Basis (Unit-MT)
2	All the steel (structural, reinforcement, earthing rod/GI flats, GI foundation bolts, etc.) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved Bar Bending schedule, fabrication drawings, approved laps, chairs and lugs etc. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the relevant IS/BS/EN code specifications. In case any such sectional weights are not available in the above documents, the manufacturer recommendation/BHEL instruction shall be binding.
3	The steel issued to the contractor shall be mainly in standard length and sections as received from the supplier. However, the contractor shall be bound to accept the steel in length as available in the stores/consignment and no claims for extra payment because of issue of non-standard length will be entertained.
4	The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL.
5	The contractor shall submit to BHEL well in advance of before Three month from requirement, a statement indicating estimated quantity of cement and steel required during a quarter.
6	The contractor must note that cement and steel required for the contractor's enabling job like store/ site office/batching plant/temporary woks etc. shall be arranged by the contractor at his own cost. All temporary structures constructed/installed/erected are to be dismantled and removed as per instruction of BHEL
7	Bidder to give requirement of Material in BHEL Scope well in advance of before Three month from requirement. Any delay in raising the requirement of these item leading to delay in placement of order, will be Contractor responsibility and its attributable delay in erection will be responsibility of Bidder only.

2	**HANDLING OF MATERIALS ISSUED BY BHEL:**
1	All materials issued by BHEL shall be stacked, stored above ground level **by use of concrete or wooden sleepers. No materials shall remain on ground at any time.** All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor (successful bidder of this package) at his own cost within the quoted rates. All other equipment's like winches, D-Shackles, slings of various sizes, max puller, pulley blocks, jacks, trucks, trailers etc. required for such handling of steel from BHEL stores/storage yard etc. shall be arranged by contractor within quoted/accepted rates. All materials stored by contractor shall be in accordance to standards/specifications and instruction of BHEL. Utilization of these material shall also be done in such a manner so that wastage on account of long storage/storage beyond shelf life can be avoided. Any loss/damage of material on this account will be attributable to the contractor.
2	If material is supplied before mobilisation of contractor, the contractor shall take delivery of the materials from the designated place within the project premises at his own cost and store the same at his stores as per standard norms. After mobilisation of contractor, the consignment received at BHEL site can directly be diverted to the work site following issuance procedure of BHEL. Quantity of such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, Contractor shall do unloading of materials from trucks/lorry at their own cost.
3	The Open land for such purposes as available shall be provided by BHEL on free of cost basis. Temporary barbed wire fencing of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc. wherever required off the land provided to him and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc. and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel to safeguard all such materials in his custody. Materials issued will be used only for construction of permanent works. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. In case, due to any cause attributable to the contractor, such loss/theft/rusting of steel occurs, then such quantity of steel shall be recovered from the interim payment at the penal rate specified in the tender.
3	**RECONCILIATION OF MATERIALS ISSUED BY BHEL**
	a. The contractor shall submit a reconciliation statement of cement and steel issued to the contractor with each RA Bill. b. 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 is available in the contractor custody at site. c. At the time of submission of bills, if it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then, BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified. d. If at any point of time, BHEL finds there is a difference in physical and theoretical balance, where the contractor fails to provide necessary reconciliation, the decision of penal recovery/withhold of amount at penal rate by BHEL shall be final and binding to the contractor till proper records are submitted to and verified by BHEL. e. The reference drawings for actual material consumption to be used for the purpose of reconciliation shall be drawings prepared by the BHEL and drawings approved by BHEL for fabrication works and such other drawings approved by BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.
4	**RETURN OF MATERIALS ISSUED BY BHEL**
1	**Return of Cement:** 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 entitle contractor to

<table>
<tr><td></td><td>handling and incidental charges. Surplus sealed and good conditioned cement bags will be taken back on weighment /no. of bags basis.</td></tr>
<tr><td>2</td><td>Return of Reinforcement Steel and Structural Steel including Scrap:
All surplus steel and all wastage materials will be taken back on weighment basis. Surplus, unused and untampered steel shall be sorted section-wise and returned separately at a place directed by BHEL/Engineer within the project area. For return of such materials, contractor will not be entitled to any handling and incidental charges. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be promptly returned to the stores and a receipt obtained for material accounting purposes. Scrap for reinforcement steel and structural steel shall be returned separately.</td></tr>
<tr><td>5</td><td>SCRAP AND SERVICEABLE MATERIALS:</td></tr>
<tr><td></td><td>All structural steel of length above 2 Meter except M.S Plate shall be considered as serviceable materials provided the materials is in good and acceptable condition. Structural steel in length less than 2 Meter Shall be treated as scrap.</td></tr>
<tr><td></td><td>Plates having both side greater than 1 Meter OR if any side is less than 1 Meter but greater than 0.5 Meter and the total area is equal or greater than 2 sq. Meter shall be considered as serviceable material.</td></tr>
<tr><td></td><td>All pipe measuring 2 Meter and above in length shall be treated serviceable materials provided they are in good and acceptable condition. Pipe in less than 2 Meter length shall be treated as Scrap.</td></tr>
<tr><td></td><td>All TMT measuring 3 Meter and above in length shall be treated as serviceable material provided they are in good acceptable condition. TMT in less than 3 Meter shall be treated as scrap.</td></tr>
<tr><td>6</td><td>CONSUMPTION AND WASTAGE OF MATERIAL ISSUED BY BHEL</td></tr>
<tr><td>1.1</td><td>Cement Consumption:
The theoretical consumption of cement shall be based on the following:
a. For design mix concrete as per approved design mix.
b. For nominal mix concrete work, as per minimum cement as specified or as approved by engineer-in-charge.
c. 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 the latest version of Delhi Schedule of Rates (DSR) unless otherwise specified in the specifications or the drawing of contract or mutually agreed by engineer-in-charge and the contractor.
d. Actual consumption = Issue – Surplus/ unused quantity of cement returned in good condition by the contractor to store. (No sweep cement will be taken back by BHEL).</td></tr>
<tr><td>1.2</td><td>Cement Wastage:
a. Allowable wastage: One and half percent (+1.5%) of theoretical consumption of cement.
b. For any material issued by BHEL to the contractor free of cost, and which is not accounted for by the contractor to BHEL, then recovery for such material shall be affected at penal rates.

<table>
<tr><th>Sl no.</th><th>Cement consumption</th><th>Basis of issue & penal recovery</th></tr>
<tr><td>C1</td><td>Theoretical consumption (without considering any wastage or loss).</td><td>Free</td></tr>
<tr><td>C2</td><td>Actual consumption being Limited to one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.</td><td>Free</td></tr>
<tr><td>C3</td><td>Actual consumption beyond one and half percent (+1.5%) of above (C1).</td><td>Penal rate</td></tr>
</table>
</td></tr>
<tr><td>2.1</td><td>Reinforcement Steel, MS earthing rod Consumption
The theoretical consumption of various sections and/or diameter of reinforcement and earthing rod steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be</td></tr>
</table>

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.

a. Actual consumption = Issue – Surplus.
b. Surplus = un-tampered, unused, uncut Quantity of steel **including serviceable material** returned by the contractor to BHEL store along-with relevant documents.
c. Wastage = Actual consumption – Theoretical consumption.

2.2 **Reinforcement Steel, MS earthing rod Wastage**

a. **Allowable Wastage:** (+3%) of the theoretical consumption shall be considered as allowable wastage.
b. Wastage and scrap shall be as per actual weighment basis.

Sl no.	**Reinforcement steel & MS earthing rod**	**Basis of issue & penal recovery**
R1	Theoretical consumption (without considering wastage and scrap or loss)	Free
R2a	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R1) towards allowable wastage and returned to BHEL Store.	Free
R2b	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R1) towards allowable wastage but not returned to BHEL Store.	Penal rate
R3	Wastage beyond **THREE** percent (+3%) of the theoretical consumption above (R1).	Penal rate

3.1 **Structural Steel (Rolled Sections and Plates etc.) Consumption**

The theoretical consumption of various sections shall be based on approved drawings. Weights shall be calculated considering the sectional weights as per Indian standard. No extra shall 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.

a. Actual consumption = Issue – Surplus.
b. Surplus = un-tempered, unused, uncut quantity of steel **including serviceable material** returned by the contractor to BHEL store.
c. Wastage = Actual consumption – Theoretical consumption.

3.2 **Structural Steel Wastage**

a. **Allowable wastage:** 4% (FOUR percent) of the theoretical consumption shall be considered as allowable wastage. Wastage shall be considered as cut pieces and scrap material, measured as per actual weighment basis. Invisible wastage, if any, shall be considered to be included in the specified 4 % allowable wastage.
b.

Sl no	**Structural steel including SS plate**	**Basis of issue & penal Recovery**
S1	Theoretical consumption (without considering any wastage, scrap or loss) as per specification & drg.	Free
S2a	Wastage limited to plus four percent (+4%) of aforesaid theoretical consumption (S1) towards allowable wastage (including invisible wastage limited to 0.5%) and return to BHEL Store.	Free
S2b	Wastage limited to plus four percent (+4%) of aforesaid theoretical consumption (S1) towards allowable wastage (including invisible wastage limited to 0.5%) but not returned to BHEL Store.	Penal rate
S3	Wastage beyond **four** percent (4%) of the aforesaid theoretical consumption (S1).	Penal rate

7 **RECOVERY FOR MATERIAL ISSUED BY BHEL**

	Any loss of material due to theft/damage/unaccounted loss shall be recovered at penal rates. Recovery of wastages shall be made from the bills of contractor at the penal rate for the following cases: a. If wastage exceeds the specified limit b. If the wastage not exceeded specified limit, but not returned to BHEL store except invisible wastage c. For not returning the surplus serviceable materials.
	PANEL RATE FOR MATERIAL ISSUED BY BHEL
	Recovery of wastages shall be made from the bills of contractor at the penal rate mentioned in table below for the following cases: a. If wastage exceeds the specified limit b. If the wastage not exceeded specified limit, but not returned to BHEL store except invisible wastage c. For not returning the surplus serviceable materials.

Sl. No.	Items	Penal Rate (Rs.)
1	Cement (PPC/OPC/PSC)	Not Applicable
2	Reinforcement Steel	Rs. 68,978.82 per MT (Excl. GST)
3	MS Earthing Rod	Not Applicable
4	Structural Steel	Not Applicable

Note: The penal rate shall be 1.5 times the actual cost of procurement to BHEL or rates mentioned in above table, whichever is higher.

J. Clause No. C.30.0 "INCOME TAX/SALES TAX/WORKS TAX/VAT" stands deleted. Now the INCOME TAX/SALES TAX/WORKS TAX/VAT clause for this Contract shall be read as below.

1. All taxes (except GST), duties, charges, royalties, cess and any other levies by Central/ State/local authorities for the execution of the contract shall be borne by the contractor and shall not be payable extra. Any increase of the same at any stage during execution of the contract shall be borne by the contractor. Quoted price of the same shall be inclusive of all such requirements.
2. Contractors have to make their own arrangement at their cost for completing the formalities, if required with relevant taxation authorities, for bringing their material, plant and machinery at site for the execution of the contract. Road permits / way bill, if required shall be arranged by the contractor.
3. The Contractor is responsible to furnish documentary evidence towards GST Registration of the State wherein the site is located or any other documents as per GST Act which may be required from time to time. BHEL will not be held to be responsible for any non-compliance of the Contractor in respect of GST laws as framed from time to time.
4. Goods and Service Tax (GST) will be reimbursed to the Contractor subject to the following conditions: -
   I. Submission of valid GST Compliant Tax Invoice as per the GST Invoice Rules.
   II. The Invoice raised by the Contractor should indicate the BHEL GST Registration Number.)
   III. Contractor declaring such invoice in GSTR-1 and the same should be available to BHEL in the form GSTR -2A/ 2B electronically through GST portal
   IV. Confirmation of payment of GST thereon by contractor on GST portal.

5. The GST amount shall get reflected within prescribed time limit in the GSTN for BHEL to avail the input credit. If the GST Credit is reversed/ denied/ delayed to BHEL due to non-receipt/delayed receipt of Services and/or tax invoice or due to expiry of timeline prescribed in GST law or due to any other factor for availing such Input Tax Credit (ITC) or for any other reason arising out of

the act directly attributable to the Contractor, GST amount shall be recoverable from Contractor from any dues payable to the Contractor along with any interest levied/ leviable on BHEL.

6. Statutory variation, if any, on account of GST will be payable by BHEL at actuals on submission of documentary evidence.
7. TDS under Income Tax Act/ GST Act shall be deducted as per applicable rates unless Exemption certificate, if applicable, from the appropriate Authority is furnished to BHEL along with the Invoice.

8. New Taxes & duties (Introduced after tender opening date):

If any new tax or duty is levied by the Central/State Government/Municipality/Local Authority and becomes directly applicable on items specified in the Bill of Quantities, full reimbursement shall be made subject to submission of documentation as per statute.

K. <u>BOCW (TAXES, DUTIES & LEVIES):</u>

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

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

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

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

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

1.5. The contractor shall, however ensure before deposit of any BOCW cess, that customer is not depositing the same in order to avoid excess deposit of cess.

1.6. The contractor shall bear cost of BOCW cess either by way of deposit or through recovery by BHEL in case the same is deposited by the customer.

1.7. In case of failure in above mentioned compliances, BOCW Cess @ 1% as well as applicable penalty as specified in BOCW Act/Rules shall be deducted from the contractor

L. <u>DELAY AND EXTENSION OF TIME:</u>

Clause No. C.24.0 (Delay and Extension of Time) of Conditions of Contract for Civil Works has been modified for this Contract as below;

1. If, in the opinion of the Engineer, the work is delayed:

(i) by reason of abnormally bad weather, or
(ii) by reason of serious loss or damage by fire, or
(iii) by reason of civil commotion, local combination of workmen, strike or lockout, affecting any of the trades employed on the work, or

(iv) by delay on the part of the agency or tradesman engaged by the BHEL in executing work not forming part of the contract, or

(v) By reason of any other cause which in the absolute discretion of the Engineer is beyond the contractor's control, then in any such case, the Engineer (or higher authority) may make fair and reasonable extension in the completion dates of the individual items of work of the contract as whole. Such extension which will be communicated to the contractor by the Engineer in writing shall be final and binding on the contractor. No other claim in this respect for compensation, idle labour or otherwise howsoever is admissible. Upon the happening of any such event causing delay the contractor shall immediately give notice thereof in writing to the Engineer but shall nevertheless use constantly his best endeavour to prevent or make good the delay and shall do all that may reasonably be required to the satisfaction of the Engineer to proceed with the work.

2. In case of delay in completion of work BHEL reserve the right to grant time extension under the following options depending upon the performance of the vendor:

a) Time extension without levy of LD in case it is found that delay is not attributable to the vendor

b) Time extension with deduction of applicable LD in line with Liquidity Damage clause if the delay is solely attributable to the vendor.

c) In case facts of delay is not settled, BHEL reserve the right to grant provisional time extension for delay in completion of total work or part thereof and running/ interim payments to the vendor will be released without deduction of LD subject to submission of additional Bank guarantee equivalent to maximum LD amount valid till completion of work under their scope and grant of final time extension.

During provisional time extension period ORC/ PVC shall not be payable to the contractor. The Final Delay analysis shall be prepared on completion of the work. In case of delay is not attributable to contractor as per final delay analysis the ORC/ PVC shall be released along with the final bill without any interest charges attributable to BHEL.

In case of delay attributable to contractor, LD shall be deducted for that period in line with clause "Compensation/ LD/ Penalty for delay in execution" of conditions of contract and balance ORC/ PVC (if any) shall be released along with the final bill without any interest charges attributable to BHEL.

M. LD / PENALTY FOR DELAY IN EXECUTION:

LD/Penalty Clause for this Contract shall be read as below:

In case the contractor fails to complete the project within the time specified in the tender specification or any extension thereof subject to force majeure condition, the contractor shall be liable to pay by way of LD/Penalty a sum equal to the half percent of the contract price, per calendar week or part thereof by which the commissioning of the project is delayed, subject to ceiling of 10 % of the contract price. Once the maximum limit of delay is reached (i.e. 20 week of delay) BHEL may consider termination of the contract and forfeit the Security deposit without prejudice to the other remedies under the contract.

Amended/ revised contract value (excluding Extra Works, Supplementary /Additional Items) shall be considered for calculating LD/ penalty.

N. RIGHTS OF BHEL: -

The Clause No. B.7.0 "RIGHTS of BHEL" of Conditions of contract for ETC & Civil works stands deleted. Now the modified clause shall be read as below: -

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

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.
In case of inadequate manpower deployed by the contractor, BHEL reserves the right to deploy additional manpower through any other agency for expediting activities in the interest of the project. Supplied manpower shall be put on job by the contractor and payments and other statutory compliances related to manpower shall be the contractor's responsibility. In case of contractor's failure to fulfil his obligations in respect of such manpower, BHEL reserves the right to take necessary action as per contract conditions.

2. Breach of Contract, Remedies and Termination

2.1. The following shall amount to breach of contract:

I. Non-supply of material/ non-completion of work by the Supplier/Vendor within scheduled delivery/ completion period as per contract or as extended from time to time.

II. The Supplier/Vendor fails to perform as per the activity schedule and there are sufficient reasons even before expiry of the delivery/ completion period to justify that supplies shall be inordinately delayed beyond contractual delivery/ completion period.

III. The Supplier/Vendor delivers equipment/ material not of the contracted quality.

IV. The Supplier/Vendor fails to replace the defective equipment/ material/ component as per guarantee clause.

V. Withdrawal from or abandonment of the work by the Supplier/Vendor before completion as per contract.

VI. Assignment, transfer, subletting of Contract by the Supplier/Vendor without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.

VII. Non-compliance to any contractual condition or any other default attributable to Supplier/Vendor.

VIII. Any other reason(s) attributable to Vendor towards failure of performance of contract.
In case of breach of contract, BHEL shall have the right to terminate the Purchase Order/ Contract either in whole or in part thereof without any compensation to the Supplier/Vendor.

IX. Any of the declarations furnished by the contractor at the time of bidding and/ or entering into the contract for supply are found untruthful and such declarations were of a nature that could have resulted in non-award of contract to the contractor or could expose BHEL and/ or Owner to adverse consequences, financial or otherwise.

X. Supplier/Vendor is convicted of any offence involving corrupt business practices, antinational activities or any such offence that compromises the business ethics of BHEL, in violation of the Integrity Pact entered into with BHEL has the potential to harm the overall business of BHEL/ Owner.

Note-Once BHEL considers that a breach of contract has occurred on the part of Supplier/Vendor, BHEL shall notify the Supplier/Vendor by way of notice in this regard. Contractor shall be given an opportunity to rectify the reasons causing the breach of contract within a period of 14 days.

In case the contractor fails to remedy the breach, as mentioned in the notice, to the satisfaction of BHEL, BHEL shall have the right to take recourse to any of the remedial actions available to it under the relevant provisions of contract.

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

LD against delay in executed work shall be calculated in line with relevant LD clause 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 of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.2 **Remedies in case of Breach of Contract is established:**

i) Wherein the period as stipulated in the notice issued under clause "BREACH OF CONTRACT, REMEDIES AND TERMINATION" of GCC has expired and Contractor has failed to remedy the breach, BHEL will have the right to terminate the contract on the ground of "Breach of Contract" without any further notice to contractor.

ii) Upon termination of contract, BHEL shall be entitled to recover an amount equivalent to 10% of the Contract Value for the damages on account of breach of contract committed by the Contractor. This amount shall be recovered by way of encashing the security instruments like performance bank guarantee etc available with BHEL against the said contract. In case the value of the security instruments available is less than 10% of the contract value, the balance amount shall be recovered from other financial remedies (i.e. available bills of the contractor, retention amount, from the money due to the Contractor etc. with BHEL) or the other legal remedies shall be pursued.

iii) wherever the value of security instruments like performance bank guarantee available with BHEL against the said contract is 10% of the contract value or more, such security instruments to the extent of 10% contract value will be encashed. In case no security instruments are available or the value of the security instruments available is less than 10% of the contract value, the 10% of the contract value or the balance amount, as the case may be, will be recovered in all or any of the following manners:

iv) In case the amount recovered under sub clause (a) above is not sufficient to fulfil the amount recoverable then; a demand notice to deposit the balance amount within 30 days shall be issued to Contractor.

v) If Contractor fails to deposit the balance amount within the period as prescribed in demand notice, following action shall be taken for recovery of the balance amount:

a) from dues available in the form of Bills payable to defaulted Contractor against the same contract.
b) If it is not possible to recover the dues available from the same contract or dues are insufficient to meet the recoverable amount, balance amount shall be recovered from any money(s) payable to Contractor under any contract with other Units of BHEL

including recovery from security deposits or any other deposit available in the form of security instruments of any kind against Security deposit or EMD.

c) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against defaulted Contractor.

vi) It is an agreed term of contract that this amount shall be a genuine pre-estimate of damages that BHEL would incur in completion of balance contractual obligation of the contract through any other agency and BHEL will not be required to furnish any other evidence to the Contractor for the purpose of estimation of damages.

vii) In addition to the above, imposition of liquidated damages, debarment, termination, de-scoping, short-closure, etc., shall be applied as per provisions of the contract.

Note:

1) The defaulting contractor shall not be eligible for participation in any of the future enquiries floated by BHEL to complete the balance work. The defaulting contractor shall mean and include:

(a) In case defaulted contractor is the Sole Proprietorship Firm, any Sole Proprietorship Firm owned by same Sole Proprietor.

(b) In case defaulted contractor is The Partnership Firm, any firm comprising of same partners/ some of the same partners (but not including any new partner); or sole proprietorship firm owned by any partner(s) as a sole proprietor.

2.3. In case Contractor fails to deploy the resources as per requirement informed by BHEL in writing to expedite the work, BHEL can deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.4. 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, whatsoever.

2.5. Whenever any Claim or Claims for payment of any sum of money(s) arises under this or any other contract against the contractor, BHEL shall be entitled to withhold and also have a lien to retain such sum of money(s) in whole or in part from any money(s) payable to contractor and/or security deposits furnished or deducted in cash from the bills of contractor, (if any) under this contract. In the event of the securities or the amounts payable to Contractor, being insufficient to cover BHEL claims, then BHEL shall be entitled to withhold and have a lien to the extent of such claims from any sum or sums found payable or which at any time thereafter may become payable to the contractor under this or any other contract with BHEL.

a) Claim or Claims for payment of any sum of money(s) arising from the Contractor under this or any other contract against the contractor, shall mean, the sum of money(s) actually incurred by BHEL in fulfilling the contractual responsibilities of contractor under the contract, to which he has failed to fulfil plus applicable overheads (@ 5%) along with interest as applicable under the Contract on total amount (i.e. money actually incurred plus overheads)

b) It is an agreed term of the contract that, the sum or sums of money so withheld or retained under the lien by BHEL will be kept withheld or retained as such by BHEL till the claims arising out of this or any other contract are finally adjudicated wither through Arbitration or a Court of competent jurisdiction as the case may be in accordance with the terms of contract. Intimation given by the BHEL Engineer regarding withholding of such money(s) shall be considered as sufficient and relevant date for all purposes. No Interest shall be payable on such sum(s) of money which becomes due or as the case may be adjudged to be due from BHEL to Contractor, whether under contract or otherwise.

c) Where the contractor is a partnership firm, BHEL shall be entitled to withhold and also have a lien to retain towards such claims in whole or in part, from any other money(s) payable to any partner, whether in his individual capacity or otherwise.

d) If any money(s) shall, as a result of any claim or application made under the relevant provisions of any Labour Welfare Act and/ or Rules, including but not limited to Contract Labour Regulation & Abolition Act, Minimum Wages Act, Payment of Gratuity Act, BOCW (RE&CS) Act, Provident Fund Act, Employee State Insurance Act, be directed to be paid by the BHEL, such money shall be deemed to be moneys payable to the BHEL by the Contractor.

e) Where the Contractor fails to repay to BHEL such moneys along with applicable overheads (@ 5%) and interest, as aforesaid within seven days of being demanded, BHEL shall be entitled to recover the same from Contractor's bills/ Security Deposit or any other money(s) payable to Contractor under this Contract or any other Contract with BHEL.

2.6. While every endeavor will be made by BHEL to this end, yet BHEL cannot guarantee uninterrupted work due to conditions beyond its 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. BHEL may permit or direct contractor to demobilize and remobilize at a future date as intimated by BHEL in case of following situations for reasons other than Force majeure conditions and not attributable to contractor:

i) suspension of work(s) at a Project either by BHEL or Customer,
or

ii) where work 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 three months

In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedies under Clause **"Remedies in case of Breach of Contract"** In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.8. In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts etc. due to which inordinate discontinuity of work is anticipated, BHEL on its own or contractor's request at its discretion may consider to short close the contract in any of the 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 shut down or on other facilities of customer or any other such 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 Trial Operation/PG Test etc.) as decided by BHEL, shall however be reduced from the final contract value.

Note: The Contractor shall not be eligible for any compensation on account of Quantity Variation arising out of short-closure of contract as per clause above.

O. <u>FORCE MAJEURE:</u>

Clause No. B.13.0 (FORCE MAJEURE) of Conditions of Contract for ETC & Civil Works has been modified as below:

O.1. "Force Majeure" shall mean circumstance which is:

a) beyond control of either of the parties to contract,

b) either of the parties could not reasonably have provided against the event before entering into the contract,

c) having arisen, either of the parties could not reasonably have avoided or overcome, and

d) is not substantially attributable to either of the parties

And

Prevents the performance of the contract,

Such circumstances include but shall not be limited to:

i) War, hostilities , invasion, act of foreign enemies.

ii) Rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war.

iii) Riot, commotion or disorder by persons other than the contractor's personnel and other employees of the contractor and sub-contractors.

iv) Strike or lockout not solely involving the contractor's personnel and other employees of the contractor and sub-contractors.

v) Encountering munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the contractor's use of such munitions, explosives, radiation or radio- activity.

vi) Natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon, flood, fire, cyclones etc.

vii) Epidemic, pandemic etc.

O.2. The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party: a) any strike, work-to-rule action, go-slow or similar labour

difficulty (b) late delivery of equipment or material (unless caused by Force Majeure event) and (c) economic hardship.

O.3. If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event.

O.4. The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event.

O.5. Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not

a) Constitute a default or breach of the Contract.

Give rise to any claim for damages or additional cost expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure

O.6. BHEL at its discretion may consider short closure of contract after 1 year of imposition of Force Majeure in line with extant guidelines. In any case, Supplier/Vendor cannot consider deemed short-closure after 1 year of imposition of Force Majeure.

P. SETTLEMENT OF DISPUTE

Clause No. B.15.0 (Arbitration) of Conditions of Contract for ETC & Civil Works has been modified as below:

If any dispute or difference of any kind whatsoever shall arise between BHEL and the Supplier/Vendor, arising out of the contract for the performance of the work whether during the progress of contract termination, abandonment or breach of the contract, it shall in the first place referred to Designated Engineer for amicable resolution by the parties. Designated Engineer (to be nominated by BHEL for settlement of disputes arising out of the contract) who within 60 days after being requested shall give written notice of his decision to the contractor. Save as hereinafter provided, such decision in respect of every matter so referred shall forthwith be given effect to by the Supplier/Vendor who shall proceed with the work with all due diligence, whether he or BHEL desires to resolve the dispute as hereinafter provided or not.

If after the Designated Engineer has given written notice of this decision to the party and no intention to pursue the dispute has been communicated to him by the affected party within 30 days from the receipt of such notice, the said decision shall become final and binding on the parties. In the event the Supplier/Vendor being dissatisfied with any such decision or if amicable settlement cannot be reached then all such disputed issues shall be resolved through conciliation in terms of the BHEL Conciliation Scheme 2018 as per Clause “Conciliation” of GCC

P.1. Conciliation:

Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure as per BHEL

Conciliation Scheme 2018. 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 for conduct of conciliation proceedings" (as available in www.bhel.com)).

Note: Ministry of Finance has issued OM reference No. 1/2/24 dated 03.06.2024 regarding "Guidelines for Arbitration and Mediation in Contracts of Domestic Public Procurement. In the said OM it has been recommended that Government departments/

Entities/agencies are to encourage mediation under the Mediation Act. 2023. The said Act has not yet been notified by the Government. Therefore, the clause **"Settlement of Disputes"** shall be modified accordingly as and when the Mediation Act 2023 gets notified.

P.2. <u>ARBITRATION:</u>

P.2.1. 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 **"Conciliation"** herein above 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, refer the disputes to Arbitral Institution i.e. **"India International Arbitration Centre (IIAC) Delhi"** and such dispute to be adjudicated by Sole Arbitrator appointed in accordance with the Rules of said Arbitral Institution.

P.2.2. A party willing to commence arbitration proceeding shall invoke Arbitration Clause by giving notice to the other party in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice') before referring the matter to arbitral institution. The Notice shall be addressed to the **Executive Director, TBG, BHEL, Noida**, executing the Contract and shall contain the particulars of all claims to be referred to arbitration with sufficient detail and shall also indicate the monetary amount of such claim including interest, if any.

P.2.3. After expiry of 30 days from the date of receipt of aforesaid notice, the party invoking the Arbitration shall submit that dispute to the Arbitral Institutions and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd Judge having considerable experience in commercial matters to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.

P.2.4. The fee and expenses shall be borne by the parties as per the Arbitral Institutional rules.

P.2.5. The Arbitration proceedings shall be in English language and the seat and venue of Arbitration shall be **Delhi.**

P.2.6. Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matters relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at **Delhi**.

P.2.7. Notwithstanding any reference to the Designated Engineer or Conciliation or Arbitration herein, a. the parties shall continue to perform their respective obligations under the

Contract unless they otherwise agree. Settlement of Dispute clause cannot be invoked by the Contractor, if the Contract has been mutually closed or 'No Demand Certificate' has been furnished by the Contractor or any Settlement Agreement has been signed between the Employer and the Contractor.

P.2.8. The Mechanism of resolution of disputes through arbitration shall be available only in the cases where the value of the dispute is less than Rs. 10 Crores.

P.2.9. In case the disputed amount (Claim, Counter claim including interest is Rs. 10 crores and above, the parties shall be within their rights to take recourse to remedies other than Arbitration, as may be available to them under the applicable laws after prior intimation to the other party. Subject to the aforesaid conditions, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof as amended from time to time, shall apply to the arbitration proceedings under this clause.

P.2.10. In case, multiple arbitrations are invoked (whether sub-judice or arbitral award passed) by any party to under this contract, then the cumulative value of claims (including interest claimed or awarded) in all such arbitrations shall be taken in account while arriving at the total claim in dispute for the subject contract for the purpose of clause P.2.9. Disputes having cumulative value of less than 10 crores shall be resolved through arbitration and any additional dispute shall be adjudicated by the court of competent jurisdiction.

P.3. 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 of CPSEs Disputes) as mentioned in DPE OM No. 05/0003/2019-FTS-10937 dated 14-12-2022 as amended from time to time.

Q. FACILITIES PROVIDED TO MSEs: -

Vide office memorandum F.No.21(8)/2011-MA dated 09.11.2016, Office of AS&DC, Ministry of MSME has issued clarification regarding definition of Goods and Services under the Public Procurement Policy of MSEs order-2012, In accordance with the Public Procurement Policy for MSEs order-2012 and OM regarding definition of Goods and Services issued by Ministry of MSME, it is clarified that benefits as envisaged in Public Procurement Policy for MSEs Order 2012 are to be provided in respect of the procurements related to the Goods and Services produced and provided by Micro and Small Enterprises (MSEs) only and **no benefits is to be given in Case of Works Contracts.**

R. RESPONSIBILITY OF CONTRACTOR IN RESPECT OF STATUTORY RULES / REGULATIONS PERTAINING TO BOCW.

It shall be mandatory for the contractor to comply with Building and Other Construction Worker (Regulation of Employment and Conditions of Service) Act, 1996 and Rules of 1998 read with Building and other Construction Workers welfare Cess act, 1996 and Cess Rules.

It shall be the sole responsibility of the contractor to apply for a license to the Competent Authority under the Building and Other Construction Worker (Regulation of Employment

and Conditions of Service) Act, 1996 and Rules of 1998 read with Building and other Construction Workers welfare Cess act, 1996 and Cess Rules and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within 2 months from date of start of work at site or along with 1st RA bill whichever is earlier.

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

The onus shall lie on the contractor to register with the authorities and provide the details of the amount remitted to the authorities. In case the contractor fails to comply with the BOCW act, no payments shall be released to the contractor.

In case the customer owns the responsibility of compliance of BOCW act and deducts the amount from BHEL, the same shall be deducted from the RA bills of the contractor.

In the event of any penalty or other implication due to non-compliance of statutory obligation the same shall be on contractor's account.

S. CLOSING OF CONTRACTS

The Contract shall be considered completed and closed upon completion of contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a performance/ experience certificate as per standard format, based on specific request of Contractor as per extant BHEL guidelines through the online portal available at https://siddhi.bhel.in only.

T. SUSPENSION OF BUSINESS DEALINGS

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

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

If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post-execution stage indulges in any act, including but not limited to, 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 tampers the tendering process 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, or does anything which is actionable under the Guidelines for Suspension of Business dealings, 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. Guidelines for suspension of business dealings is available in the webpage: http://www.bhel.com/vender_registration/vender.php.

U. PERFORMANCE MONITORING:

The Contractors performance shall be continuously monitored during execution of work at site.

In case of contractor's performance is found not satisfactory during the execution of work at site, BHEL may take alternate remedial measures and may not consider the contractor for further tenders, if the contractor performance is not improved in spite of opportunities given by BHEL.

V. MEASUREMENT OF WORK AND MODE OF PAYMENT:

a) 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.

b) 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.

c) 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 by BHEL Engineers and signed by both the parties.

d) 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.

e) Based on the above quantities, contractor shall prepare the bills, along with statutory documents, 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.

f) 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.

g) Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

h) The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

i) 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.

j) 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.

k) 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.

l) 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.

W. 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.

X. ROYALTY

The contractor shall pay the Royalty on sand, aggregate, earth material used for the project and the contractor has to submit the Royalty certificate to BHEL along with the RA bills.

Y. PROGRESSIVE PAYMENT/ FINAL PAYMENT:

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 redo the work according to the required specifications, without any extra cost.
   - v) 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.
   - vi) Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract
   - vii) Release of payment in each running bill including ORC Bills where ever applicable will be as per stages of progressive pro rata payments.
   - viii) The contractor will be eligible for payment of RA Bills 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.

     All documents like HR Clearance, Quality and Safety Compliances etc. required for processing the RA Bills should be submitted along with RA Bills.
   - ix) 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.

     For MSMEs, at the time of submission of first RA bill, the subcontractor has to declare whether it is registered on RXIL portal and wishes to receive the proceeds through RXIL portal throughout the contract duration.

     Note: BHEL may also choose to release payment by other alternative modes as applicable.

1.1. **Documents required for RA Bill:**

a) GST Complied Invoice of the work done as per approved BOQ.
b) Jointly signed Measurement sheet, WAM -6 for RA Bill.
c) Material Reconciliation statement
d) Labour Payment Certificate
e) Test Report of the material as per FQP
f) Royalty challan for material used (for civil works)
g) Power of Attorney before submission of Bill.
h) Validity of Bank Guarantees as applicable under the contract.
i) HR compliance documents:
    1) Labour Payment Certificate, Wages payment sheet
    2) Proof of PF, ESI, WC contribution submission
    3) Proof of Bonus payment as per Bonus Act if applicable.
j) Any other documents as per customer requirement/statutory requirement.

Note :

BHEL Site in charge has to certify that all the above required documents have been received and verified and documents duly verified are to be sent to Finance along with RA bills.

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, material reconciliation, removal of temporary structures, return of scrap/surplus material of BHEL. BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL.

2.1. **Documents required for Final Bill:**

a) GST Complied Invoice of the work done as per approved BOQ.
b) Jointly signed Measurement sheet, WAM -7, WAM-10 format (if Applicable).
c) Valid Bank Guarantees as applicable under the contract.
d) Labour Payment Certificate (if applicable)
e) 'No claim' certificate from the contractor.
f) Deviation statement showing the Executed quantities and quantities as per the contract.
g) Submission of Test reports as per FQP (if applicable)
h) Material Reconciliation statement duly approved by BHEL
i) Submission of balance royalty challan/Clearance from Mining dept. (for civil works)
j) HR compliance documents:
    a) Labour Payment Certificate, Wages payment sheet
    b) Proof of PF, ESI, WC contribution submission
    c) Proof of Bonus payment as per Bonus Act if applicable.
k) Submission of As Built Drawings (if applicable)
l) Compliance report from BHEL/Customer for completion of punch points
m) Power of Attorney for representative signing MBs etc, if not submitted earlier.
n) Final Delay Analysis.
o) Any other documents as per customer requirement/statutory requirement.

Note :

BHEL Site incharge has to certify that all the above required documents have been received and verified and document duly verified are to be sent to Finance along with Completion certificate.

Z. **LIMITATION ON LIABILITY:**

Notwithstanding anything to the contrary in this Contract or LOA or any other mutually agreed document between the parties, the maximum liability, for damages, of the contractor, its servants or agents, shall under no circumstances exceed an amount equal to the Price of the Contract or the Work Order. The Contractor shall not in any case be liable for loss of profit or special, punitive, exemplary, indirect or consequential losses whatsoever. This shall not be applicable on the recoveries made by Customer from BHEL on account of Contractor, any other type of recoveries for workmanship, material, T&P etc. due from the contractor.

AA. **All other terms and conditions of GCC shall remain unchanged.**

INDEMNITY BOND

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

This Indemnity Bond executed by <_____name of company> having their Registered Office at <_____> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort, Asiad, New Delhi - 110049 through its unit - TBG, 5th Floor, BHEL Sadan, Plot No. 25, Sector-16A, Noida-201301 (UP). (Hereinafter referred to as the Company)

And whereas the Company has entered into a Contract with M/s_____, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "_____".

AND WHEREAS under the provisions of GCC 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 <_____Months > i.e till <_____>

Now this deed witness 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.

The Contractor further agree that the Company shall be entitled to withhold and adjust the Security Deposit and/or withhold and adjust payment of Bills of Contractor pertaining to this Contract against any payment which the Company has made or is required to make 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 survive 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 comply with the terms and the conditions of this deed and contractual provisions to the satisfaction of the Company.

In witness where of M/s _____ these presents on the day, month and year first, above written at _____ by the hand of its signatory Mr._____.

Signed for and on behalf of
M/s _____

Witness:

1.

2.

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of 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, New Delhi-110049 through its Unit at BHEL, Transmission Business Group, Noida (name of the Unit) having agreed to exempt _____(Name of the Vendor / Contractor / Supplier) with 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._____ dated _____ [2] valued at Rs……..[3](Rupees ……) (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 _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, an amount not exceeding Rs._____without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand

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 or Arbitrator or any other authority, 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 claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force up to and including_____[5] and shall be extended from time to time for such period as may be desired by the Employer. 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.

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 not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor 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. 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…… [4]
b) This Guarantee shall be valid up to ……[5]
c) Unless the Bank is served a written claim or demand on or before _____[6] 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.

Date _____ Day of _____

for___(indicate the name of the Bank)__

(Signature of Authorised signatory)

[1] ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .
[2] DETAILS ABOUTTHE NOTICE OF AWARD/CONTRACTREFERENCE
[3] CONTRACT VALUE
[4] BG AMOUNTIN FIGURES AND WORDS
[5] VALIDITY DATE (At least 3 months more than completion period)
[6] DATE OF EXPIRY OF CLAIM PERIOD (At least 3 months more than the present date of validity of BG)

Notes:

1 The expiry of claim period shall be at least 3 months more than the validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.

2 The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

3 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's (BHEL's Consortium Bank) branch in India. 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.

Form WAM 6

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
Running Account Bill
(Para 4.3.1 of Works Accounts Manual)

Departmental Bill No.

Name of the Contractor — Date:

Name of the Work: — Division: — Sub-Division:

Sanctioned Estimate: — Date of written order to commence the Work: — Period of work covered in this bill:

Code No.: — Date of commencement of work:

Contract Agreement No.: — Dated: — Due date of completion as per agreement

Date of approval of Competent Authority for time extension as applicable (copy to be enclosed).

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item No. of work	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity executed since last RA bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										
1	2	3	4	5	6	7	8	9	10	11	12	13

** 1. Whenever payment is made on adhoc 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 upto date in column 3 may become nil.

Total value of work done upto 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

Note :
Wherever adhoc payments to contractors against running bills are made in accordance with the extant Works Policy, the amount so paid shall be adjusted.

II. MEMORANDUM OF PAYMENTS

			I	II
1.	Total value of work actually measured as per Account No. I, Column 10	(A)	----------	----------
2.	Total upto date adhoc payment for work covered by approximate or plan measurements as per Account I, Col. 3	(B)	----------	----------
4.	Total upto date payments [(A)+(B)]	(C)	----------	----------
5.	Total amount of payments already made as per entry (D) of last Running Account Bill No. ..... dated ..... forwarded to the Accounts Department on	(D)		----------
6.	Balance [(C) - (D)]			----------
7.	Payments now to be made:		----------	
	a) by cash / cheque		----------	
	b) by deduction for value of materials supplied by BHEL vide Annexure A attached		----------	
	c) by deduction for hire of tools and plant vide Annexure B attached		----------	
	d) by deduction for other charges vide Annexure C attached		----------	
	e) by deduction on account of security deposit		----------	
	f) 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

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 reorded at pages - ---------- of Measurement Book No. ---------- (Name and Designation)
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 the adhoc 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.
4	Certified that measurements by Engineer-incharge and test check of prescribed percentage of measurements by the concerned superior authorities has been carried out.
5	Certified that there are no pending recoveries from the contractor on account of chargeable items (e.g T&P, consumables, material, etc.) issued either by BHEL or by the customer and other recoveries like power, water, quarter, tax liability towards declaration forms etc.
6	Certified that with regard to the free issues, regular reconciliation is being done, completed upto ---------- and there are no recoveries pending from the contractor on account of such issues in excess of requirement for execution of work as per contract.
7	Certified that there is no pending recovery for damaged material issued free of cost.
8	Certified that the contractor has fulfilled all the requirements as per contract with reference to statutory obligations (PF, ESI, Minimum Wages, BOCW, Insurance etc.), support services such as service manpower, computer system , T&P etc

Signature of Contractor

Date:

Signature of Engineer in Charge

Designation:

Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

1	Certified that the measurements have been check measured to the prescribed extent by .... at site and also by the undersigned and the relevant entries have been initialed 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 recoverable 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)

*** Here specify the net amount payable.**

Date: **Signature of Senior Engineer**

V. ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Code No.:

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 Contractors ledger No. ---------- Page ----------

	ALLOCATION	
Estimate No :	Debit	Credit
	(Gross amount)	(Deductions)
Name of Work :		
Account code head		
Total		

Assistant
Date:

Accountant
Date:

Finance Executive
Date:

Form WAM 6 (Contd.)

ANNEXURE A

Statement showing details of materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued		Quantity actually incorporated in the work	Balance quantity with contractor		If recoverable from the contractor				
				Free	Chargeable		Free	Chargeabl	Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
							Total						

Certified that …….. (balance quantity of free issue material as per Col. 8 above) is physically available with the Contractor.

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s..... in respect of Contract Agreement No.....Dated.....

Sl. No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance Recovered now	Remarks
1	2	3	4	5	6	7	8
			TOTAL				

Signature of Contractor
Date :

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date:

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 .....

S. No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered up to previous bill	Amount now recovered	Remarks
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								
				TOTAL				

Signature of Contractor
Date :

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date:

ANNEXURE D
DEVIATION STATEMENT

Name of the Contractor:

Contract Agreement No

Name of Work:

Date:

S. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Amount further anticipated	Total Amount anticipated on completion	Difference		Reason for deviation with authority, if any
													Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date :

Form WAM 7

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
.....And Final Bill
(Para 4.3.2 of Works Accounts Manual)

Departmental Bill No:
Date:
Name of the Contractor: Division: Sub-Division:
Name of the Work: Date of Written order to commence the work:

Sanctioned Estimate: Date of commencement of the Work:
Contract Agreement/ Work Order No: Dated: Due date of completion as per Agreement:
Date of actual completion of the work:

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item no. of the agreement / work order	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity since last running account bill	Payment on t he basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										
1	2	3	4	5	6	7	8	9	10	11	12	13

** 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 upto date in column 3 may become nil.

Total value of work done upto 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

Form WAM 7 (Contd.)

II. MEMORANDUM OF PAYMENTS

1	Total value of work actually measured as per Account No. I column 10		(A)	----------
2	Deduct amount of payments already made as per last running account bill No. ..... dated		(B)	----------
3	Payment now to be made [(A) - (B)]		(C)	----------
4	Deduct amounts recoverable from the contractor on account of :			
	a) Materials supplied by BHEL vide Annexure A attached	----------		
	b) Hire of tools and plant vide Annexure B attached	----------		
	c) Other charges vide Annexure C attached	----------		
	d) Income Tax	----------		
	Total Deductions			----------
5	Balance			----------
6	Refunds of Security Deposit			----------
7	Net amount to be paid to the contractor			----------

Net value Rupees (in words) ..... Only

I/ We hereby certify that I/We have performed the work as per the terms and conditions of Contract Agreement/Work Order No.....Dated.....for which payment is claimed as above and that I/We have no further claim under this agreement/work order.

Signature of the Contractor

Date:

III CERTIFICATE OF THE ENGINEER IN CHARGE

1. The measurements on which the entries in columns 7 to 11 of Part I of this bill (Account of work executed) are based were made by.....
.....are recorded at pages.....of measurement book No..... (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 incharge

Designation:

Form WAM 7 (Contd.)

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 conditions, schedules, specifications and drawings etc., forming part of the contract agreement, subject to the deviations noted in Deviation Statement (Annexure D).
2. Certified that the measurements have been check measured to the prescribed extent by..... ..... and by the undersigned at site and the relevant entries have been initiated in the measurement book (vide pages.....) (Name and Designation)
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 the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.
6. Certified that all recoverable amounts in respect of stores, tools and plant, water, electricity charges etc. have been correctly made vide Annexures A to C and that there are no other demands outstanding against the contractor on this contract.
7. Certified that the issues of all stores as per statement attached (whether charged to the contractor or direct to the work) have been technically checked and represent fair and reasonable issues for the items of work executed vide Annexure E.
8. Certified that all statutory requirements including PF, ESI, Minimum wages, Insurance, GST, BOCW, etc. are complied with by the Contractor. This should be duly backed by the relevant documents.

Certified for payment of * Rs.....(Rupees.....only).

***Here specify the net amount payable**

Signature of Senior Engineer

Date

IV ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Account code head	Debit (Gross Amount)	Credit (Deductions)
TOTAL		

Passed for.....Rs.....
Less Deductions.....Rs.....
Net Amount Payable.....Rs.....
(Rupees.....only)

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

Form WAM 7 (Contd.)

ANNEXURE A
Part I

Statement showing details of materials issued to the contractor Shri / M/S.....in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement.

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from t he Contractor				
							Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
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 materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and not covered by the agreement

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	Issue Rate	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11

TOTAL
Add Departmental Charges
Add GST (Wherever applicable)
GRAND TOTAL

Signature of Contractor
Date:

Signature of Engineer-in-Charge
Date:

Signature of Senior Engineer
Date:

Note: Cost of materials recovered in this bill should be shown against item 4 (a) of the memorandum of payments. The amounts of taxes and departmental charges recovered in this bill should be incorporated in Annexure C.

Form WAM 7 (Contd.)

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri /M/S.....in respect of contract Agreement / Work Order No.....Dated.....

Sl.No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8
			TOTAL				

Signature of Contractor
Date

Signature of Engineer-in-Charge
Date

Signature of Senior Engineer
Date

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s..... In respect of Contract Agreement / Work Order No.....Dated.....

Sl.No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered upto previous bill	Amount now recovered	Remarks
1	2	3	4	5	6	7	8	9
1	Water charges							
2	Electricity charges							
3	Medical charges							
4	Cost of empty gunny bags and empty containers not returned							
5								
6								
7								
			TOTAL					

Signature of Contractor
Date

Signature of Engineer in Charge
Date

Signature of Senior 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	Rate as executed	Amount as per agreement	Amount as executed	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 Signature of Senior Engineer

Date: 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 colum 5 & 8)		Rate chargeable for excess/short consumption, if any	Amount Recoverable for excess/short consumption, including materials not returned, if any	Remarks
								More	Less			
1	Cement											
2	Bricks											
3	Wood											
4	Asbestos Sheet											
5	Iron Material											
6												
7												

Signature of Contractor Signature of Engineer in Charge Signature of Senior Engineer

Date: Date: Date:

Note

1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 & 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.

Form WAM 7 (Contd.)

ANNEXURE F

Statement showing details of materials issued to the contractor Shri/M/s..... in respect of Contract Agreement / Work Order No.....dated.....

Name of the Work:

FREE OF COST

Sl.No	Stores Issue Voucher No.	Description of material	Unit	Quantity issued	Quantity required as per data	Quantity consumed in the work	Balance (if any)	Nature of disposal for the balance	Rate chargeable for material not returned	Amount recoverable for material not returned	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE G

QUESTIONNAIRE TO BE ANSWERED BY THE ENGINEER IN CHARGE AND SENIOR ENGINEER

(Correct particulars and answers to be recorded)

1. Name of the Work:
2. Name of the Contractor:
3. Date of commencement of the Work:
4. Contract agreement /Work Order No. and date:
5. Reference to the supplementary Agreement No. if any:
6. Whether administrative approval and technical sanction has been accorded by the competent authority? If so, cite reference?
7. Whether sanction of the competent authority and financial concurrence of the Finance Department for award of the work has been accorded? If so, cite reference.
8. 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 Finance 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).
9. (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 Finance Department together with rate analysis? If so, cite reference
10. Whether deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.
11. 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?
12. Whether discrepancies pointed out by the Finance department in the stores statement have been reconciled and accepted by the Finance Department?
13. 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 materials has been recovered at the prescribed rate? Whether consumption statements in respect of materials chargeable to the work have been attached to the bill?
14. Whether consumption of materials shown has been technically checked by Senior Engineer?
15. Whether materials issued and used in the work is not less than that required for consumption in work according to our specifications? If consumption is less, whether necessary recovery has been made in the bill?
16. Whether measurements have been checked by the Engineer and Senior Engineer to the extent required and certificates of check recorded in the measurement books?
17. Whether contractor has signed the bill and the measurement books without reservations? If not, whether reasons have been intimated to the Finance Department?
18. Whether arithmetical calculations have been checked and certificate recorded in the measurement books by a person other than the one who calculated initially?
19. Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulars.
20. Whether all advance payments on running accounts have been recovered?
21. Whether all the recoveries due for services given to the contractor like rent of accommodation, water charges, electricity charges have been recovered and whether payments made by the company on behalf of the contractor have been adjusted?
22. Whether the files containing abstracts from measurement books/standard measurement books have been completed/updated?
23. Whether hire charges for tools & plant have been recovered and the statement of hire charges with full details attached?
24. Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer Incharge/Senior Engineer and whether recoveries have been made for defective works, if any?
25. Whether all corrections in the bill/measurement books etc. have been neatly made and attested and there are no overwriting?
26. Whether final measurements have been taken as soon as possible after completion of the work and the certificate of completion issued? If not, whether reasons for delay have been recorded and communicated to finance department?
27. In respect of quantities reduced in the final bill as compared to the running payment, whether adequate reasons have been recorded and communicated to finance department?
28. Whether the expenditure has been classified correctly according to heads of account recorded in the sanctioned estimate?
29. 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 the Senior Engineer, what action has been taken for obtaining the approval of the authority competent to sanction the excess?
30. (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?
31. Whether all the previous audit objections raised on running account bills have been settled? If so, cite references.

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE TO MODEL CONCILIATION CLAUSE FOR CONDUCT OF CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. 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 herein:

2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings.

3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.

4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL.

5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.

6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.

7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within

15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.

8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.

9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.

10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.

11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.

12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.

13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.

14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.

15. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.

16. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.

17. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.

18. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.

19. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.

20. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall

however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.

21. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.

22. The proceedings of Conciliation under this Scheme may be terminated as follows:
    a. On the date of signing of the Settlement agreement by the Parties; or,
    b. By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,
    c. By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
    d. By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration.
    e. On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

23. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	**Particulars**	**Amount**
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator)

Sl No	Particulars	Amount
		In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator) In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation and stay at outstation i) Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)	As per entitlement of the equivalent officer (pay scale wise) in BHEL.
	Others	As per the extant entitlement of whole time Functional Directors in BHEL.

Sl No	Particulars	Amount
		Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class.
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region / Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

24. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s)on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.

25. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.

26. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.

27. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.

28. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 3 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.

29. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.

30. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
    a. Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
    b. admissions made by the other party in the course of the Conciliator proceedings;
    c. proposals made by the Conciliator;
    d. The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.

31. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

32. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

33. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue

notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.

34. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

Format 2 to BHEL Conciliation Scheme, 2018

FORMAT FOR SEEKING CONSENT FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Sub: Resolution of the Disputes through conciliation by Independent Expert Committee (IEC).

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Sir,

With reference to above referred Contract/MoU/Agreement/LOI/LOA, you have raised certain Disputes/claims. Vide your letter dated____ you have requested BHEL to refer the Disputes/claims to IEC for Conciliation.

We are enclosing herewith Format (3) for giving consent and the terms and conditions of BHEL Conciliation Scheme, 2018 governing conciliation through IEC. You are requested to give your unconditional consent to the said terms and conditions of the Scheme by returning the same duly sealed and signed on each page. On receipt of your consent, matter will be put to the Competent Authority for consideration and decision.

Please note that BHEL has also certain claims against you (if applicable). BHEL reserves its right to agree or not to agree conciliation of the said disputes through BHEL and this letter is being issued without prejudice to BHEL's rights and contentions available under the contract and law.

Yours faithfully,

Representative of BHEL

Format 3 to BHEL Conciliation Scheme, 2018

FORMAT FOR GIVING CONSENT BY CONTRACTOR/VENDOR/CUSTOMER/COLLABORATOR/CONSORTIUM PARTNERSFOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

BHEL

.....

Sub: Resolution of Disputes through Conciliation by Independent Expert Committee (IEC).

Ref: Contract/MoU/Agreement/LOI/LOA No & date____

With reference to above referred contract, our following bills/invoices/claims submitted to BHEL are still unpaid giving rise to Disputes:

SL. no.	Claim Description	Bill submitted to BHEL (no. and date)	Amount of the bill/claim	Amount received from BHEL	Outstanding Amount

Accordingly we request you to kindly refer the Disputes in respect of above claims to IEC for Conciliation.

We hereby agree and give our unconditional consent to the terms and conditions of BHEL Conciliation Scheme, 2018 governing conciliation through IEC. We have signed the same on each page and enclosed it for your consideration.

Yours faithfully,

(Signature with stamp)

Authorized Representative of Contractor
Name, with designation
Date

Format 5 to BHEL Conciliation Scheme, 2018

STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE IEC BY BOTH THE PARTIES

1. Chronology of the Disputes

2. Brief of the Contract/MoU/Agreement/LOI/LOA

3. Brief history of the Disputes:

4. Issues:

5. Details of Clam(s)/Counter Claim(s):

Sl. No.	**Description of claim(s)/Counter Claim**	**Amount (in INR)Or currency applicable in the contract**	**Relevant contract clause**

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– *The Statement of Claims/Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/Counter Claims. The statement of Claims/Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.*

BILL OF QUANTITY CUM PRICE SCHEDULE (ANNEXURE-I)

Name of Project: 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH.

Name of Work: EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH

Tender Spec. No. : TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25, DATE: 20.02.2025

Sl. No.	Description of Item	UOM	Quantity	Unit Rate	Amount
A	**Check survey of 400 kV D/C transmission line**	-	-	-	-
A.1	Execution of Check survey during execution on the basis of the alignment profile drawing and tower schedule approved by the Owner. If during check survey necessity arises for minor change in route to eliminate way leave or other unavoidable constraints or any instruction from customer, change in the said alignment is to be done alongwith formal approval from BHEL/customer.	-	-	-	-
A.1.1	Check survey of 400 kV D/C transmission line	1.2	km	**₹ 21,060.00**	**₹ 25,272.00**
B	**Supply of 400kV Transmission lines Tower structure - (From approved sources only)**	-	-	-	-
B.1	Preparation of shop/fabrication drawings, fabrication of 400 kV line towers (mild steel and HT steel as required) , submission of proto corrected drawings/BOMs, mass fabrication, galvanising, inspection and supply of lattice type galvanized steel structures including stub assembly, hardwares, stub-template etc. (Zinc coating 610 gms/sq.m)	-	-	-	-
B.1.1	400 kV Double circuit DD Type tower with extensions, aux cross arms, including hardware, etc.	280	MT	**₹ 1,11,150.00**	**₹ 3,11,22,000.00**
C	**SUPPLY OF Tower and stringing accessories and earthing material**	-	-	-	-
C.1	**Tower accessories (for 400 kV lines)**	-	-	-	-
C.1.1	ACSR Moose Conductor	30	kM	₹ 4,85,550.00	**₹ 1,45,66,500.00**
C.1.2	GS Shield wire (as per specification)	3	kM	₹ 76,050.00	**₹ 2,28,150.00**
C.1.3	OPGW conductor	3	kM	₹ 2,34,000.00	**₹ 7,02,000.00**
C.1.4	Danger Plate	5	Nos.	₹ 280.80	**₹ 1,404.00**
C.1.5	Number Plate	5	Nos.	₹ 280.80	**₹ 1,404.00**
C.1.6	Phase Plate (Set of three)	10	Sets	₹ 280.80	**₹ 2,808.00**
C.1.7	Circuit Plate (Set of two)	5	Sets	₹ 280.80	**₹ 1,404.00**
C.1.8	Anti-Climbing Device	5	Nos.	₹ 8,775.00	**₹ 43,875.00**
C.1.9	Bird - Guard (Set of six)	2	Sets	₹ 6,435.00	**₹ 12,870.00**
C.1.10	Vibration dampers for ACSR Moose conductor	336	Nos.	₹ 1,111.50	**₹ 3,73,464.00**
C.1.11	Rigid Spacer for jumper for Quad Moose ACSR conductor	90	Nos.	₹ 643.50	**₹ 57,915.00**
C.1.12	Flexible spacer for Quad ACSR Moose conductor	100	Nos.	₹ 877.50	**₹ 87,750.00**
C.1.13	Mid span compression joint for ACSR Moose conductor	30	Nos.	₹ 1,228.50	**₹ 36,855.00**
C.1.14	Repair sleeve for ACSR Moose conductor	4	Nos.	₹ 526.50	**₹ 2,106.00**
C.1.15	Vibration dampers for Earth wire	24	Nos.	₹ 877.50	**₹ 21,060.00**
C.1.16	Tension clamp for Earth wire	10	Nos.	₹ 760.50	**₹ 7,605.00**
C.1.17	Flexible Copper bonding for Earth wire	10	Nos.	₹ 994.50	**₹ 9,945.00**
C.1.18	Mid span compression joint for Earth wire	2	Nos.	₹ 409.50	**₹ 819.00**
C.1.19	Suspension clamp for earth wire	2	Nos.	₹ 760.50	**₹ 1,521.00**
C.1.20	X way Joint box for OPGW	4	Nos.	₹ 8,775.00	**₹ 35,100.00**
C.1.21	Armor rods for OPGW	2	Nos.	₹ 1,755.00	**₹ 3,510.00**
C.1.22	Suspension clamp for OPGW	2	Nos.	₹ 4,095.00	**₹ 8,190.00**
C.1.23	Tension clamp for OPGW	10	Nos	₹ 5,265.00	**₹ 52,650.00**
C.1.24	Tension string hardware with composite long rod insulator/disc insulators, etc to complete suitable for quad moose conductor	72	Nos	₹ 1,00,035.00	**₹ 72,02,520.00**
C.1.25	Suspension string hardware with composite long rod insulator/disc insulators, etc to complete suitable for quad moose conductor	30	Nos	₹ 42,120.00	**₹ 12,63,600.00**
D	**Earthing material of towers (for 400 kV lines)**	-	-	-	-
D.1	3 m , 40 NB pipe electrode	10.00	Nos.	₹ 3,744.00	**₹ 37,440.00**
D.2	Counterpoise type (120 m long)	5.00	Nos.	₹ 9,945.00	**₹ 49,725.00**
E	**ETC (Erection , Testing and Commissioning) of 400 kV lines**	-	-	-	-
E.1	Erection of various type of tower angles , tower parts and tower body / leg (equal & unequal) extensions (complete) including bolts and nuts, step bolts, hangers, D-Shackles, tower accessories etc., including tack welding and supply and application of zinc rich primer and two coats of enamel paint for both Tension and Suspension type towers for 400 kV Double Circuit Transmission Line	280	MT	₹ 8,550.00	**₹ 23,94,000.00**
E.2	ACSR Moose Conductor complete with rigid/bundle spaces, preformed armour rod, Mid span compression joint, Repair sleeves , viabration dampers , etc. to complete (for entire route length of lines of approximate 1.2 km)	30.00	kM	₹ 78,975.00	**₹ 23,69,250.00**
E.3	Shield Wires(7/3.66) with Tension Clamps, Down lead clamp, PG clamp, flexible copper bond etc),Mid span compression joint,Repair sleeves, vibration dampers , etc to complete (for entire route length of lines of approximate 1.2 km)	3.00	kM	₹ 87,750.00	**₹ 2,63,250.00**
E.4	OPGW conductor (Tension Clamps, Suspension clamp, grounding and parallel groove clamps, Preformed armour rod , vibration dampers , etc.) for OPGW wire (for entire route length of lines of approximate 1.2 km) including testing of Fibre Optic Cable	3.00	kM	₹ 87,750.00	**₹ 2,63,250.00**
E.5	String hardware compression /tension type, etc. to complete.	72.00	Nos	₹ 11,115.00	**₹ 8,00,280.00**
E.6	String hardware suspension type, etc. -For tension tower	30.00	Nos	₹ 8,775.00	**₹ 2,63,250.00**
F	**Complete earthing of all towers as per approved drawings (Scope includes complete work includes testing to show that the tower resistance meets the acceptable limits.)**	-	-	-	-
F.1	3 m long , 40 NB pipe electrode	10.00	Nos.	₹ 4,095.00	**₹ 40,950.00**
F.2	Counterpoise type (120 m long)	5.00	Nos.	₹ 7,605.00	**₹ 38,025.00**
G	**Civil works of 400kV Transmission Line**	-	-	-	-
G.1	Earthwork in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30cm in depth 1.5m in width as well as 10sqm on plan) including dewatering as necessary of rain water/subsoil seepage water and disposal of excavated earth upto 100m and lift upto 3.5m, disposed earth to be levelled and neatly dressed : **All kinds of soil.**	5193.00	cum	₹ 125.95	**₹ 6,54,058.35**

BILL OF QUANTITY CUM PRICE SCHEDULE (ANNEXURE-I)

Name of Project: 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH.

Name of Work: EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH

Tender Spec. No. : TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25, DATE: 20.02.2025

Sl. No.	Description of Item	UOM	Quantity	Unit Rate	Amount
G.2	Earthwork in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30cm in depth 1.5m in width as well as 10sqm on plan) including dewatering as necessary of rain water/subsoil seepage water and disposal of excavated earth upto 100m and lift upto 3.5m, disposed earth to be levelled and neatly dressed: **Soft rock**	577.00	cum	₹ 221.05	**₹ 1,27,545.85**
G.3	Filling available excavated earth (including rock) in trenches, plinth, sides of foundations etc., in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead upto 100m and lift upto 3.5m.	4640.00	cum	₹ 125.75	**₹ 5,83,480.00**
G.4	Carriage & disposal of surplus excavated earth/rock beyond initial lead by mechanical means not necessarily all the times on pucca roads, including loading, unloading, dressing of excavated material, etc., complete as per specifications **:Lead upto 1 km.**	1140.00	cum	₹ 98.34	**₹ 1,12,107.60**
G.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work upto plinth level :M7.5(1:4:8 nominal mix).	150.00	cum	₹ 4,148.54	**₹ 6,22,281.00**
G.6	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately.): All works upto plinth Level	990.00	cum	₹ 5,887.43	**₹ 58,28,555.70**
G.7	Add for using extra cement in the items of design mix over and above the specified cement content therein	495.00	Qunital	₹ 533.82	**₹ 2,64,240.90**
G.8	Centering and shuttering including strutting, propping, etc., and removal of form for: Foundations, footings, bases of columns, etc., for mass concrete.	490.00	sqm	₹ 184.42	**₹ 90,365.80**
G.9	Centering and shuttering including strutting, propping, etc., and removal of form for: Columns, Pillars, Piers, Posts and Struts .	240.00	sqm	₹ 454.41	**₹ 1,09,058.40**
G.10	Steel reinforcement of grade Fe-500 /500D/550D TMT bars, minimum elongation shall be 14.5% :Including supply and straightening, cutting,bending, binding, (i/c cost of binding wire), placing in position, chairs & laps etc. all labour & material complete at all level and heights.	9890.00	kg	₹ 67.10	**₹ 6,63,619.00**
G.11	Steel reinforcement of grade Fe-500 /500D/550D TMT bars, minimum elongation shall be 14.5% : Excluding supply but including straightening, cutting,bending, binding, (i/c cost of binding wire), placing in position, chairs & laps etc. all labour & material complete at all level and heights. (Note: Rates also includes Unloading, storage, watch and ward etc for BHEL supplied Reinforcement).	89010.00	kg	₹ 11.00	**₹ 9,79,110.00**
G.12	Fixing of stub angles in position with necessary arrangements as per drawing and directions of Engr-in-Charge including template fixing,alignment and removal of template including all T&P, labour etc. Note: 1. Weight of stub only shall be measured for payment of this item. 2. Item is excluding supply of Stub & Templates .	4760.00	kg	₹ 32.50	**₹ 1,54,700.00**
G.13	6 mm plaster of mix: 1:3 (1 cement:3 fine sand)	20.00	sqm	₹ 138.39	**₹ 2,767.80**
G.14	Neat cement punning.	20.00	sqm	₹ 39.55	**₹ 791.00**
				Total Amount (Excluding GST)	**₹ 7,25,84,398.40**

Validate Print Help

Percentage BoQ

Tender Inviting Authority: BHEL, TBG- SubContracting Department, Sector 16A Noida, UP

Name of Work: EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH.

Contract No: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 DATE: 20.02.2025

Name of the Bidder/ Bidding Firm / Company :						

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	Estimated Rate in Rs. P	TOTAL AMOUNT Without Taxes in Rs. P	TOTAL AMOUNT In Words
1	2	4	5	6	53	55
1	Total amount as per rates in BOQ (as per Annexure-I) for "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH". - Excluding GST	1.000	Nos	72584398.40	**72584398.40**	INR Seven Crore Twenty Five Lakh Eighty Four Thousand Three Hundred & Ninety Eight and Paise Forty Only
Total in Figures					**72584398.40**	INR Seven Crore Twenty Five Lakh Eighty Four Thousand Three Hundred & Ninety Eight and Paise Forty Only
Quoted Rate in Figures			**Select**		**0.000**	INR Zero Only
Quoted Rate in Words					**INR Zero Only**	

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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BHEL Document No. **TB-423-316-050-TL**	Rev. 00		Prepared by	Checked by	Approved by
		Name	**MSP**	**SKS**	**SKS**
Type of Document: **Technical Specification**		Sign	-sd-	-sd-	-sd-
Title: **Supply, Civil & ETC Works for 400kV Transmission Line at LARA**		Date	11.02.25	11.02.25	11.02.25
		Group	TBEM		
		W.O. No	WO24A02871		

CUSTOMER	**NTPC LTD.**
CONTRACT NO.	**CS-9587-001R-2-FC-NOA- 7332 dtd 29.08.2023** **CS-9587-001R-2-SC-NOA- 7333 dtd 29.08.2023**
PROJECT	**400kV Switchyard for LARA SUPER THERMAL POWER PROJECT (2X800MW)**

CONTENTS

SN	TITLE	No. of Pages
1	Section-1: Scope, Specific Technical Requirements, BOQ Enclosures: 1. Route Survey report 2. Plot Plan 3. Electrical Layout plan & section for 400kV Switchyard	5+5+1+27+2+3
3	Section-2: NTPC TECHNICAL SPECIFICATION	1+98
4	Section – 3: Project details & General Specification	35

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution	To					
	Copies					

SECTION - 1
SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES

1.1 SCOPE & GENERAL INFORMATION

The scope of work under this specification is as follow.

Supply, civil works, erection, testing and commissioning, dispatch of 400kV D/C (Double Circuit) lines consisting of Quad Moose ACSR conductor per phase between Unit 3& 4 switchyard and unit -1&2 extension switchyard at NTPC LARA.

The approximate distance between two substations (gantry to gantry) is 1200 m (approx.). which is total route length of the double circuit line to be constructed by the bidder.

Please refer attached plot plan drg. No 9587-001-301-POC-F-001, Rev -01 & Electrical Layout plan & section for 400kV Switchyard for Lara Unit-1 & 2 extension/ Lara Unit-3 & 4 for tentative route of transmission lines.

Name of customer	**NTPC**
Name of the project	**2X800MW LARA SUPER THERMAL POWER PROJECT**

1.2 Design

The works shall general include, *but not limited to*, following:

(i) Submission of drawings, test reports & quality plans of supply items like Conductor, conductor accessories & earth wire accessories, earthing materials, etc., for customer approval.

(ii) Getting approval from customer/BHEL for all design drawings and documents required for the successful completion of job prior to the execution of work.

(iii) Submission of drawings / documents, Quality Plans, inspection reports in soft copies and hard copies at each stage for customer / BHEL use.

(iv) Detailed Route survey Doc No. 9587-001-230-PVE-B-001 is enclosed. Check Survey to be conducted by bidder in coordination with the Detailed route survey agency.

1.2.2 Design for 400 kV –

BHEL shall provide following drawings/documents: Structural drawing of normal towers for 2 towers (DA & DD type) with 3 m, 6 m & 9 m extension for two towers and 18/25m extension for DD type tower, shop drawings and bill of material (BOM) for 2 towers including extension, drawing of foundation for 2 normal towers including extension (max. 8 nos. per tower i.e. for soil type – Dry, Wet, partially submerged, fully submerged, dry fissured rock, wet fissured rock, wet black cotton & submerged Fissured rock) and foundation loads, stub setting templates, sag tension calculation, sag templates drawing, tower spotting data. Structural drawings, bill of material & shop drawing of auxiliary cross –arm for DD type tower

for 400kV DC line with quad moose conductor (for 90degree deviation) shall be provided.

1.2.3 Supply –

(i) Make of items should have NTPC/BHEL approval before supply. Bidder should consider NTPC approved make of all supply items. In case the offered make is not approved by BHEL/ NTPC, bidder has to submit required documents for getting the sub-vendor approval of alternate make components without any commercial/ time of delivery implication to BHEL/ NTPC.

(ii) The materials shall conform to all the type tests as per relevant standards and NTPC specification. The acceptance, routine tests and tests during manufacture shall be carried out on the line material as per relevant standards & customer technical specification.

(iii) Source of structure material shall be from NTPC & BHEL approved sources.

(iv) BHEL / customer / third party shall inspect equipment / material before dispatch. Stage inspection during manufacturing may also be carried out. Material shall be dispatched only after getting Despatch Clearance from BHEL. Supplier shall send inspection call on prescribed format (web site) only, with an advance notice of 15 days.

(v) Fabrication of 400kV towers, stub, stub setting template as per approved drawings and proto type testing.

(vi) Supply of 400kV Transmission Line towers including extensions, bolts and nuts, conductors, Earthwire, string insulator, hardware, clamps/connectors stub setting template including all tower accessories (phase plate, caution plate, number plate, circuit plate, anti climbing device, bird guard, aviation signal etc).

(vii) Accessories of conductor includes Vibration dampers, Clamps (tension, suspension, cleat), Preformed armour rod, Mid span compression joint, Repair sleeves, rigid & flexible spacers etc to complete.

(viii) Accessories of earthwire includes Vibrations dampers, Clamps (Tension Clamps, suspension clamp, cleat clamp, PG clamp etc), flexible copper bond, mid span compression joint, Repair sleeves etc to complete.

(ix) Earthing materials includes electrodes and counterpoise type earthing for all type of towers.

(x) Any material apart from Bill of Quantity defined in Section-1 of this technical specification (if required to complete the work).

1.2. Services – Civil works & Erection

(i) The civil works to be performed in the above construction includes preparation of bar bending schedules, based on the drawings released for construction and getting the same approved by the Engineer-in-charge plus the execution of the work including providing of all labour, supervision, materials, scaffolding, power, fuel, construction equipments, tools and plants, supplies, transportation, all incidental items necessary for successful completion of the work including contractor's supervision and in strict accordance with the drawings and specifications and with

inspection and testing standards. The nature of work shall generally involve excavation in all type of soil including dewatering, shoring, strutting, and filling under and around structures, backfilling with suitable available excavated earth around completed structures, disposal of surplus soil, formwork, providing necessary steel embedment and other inserts, concreting, muffing, finishing exposed concrete with plaster etc. as per detailed specification, drawings and directions of Engineer-in-charge.

(ii) Providing FQP for erection and other details as required for civil works, erection including stringing of all lines.

(iii) Technical support and revision of documents including recheck survey as and when required during the execution of the transmission line contract till completion of work.

(iv) Check survey for 400kV lines.

(v) Civil work for 400kV transmission line tower foundation including excavation including dewatering, shoring, strutting, and filling under and around structures, backfilling with suitable available excavated earth around completed structures, disposal of surplus soil, backfilling, formwork, providing necessary steel embedment and other setting of template, stub fixing including supply of all material, labour etc. complete as per approved drawing.

(vi) Erection of 400kV Transmission Line towers including extensions, bolts and nuts, stub setting template including all tower accessories (phase plate, caution plate, number plate, circuit plate, anti climbing device, bird guard, aviation signal etc).

(vii) Complete erection of 400kV double circuit transmission line, including erection of tower, stringing of conductor, ground wire and their accessories, earthing of tower, insulator hoisting, String hardware, OPGW etc. for successful commissioning of line.

(viii) Tack welding of bolts & nuts along with supply & subsequent application of zinc coating on the welded portion as required.

(ix) Tree cutting (if any) is in the scope of bidder. However, bidder is advised to carry out material shifting & erection of tower in such a way that there is minimum requirement of tree cutting/trimming. TO meet the requirement, all possible resources like Farrana, trailer, trolley, manpower shall be arranged by bidder.

(x) Bidder may note that (NTPC /BHEL) shall not pay any compensation for any damage or loss of material including the free issue items during storage, transportation & erection work. Further, any other loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work shall not be compensated by NTPC/BHEL.

(xi) All equipment, tools-tackles shall be organized by contractor.

(xii) Obtaining clearance from electrical inspector & submitting any relevant drawing/ document shall be responsibility of bidder.

1.2.5 Exclusion –

(i) Design Drawings of 400kV Tower shall be provided by BHEL for single use (for NTPC Lara only).

(ii) Reinforcement steel shall be supplied by BHEL on free issue basis. However, shifting, unloading of the same from BHEL store to bidder store, site shall be in bidder scope.

(iii) Detailed route survey report of 400kV line (doc. No 9587-001-230-PVE-B-001 is attached for your reference.

(iv) Right of way is not in Bidder's scope.

Notes:-

(i) Any other work/ supply required for the successful commissioning of Transmission Line is in the scope of bidder.

1.3 SPECIFIC TECHNICAL REQUIREMENT

The specific technical requirements for the execution of transmission line works shall be as per NTPC/BHEL Specifications and the relevant standard IS/IEC/CBIP Manual/IEEE.

Refer Section 2 for NTPC specification of Switchyard & 400kV Transmission Line & BHEL specification for lattice structure supply

Refer Section 3 for Project Details and general specification.

In case of any conflict between these Customer's specification shall prevail.

1.4 BILL OF QUANTITY

BOQ for transmission line is enclosed in Annexure-I & Annexure-II. The bidder has to provide price against each item of BOQ. However, payment will be done on actual executed quantity. Quantity of any item may vary upto any extent but the overall quantity may vary by ± 30%.

Any item(s)/ work(s) not covered specifically in the BOQ but is(are) required for successful completion of transmission line shall be deemed to be included in the package.

The provision of Bill of Quantity, specifications shall be read in conjunction with each other and in case of conflict amongst them, the clarification shall be obtained from the Engineer-in-charge whose decision shall be final and binding.

1.5 PROVEN-NESS CRITERIA:

The Bidder/Sub-vendor should have erected and commissioned at least 30KM of Transmission line of 400KV or above voltage class on Towers in a single or multiple contract cumulatively during last 7 years from date of bid opening i.e, 03.03.2023.

Bidder should submit documentary evidence for the above by submission of following document:

Work order copy along with completion certificate issued by end-Client with no adverse remark.

1.6 METHOD OF MEASURMENT for Civil Works:

Excavation shall be measured in cubic meters. The lateral dimensions to be considered for working out excavation quantity shall be the PCC dimension below the footing as per approved drawing. Nothing extra shall be paid for slope cutting, etc. Backfilling & disposal qtys shall be worked out based on the above dimensions only.

For other items, unless otherwise described the method of measurement as described in 'Method of Measurement of Building and Civil Engineering Works'-IS 1200(Part I to XXV) latest edition of BIS shall be followed.

Enclosures:

1. Annexure-1 (BOQ for Supply & ETC Works)
2. Annexure-2 (BOQ for Civil Works)
3. Annexure-3 (Detailed Route Survey)
4. 400kV Layout Plan & Section for Lara Stage-II (Doc No. 9587-001-230-PVE-F-0013)
5. Plot Plan for NTPC Lara Stage-II (Doc No. 9587-001-301-POC-F-001)

Rev-01

ANNEXURE-I BILL OF QUANTITY FOR SUPPLY & ETC WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Project	**ETC OF 400 kV TRANSMISSION LINE AT 2X800MW NTPC LARA STPP-II**
Customer	**NTPC**

Notes

A The scope in brief is as follows :
The scope involves construction of 400kV D/C (Double Circuit) lines from 400kV Switchyard at 2X800MW NTPC LARA STPP-II to existing NTPC LARA STAGE-I. The approximate distance between two substion is 1.2 km. i.e. total route length of the double circuit line to be constructed by the bidder.

B The quantities mentioned in the BOQ are tentative and may vary to any extent for individual items. However overall quantity variation allowed is +/30%. Any material/services required for successful completion of the project but not covered in the BOQ shall be deemed to be included in the scope of

C Make of items to be supplied/used under this contract shall be subject to accaptance by customer/BHEL at contract stage.

D Unloading & Storage of all items is in the scope of bidder.

E Handling, shifting to & from stores at NTPC LARA STPP, proper storage are also included in the scope of the bidder.

F Bidder may note that owner (NTPC/BEL) shall not pay any compensation for any loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work.

S. No.		Item / Work description	Unit	Quantity
A		**Check survey of 400 kV D/C transmission line**		
A.1		Execution of Check survey during execution on the basis of the alignment profile drawing and tower schedule approved by the Owner. If during check survey necessity arises for minor change in route to eliminate way leave or other unavoidable constraints or any instruction from customer, change in the said alignment is to be done alongwith formal approval from BHEL/customer.		
A.1.1		Check survey of 400 kV D/C transmission line	km	1.2
B		**Supply of 400kV Transmission lines Tower structure - (From approved sources only)**		
B.1		Preparation of shop/fabrication drawings, fabrication of 400 kV line towers (mild steel and HT steel as required) , submission of proto corrected drawings/BOMs, mass fabrication, galvanising, inspection and supply of lattice type galvanized steel structures including stub assembly, hardwares, stub-template etc. (Zinc coating 610 gms/sq.m)		
B.1.1		400 kV Double circuit DD Type tower with extensions, aux cross arms, including hardware, etc.	MT	280

Rev-01

ANNEXURE-I BILL OF QUANTITY FOR SUPPLY & ETC WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Project	**ETC OF 400 kV TRANSMISSION LINE AT 2X800MW NTPC LARA STPP-II**
Customer	**NTPC**

Notes

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The scope involves construction of 400kV D/C (Double Circuit) lines from 400kV Switchyard at 2X800MW NTPC LARA STPP-II to existing NTPC LARA STAGE-I. The approximate distance between two substion is 1.2 km. i.e. total route length of the double circuit line to be constructed by the bidder.

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C Make of items to be supplied/used under this contract shall be subject to accaptance by customer/BHEL at contract stage.

D Unloading & Storage of all items is in the scope of bidder.

E Handling, shifting to & from stores at NTPC LARA STPP, proper storage are also included in the scope of the bidder.

F Bidder may note that owner (NTPC/BEL) shall not pay any compensation for any loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work.

C		**SUPPLY OF Tower and stringing accessories and earthing material**		
C.1		**Tower accessories (for 400 kV lines)**		
C.1.1		ACSR Moose Conductor	kM	30
C.1.2		GS Shield wire (as per specification)	kM	3
C.1.3		OPGW conductor	kM	3
C.1.4		Danger Plate	Nos.	5
C.1.5		Number Plate	Nos.	5
C.1.6		Phase Plate (Set of three)	Sets	10
C.1.7		Circuit Plate (Set of two)	Sets	5
C.1.8		Anti-Climbing Device	Nos.	5
C.1.9		Bird - Guard (Set of six)	Sets	2
C.1.10		Vibration dampers for ACSR Moose conductor	Nos.	336
C.1.11		Rigid Spacer for jumper for Quad Moose ACSR conductor	Nos.	90
C.1.12		Flexible spacer for Quad ACSR Moose conductor	Nos.	100
C.1.13		Mid span compression joint for ACSR Moose conductor	Nos.	30
C.1.14		Repair sleeve for ACSR Moose conductor	Nos.	4
C.1.15		Vibration dampers for Earth wire	Nos.	24
C.1.16		Tension clamp for Earth wire	Nos.	10
C.1.17		Flexible Copper bonding for Earth wire	Nos.	10

Rev-01

ANNEXURE-I BILL OF QUANTITY FOR SUPPLY & ETC WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Project	**ETC OF 400 kV TRANSMISSION LINE AT 2X800MW NTPC LARA STPP-II**
Customer	**NTPC**

Notes

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The scope involves construction of 400kV D/C (Double Circuit) lines from 400kV Switchyard at 2X800MW NTPC LARA STPP-II to existing NTPC LARA STAGE-I. The approximate distance between two substion is 1.2 km. i.e. total route length of the double circuit line to be constructed by the bidder.

B The quantities mentioned in the BOQ are tentative and may vary to any extent for individual items. However overall quantity variation allowed is +/30%. Any material/services required for successful completion of the project but not covered in the BOQ shall be deemed to be included in the scope of

C Make of items to be supplied/used under this contract shall be subject to accaptance by customer/BHEL at contract stage.

D Unloading & Storage of all items is in the scope of bidder.

E Handling, shifting to & from stores at NTPC LARA STPP, proper storage are also included in the scope of the bidder.

F Bidder may note that owner (NTPC/BEL) shall not pay any compensation for any loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work.

C.1.18		Mid span compression joint for Earth wire	Nos.	2
C.1.19		Suspension clamp for earth wire	Nos.	2
C.1.20		X way Joint box for OPGW	Nos.	4
C.1.21		Armor rods for OPGW	Nos.	2
C.1.22		Suspension clamp for OPGW	Nos.	2
C.1.23		Tension clamp for OPGW	Nos	10
C.1.24		Tension string hardware with composite long rod insulator/disc insulators, etc to complete suitable for quad moose conductor	Nos	72
C.1.25		Suspension string hardware with composite long rod insulator/disc insulators, etc to complete suitable for quad moose conductor	Nos	30
D		**Earthing material of towers (for 400 kV lines)**		
D.1		3 m , 40 NB pipe electrode	Nos.	10.00
D.2		Counterpoise type (120 m long)	Nos.	5.00
E		**ETC (Erection , Testing and Commissioning) of 400 kV lines**		
E.1		Erection of various type of tower angles , tower parts and tower body / leg (equal & unequal) extensions (complete) including bolts and nuts, step bolts, hangers, D-Shackles, tower accessories etc., including tack welding and supply and application of zinc rich primer and two coats of enamel paint for both Tension and Suspension type towers for 400 kV Double Circuit Transmission Line	MT	280

Rev-01

ANNEXURE-I BILL OF QUANTITY FOR SUPPLY & ETC WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Project	**ETC OF 400 kV TRANSMISSION LINE AT 2X800MW NTPC LARA STPP-II**
Customer	**NTPC**

Notes

A The scope in brief is as follows :
The scope involves construction of 400kV D/C (Double Circuit) lines from 400kV Switchyard at 2X800MW NTPC LARA STPP-II to existing NTPC LARA STAGE-I. The approximate distance between two substion is 1.2 km. i.e. total route length of the double circuit line to be constructed by the bidder.

B The quantities mentioned in the BOQ are tentative and may vary to any extent for individual items. However overall quantity variation allowed is +/30%. Any material/services required for successful completion of the project but not covered in the BOQ shall be deemed to be included in the scope of

C Make of items to be supplied/used under this contract shall be subject to accaptance by customer/BHEL at contract stage.

D Unloading & Storage of all items is in the scope of bidder.

E Handling, shifting to & from stores at NTPC LARA STPP, proper storage are also included in the scope of the bidder.

F Bidder may note that owner (NTPC/BEL) shall not pay any compensation for any loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work.

E.2		ACSR Moose Conductor complete with rigid/bundle spaces, preformed armour rod, Mid span compression joint, Repair sleeves , viabration dampers , etc. to complete (for entire route length of lines of approximate 1.2 km)	kM	30.00
E.3		Shield Wires(7/3.66) with Tension Clamps, Down lead clamp, PG clamp, flexible copper bond etc),Mid span compression joint,Repair sleeves, vibration dampers , etc to complete (for entire route length of lines of approximate 1.2 km)	kM	3.00
E.4		OPGW conductor (Tension Clamps, Suspension clamp, grounding and parallel groove clamps, Preformed armour rod , vibration dampers , etc.) for OPGW wire (for entire route length of lines of approximate 1.2 km) including testing of Fibre Optic Cable	kM	3.00
E.5		String hardware compression /tension type, etc. to complete.	Nos	72.00
E.6		String hardware suspension type, etc. -For tension tower	Nos	30.00
F		**Complete earthing of all towers as per approved drawings (Scope includes complete work includes testing to show that the tower resistance meets the acceptable limits.)**		
F.1		3 m long , 40 NB pipe electrode	Nos.	10.00
F.2		Counterpoise type (120 m long)	Nos.	5.00

Rev-01

ANNEXURE-I BILL OF QUANTITY FOR SUPPLY & ETC WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Project	**ETC OF 400 kV TRANSMISSION LINE AT 2X800MW NTPC LARA STPP-II**
Customer	**NTPC**

Notes

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The scope involves construction of 400kV D/C (Double Circuit) lines from 400kV Switchyard at 2X800MW NTPC LARA STPP-II to existing NTPC LARA STAGE-I. The approximate distance between two substion is 1.2 km. i.e. total route length of the double circuit line to be constructed by the bidder.

B The quantities mentioned in the BOQ are tentative and may vary to any extent for individual items. However overall quantity variation allowed is +/30%. Any material/services required for successful completion of the project but not covered in the BOQ shall be deemed to be included in the scope of

C Make of items to be supplied/used under this contract shall be subject to accaptance by customer/BHEL at contract stage.

D Unloading & Storage of all items is in the scope of bidder.

E Handling, shifting to & from stores at NTPC LARA STPP, proper storage are also included in the scope of the bidder.

F Bidder may note that owner (NTPC/BEL) shall not pay any compensation for any loss or damage to the properties during work of execution of transmission line job or for tree cutting due to bidder's work.

Notes :	
1	MS welding - apply red lead paint then aluminium paint then bitumen after welding.
2	GI welding - apply 2 coats of cold galvanising anti corrosive paint after welding.
3	10% welding joints in earthing shall be tested for dye penetration test.
4	Equipment labels to be painted as per requirement.
5	Quoted rates are deemed to be inclusive of miscellaneous works, viz.. erection of clamps and connectors, phase colour discs etc.
6	Right of way is not in scope but tree cutting (if any) is in the scope of bidder.
7	All associated items, though specifically not mentioned but required for safe and satisfactory execution and commissioning of transmission line will also be treated as included and same shall be supplied, ETC to be done at no extra cost to BHEL/ NTPC.

ANNEXURE-2 BILL OF QUANTITY FOR CIVIL WORKS FOR 400kV TRANSMISSION LINE WORK FOR D/C QUAD MOOSE

Name of Project **400KV SWITCHYARD AT LARA STAGE-II**

Name of Work **Civil works of 400kV Transmission Line.**

S.No.	Description of Item	Quantity	Unit
G	**Civil works of 400kV Transmission Line**		
G.1	Earthwork in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30cm in depth 1.5m in width as well as 10sqm on plan) including dewatering as necessary of rain water/subsoil seepage water and disposal of excavated earth upto 100m and lift upto 3.5m, disposed earth to be levelled and neatly dressed : **All kinds of soil.**	5193	cum
G.2	Earthwork in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30cm in depth 1.5m in width as well as 10sqm on plan) including dewatering as necessary of rain water/subsoil seepage water and disposal of excavated earth upto 100m and lift upto 3.5m, disposed earth to be levelled and neatly dressed: **Soft rock**	577	cum
G.3	Filling available excavated earth (including rock) in trenches, plinth, sides of foundations etc., in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead upto 100m and lift upto 3.5m.	4640	cum
G.4	Carriage & disposal of surplus excavated earth/rock beyond initial lead by mechanical means not necessarily all the times on pucca roads, including loading, unloading, dressing of excavated material, etc., complete as per specifications **:Lead upto 1 km.**	1140	cum
G.5	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work upto plinth level :M7.5(1:4:8 nominal mix).	150	cum
G.6	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately.): All works upto plinth Level	990	cum
G.7	Add for using extra cement in the items of design mix over and above the specified cement content therein	495	Qunital
G.8	Centering and shuttering including strutting, propping, etc., and removal of form for: Foundations, footings, bases of columns, etc., for mass concrete.	490	sqm
G.9	Centering and shuttering including strutting, propping, etc., and removal of form for: Columns, Pillars, Piers, Posts and Struts .	240	sqm
G.10	Steel reinforcement of grade Fe-500 /500D/550D TMT bars, minimum elongation shall be 14.5% :Including supply and straightening, cutting,bending, binding, (i/c cost of binding wire), placing in position, chairs & laps etc. all labour & material complete at all level and heights.	9890	kg
G.11	Steel reinforcement of grade Fe-500 /500D/550D TMT bars, minimum elongation shall be 14.5% : Excluding supply but including straightening, cutting,bending, binding, (i/c cost of binding wire), placing in position, chairs & laps etc. all labour & material complete at all level and heights. (Note: Rates also includes Unloading, storage, watch and ward etc for BHEL supplied Reinforcement).	89010	kg
G.12	Fixing of stub angles in position with necessary arrangements as per drawing and directions of Engr-in-Charge including template fixing,alignment and removal of template including all T&P, labour etc. Note: 1. Weight of stub only shall be measured for payment of this item. 2. Item is excluding supply of Stub & Templates .	4760	kg
G.13	6 mm plaster of mix: 1:3 (1 cement:3 fine sand)	20	sqm
G.14	Neat cement punning.	20	sqm

NOTES:

1 The approximate lengths of 400kV Transmission line is 1.0 KM . Locations of tower foundations shall be as per approved layout and construction has to be done accordingly on those locations.

2 Bidder is advised to visit the site before submitting the offer.

ANNEXURE-3

CUSTOMER DRAWING NO. 9587-001-230-PVE-B-001

CUSTOMER

NTPC LIMITED

2 X 800 MW NTPC LARA STPS STAGE-II EPC

JOB NO. 423

STATUS

DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

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TITLE 400 KV Switchyard Transmission Line – Detailed route survey report

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REV2

DETAILED SURVEY REPORT OF 400KV TRANMISSION LINE AT 2X800MW NTPC LARA STAGE-II, CHATTISGARH

JANUARY, 2025

Survey Consultants

THE DESIGNERS CONSORTIUM

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1 PROJECT DESCRIPTION

1.1 INTRODUCTION

National Thermal Power Corporation (NTPC) is currently in the process of setting up LARA STPP -II which shall be the extension project of LARA STPP-I (2X800 MW) and would comprise of two (2) Nos. of coal fired unit of capacity 800 MW each. Step up/power evacuation voltage of Stage-I of the project is 400KV. Under Stage-I of the project, provision of One no. 400kV twin D/C line up to Raigad Kotra pooling station has been considered for connectivity. One no. 400kV Quad D/C line to Champa pooling has also been kept for evacuation of power as finalized in Western Region Standing Committee Meeting/LTA& Connectivity meeting.

Under stage-II, two more units of 800 MW units are considered making the ultimate project capacity as 3200 MW. A number of IPPs are coming in this vicinity of Raigarh-Korba complex of Chhattisgarh., the bulk power generated in this region shall be exported to power deficit region of WR and NR. Major 765 kV/400 kV pooling stations in this vicinity are being implemented by Central Transmission utility for bulk transmission of power through high capacity 765 kV and 800 kV HVDC corridors to facilitate exchange of the quantum of power from generation projects proposed to be located in eastern part of WR to Central/Western part of WR and NR. Considering above aspect, the step up/power evacuation voltage for stage-II has been considered at 400 kV for interconnection to stage-I.

Bharat Heavy Electricals (BHEL) has been awarded by the job of design, engineering, manufacture, supply, construction, erection, testing & commissioning with civil & structural works for the EPC package with steam generator capable of biomass co-firing, steam turbine, generator & auxiliaries, emission control systems, control and instrumentation, balance of plant packages etc.

For preparing the transmission lines bill of quantities before the actual construction work takes place, detailed survey along with details of features en-route, details of obligatory point and important crossing is an essential requirement. Keeping above in view, the

contractor BHEL in consultation with owner proposed to conduct a detailed survey of the proposed transmission line.

While planning the above transmission lines, various alternative routes and feasible alignments for these transmission lines were examined in detail. For undertaking such studies, the major requirement is to obtain adequate information regarding topography, terrain, physical constraints, environmental factors, etc. along the route of the line so that optimum solution is identified.

As transmission lines traverse across the country, for evacuation of power from generating station to load/distribution centres, the topographical & geographical nature of the terrains play significant influence in the project cost and implementation time. Hence it is essential that at the planning stage itself various alternative routes and technical solutions for transmission lines be examined in detail. For undertaking such studies, the major requirement is to obtain adequate information regarding physical constraints, environmental factors, etc. along the route so that optimum solutions are identified. Subsequently, during implementation of the project, it is required to obtain details about terrain, soil conditions, ground water level, etc. along the route for proper resource planning, costing, etc. as well as reduction in implementation time. In recent times, remote sensing technology is being used in this field by means of satellite imageries and GPS equipments. Using GPS devices, it is possible to navigate any location on the ground with reasonable accuracy out to sub centimetre level

1.2 OBJECTIVE

The detailed survey and route alignment features have been covered to address the environmental and social needs of the area affected by the transmission line. The key features of the detailed survey & route alignment objective are

- Minimize transmission length
- Minimize vegetation loss,
- Minimize disturbance to plain & mountain ecosystem;
- Protect soils and minimize slope instability,

- Avoid settlements and economic land use.
- Minimize future operating & maintenance cost.

The key design features adopted for the transmission line are presented in the following table considering all engineering aspects and environmental and social parameters.

Table: Key Design Features

Item Description	400kV D/C Transmission Line for interconnection
Line length (km)	1253.66m
Number of Towers/Gantry	5 tower & 2 gantry
Average span (m)	176.38m
Right of way width (ROW)	46m

Proposed 'Right of Way' for the transmission line is 23m on either side. During survey, effort has been made to take the line away from settlements and to minimize infringement of forest area, to the extent possible. This can be achieved easily by careful selection of route. Conventionally lands are not acquired for ROW in India except at the base of the towers where compensation has to be given. There will not be any problem in continuing the normal agricultural activities where minimum vegetation clearances are maintained.

1.3 LINE CLEARANCES

Minimum Ground Clearance

The minimum clearance above ground as per sub rule 4 of Rule 77 of IE Rules 1956 (latest revision) for 400 kV AC system and for 400 kV HVDC systems as adopted in India are as under:

Nominal Voltage	66	132	220	400	800	± 500
Minimum Ground Clearance (mm)	5500	6100	7000	8800	12400	12500

To the above clearance, an additional clearance of 150 mm is added to provide for uneven ground profile and possible sagging error.

Minimum Clearance above River/Lakes

The minimum clearance of Power Conductor over the highest flood level in case of non-navigable rivers shall be as follows:

Nominal Voltage	Minimum clearance above HFL (mm)
66	3650
132	4300
Nominal Voltage	Minimum clearance above HFL (mm)
220	5100
400	6400
800	9400
± 500	6750

For navigable rivers, clearances are fixed in relation to the tallest mast in consultation with the concerned navigational/port authorities.

Minimum Clearance above Buildings:

As per Indian Electricity Rules 1956 (rule 80) - Minimum vertical clearance from building

- For HV lines up to & including 33 KV – 3.7 m
- For EHV lines 33kV > 3.7 m +0.3 m for every additional 33 KV or part of thereof

Minimum horizontal clearance between the nearest conductor and building on any part of such building on the basis of maximum deflection due to wind pressure be not less than

- For HV lines up to & including 11 KV > 1.2 m
- For HV line above 11 KV & up to – 2.0 m
- For EHV lines above 11kV > 2.0 m +0.3 m for every additional 33 KV or part of thereof

For above clearances term “building” should deem to include any structure whether permanent or temporary.

Power Lines Crossing Each Other:

The minimum electrical clearances between the lowest power conductor of crossing line over the crossed line as per Rule 87 of IE Rule 1956 is given as under:

Nominal Voltage	Minimum Clearance (in m) between line crossing each other					
	Low & Medium	11-66 KV	110-132 KV	220 KV	400 KV	800 KV
11-66 KV	2.44	2.44	3.05	4.58	5.49	7.94
110-132 KV	3.05	3.05	3.05	4.58	5.49	7.94
220 KV	4.58	4.58	4.58	4.58	5.49	7.94
400 KV	5.49	5.49	5.49	5.49	5.49	7.94
800 KV	7.94	7.94	7.94	7.94	7.94	7.94

Power line crossing Communication Lines

The minimum clearances to be maintained between power lines and communication lines as per “Code of Practice for Protection of Telecommunication Line Crossings with Overhead Power Lines” should be as follows:

Nominal Voltage	11-66 KV	110-132 KV	220 KV	400 KV	800 KV
Minimum clearance between power conductor crossing telecommunication line (mm)	2440	2750	3050	4480	7900

Power Line Crossing Railway Tracks:

The minimum vertical clearance between the lowest conductors of a power line crossing the railway track as per "Regulations for Power Line Crossings of Railway Tracks – 1987" shall be as follows:

The minimum vertical clearances above rail track as also the highest working point of the jib when crane is deployed and the lowest point of any conductor of crossing including ground wire under condition of maximum sag are given as under:-

Nominal Voltage	Minimum Clearance (mm)	
	Above Rail Track	Above Crane
66	14100	2000
132	14600	2500
220	15400	3500
400	17900	6000
800	22000	9500

Power Line Running Along or Across the Roads:

The minimum clearance above ground for 66 kV and higher voltage power lines running along or across the road shall be 6.1 m as per Rules 77 of IE Rule 1956. As per electrostatic field effect of EHV transmission lines, the minimum clearance for line passing over the road shall be corresponding to field gradient of 10kV/m. It should not cause a short circuit current of more than 5 MA through an individual on touching a vehicle standing below the line.

2 PHILOSOPHY OF DETAILED SURVEY

2.1 Route Selection - Assessment & Management Process

Route Selection is the major criteria for any transmission line. At the system planning stage itself one of the factors that govern the evolution of system is the possible infringement with the forest. Wherever such infringements are substantial, different alternative options are considered. While identifying the transmission system for a generation project or as a part of National Grid, preliminary route selection is done based on the Topographical sheets collected from Survey of India and Forest Atlas (Govt. of India Publication). During route alignment all possible efforts are made to avoid the forest area involvement and to keep it to the barest minimum. Moreover, in forest areas trees are felled only below each conductor to facilitate stringing. On completion of construction only one such strip is maintained for O&M purpose. Therefore the actual loss of forest is restricted to some selected area only. However, as per the requirement of Forest (Conservation) Act 1980, approval of Ministry of Environment & Forest, Government of India for diversion of forest land shall be taken and compensatory afforestation shall be done on double the area of degraded forest land to compensate the loss of vegetation.

For the proposed lines there is minimum forest involvement and the most criteria to take the alignment in optimum way by avoiding habitation and good connectivity by roads for ease of construction and operation & maintenance purpose.

2.2 Study of Alternatives

Approach towards Route selection

For selection of optimum route, the following points are taken into consideration:

- The route of the proposed transmission line does not infringe any human habitation.
- The route of the transmission line does not affect any monument of cultural or historical importance.
- The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.

- The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
- The line route does not pass through any sanctuaries, National Park etc.
- The line route does not infringe with area of natural resources.

Sensitive areas and settlements at execution stage

- As a rule, alignments are generally kept 10-15 km away from major towns, whenever possible, making a provision for future urban expansion.
- Similarly, forests are avoided to the extent possible, and when it is unavoidable, a route is selected in consultation with the local Divisional Forest Officer, that causes minimum damage to existing forest resources.
- Selected Alignments do not infringe wetlands and unstable areas for both financial and environmental reasons. Additional care has to be taken to avoid National parks and sanctuaries and any other forest area inhabited by wild life.
- The following types of towers shall be used:
    - A. Type up to - 0 - 2 Degree
    - B. Type up to - 2 - 15 Degree
    - C. Type up to - 15 -30 Degree
    - D. Type up to - 30- 60 Degree

Keeping above factors in mind various alternative routes were studied and most optimum route was provided for the detailed survey and covered in this report. All such different alternatives were studied with the help of Govt. published data like Forest atlas, Survey of India topo maps, satellite imageries etc. to arrive at most optimum route which was taken up for detailed survey and assessment of environmental & social impacts for their proper management.

2.3 Detailed Survey

Once the route alignment is optimized, the detailed survey has been done by picking up levels at every 100m interval or less, depending upon the terrain. The data has been collected in such a fashion that it is being capable to be used by suitable software on

Auto CAD platform for the tower optimization. During the course of detailed survey, following points also kept in consideration:

- Requirement of special tower, if any, for river/power line crossing or actual site conditions demand.
- From the centerline of the route alignment 13meter strip on both side of centre line to be shown in protected/reserved forest area where tree cutting is involved, classification of trees, its full dimension is to furnished.
- Details of existing HV/LV Power Line and river crossings shall be taken.
- Geographical details such as river flooding areas, water reservoir or other settlement, agricultural lands, forest etc.
- Data for clearance from PTCC.
- Soil classification, recommendation on type of foundations including special foundation for different types of towers en-routed the line including water table.
- Identification of landslide zone and land settlement zones to ascertain tendency of sinking of foundation.

2.4 Profiling & Tower Spotting

Ground profile and tower spotting has been done using PLSCADD. The route plan and level profile has been plotted and prepared to the scale of 1:2000 horizontal and 1:200 vertical as per established procedure. If the difference in levels were too high, the chart may be broken up according to requirement. The chart shall progress from left to right. The estimation of different type of tower foundations and towers, their quantities, extensions if required, suitable ground clearance, observing requisite safety clearance from buildings & power lines etc. along with requirement of special tower, if any, for river/power line crossing or actual site conditions demand has been considered.

Sag Tension report along with Wind & Weight Span Report of the two lines are enclosed at Annexure ‘A’ & ‘B’ respectively.

2.5 Salient Feature of Routes

400kV Double Circuit Line		
Route Length	:	1253.67m

No. of Angle Points	:	5 Nos.
Bee Line Length	:	1.048km
Major Crossings	:	
High Tension Lines	:	1 crossing
Medium Voltage Lines	:	4 crossing
Road	:	2 crossing
Railway Lines	:	Nil
National Highways	:	Nil
State Highways	:	Nil
River Crossings	:	Nil
Forest Area	:	Nil
Coal Belt	:	Nil

3 SALIENT FEATURES OF TRANSMISSION LINE

3.1 General

The primary consideration for design and estimation of transmission lines is walkover survey, which is carried out based on topographical map/forest map of India and with help of GPS. Also type of terrain, i.e., plain, hilly, forest stretch etc. likely to be encountered has been taken into consideration by visual inspection while estimating the quantities.

3.2 The Wind Zone

The identification of the wind zone is based on the wind zone map given in IS: 875 (part-I)/IS: 802.

3.3 Design Criteria

The design parameters are generally based on the report of standardization committee of CEA. The details of equipment have been given in subsequent clauses. The conductor maximum temperature of 85^0C has been considered to have higher thermal capacity.

3.4 Line Configuration

Double Circuit (D/C) 400kV line shall have vertical configuration of conductors. The configuration of suspension insulator shall have “I” Type Configuration.

3.5 Towers

Self-supporting latticed bolted steel towers, fabricated from structural steel angle section shall be used. Tower components and bolts & nuts shall be hot dip galvanized. Normally the following four types of double circuit towers shall be used in these lines:

- A type suspension towers for 0-degree angle of deviation in plain terrain only.
- B type tension towers up to 15-degree angle of deviation. These may also be used as section towers.

- C type tension towers up to 30-degree angle of deviation. These may also be used as section towers and also as transposition towers.
- D type tension towers up to 60-degree angle of deviation and suitable for dead end condition. These may also be used for terminal locations.

In addition to above, special towers for major river crossing (if any), power line crossing and the places where the terrain is particularly different, such as approach to the sub-station; forest stretches etc. shall also be used. All standard and special towers shall be designed in accordance with the latest edition of IS: 802 (part I).

3.6 Conductors

For 400 kV DC lines, Moose ACSR conductors of overall diameter 31.77mm shall be used per phase.

3.7 Earthwire

Two 7/3.15mm galvanized steel earthwire shall be used on the line so that it can withstand two successive lightning stroke of 150 kA. Shielding angles of 30 degree is considered for transmission lines.

3.8 Grounding

The tower footing resistance shall be kept below 10 ohms. Normally pipe type grounding shall be used. In case of rocky ground where the ground resistance is high, counterpoise earthing shall be used to bring the tower footing resistance down to acceptable level.

3.9 Insulator and Hardware Fittings

High strength glazed electro porcelain/toughened glass disc insulators/ Porcelain long rod insulators shall be used. In case of disc insulators, the following types of insulator strings along with hardware fittings shall be used

	No of discs	Diameter	Ball to ball spacing	Nominal creepage distance	Electro-mechanical strength	
					Disc	String
		(mm)	(mm)	(mm)	(kN)	(kN)
a) 1x23 single 'I' suspension	23	255/280	145	315	120	120

b) 1x24 single tension	24	255/280	145	315	120	120

Note: Equivalent porcelain long rod insulators/composite insulators shall also, to be considered for use based on the result of detailed studies

Item (a) and (b) are mostly used for suspension and tension towers respectively. Item (b) also shall be used in heavy angle towers (C/DC & D/DD types) to restrict jumper movement. Suitable hardware fittings shall be used for attachment of the insulators with the tower at one end and also for supporting the conductors at the other end. Grading rings will be used for improving voltage distribution across the insulator discs. The voltage across any disc shall not exceed 9% in case of suspension type and 10% in case of tension type of the line to the earth voltage. This will reduce aging and also minimize radio interference.

3.10 Line Accessories

Mid span compression joint for conductor/earthwire: Mid span compression joint suitable for conductor/earthwire shall be used for joining two lengths of conductor/earthwire. The minimum slipping strength of the joint after compression shall not be less than 95% of UTS of conductor/earthwire.

Repair sleeve for conductor: Repair sleeve shall be used only for repairing not more than two strands broken in the outer layer of conductor. It shall be of compression type in two parts with provision of seat sliding of keeper piece.

Flexible copper bond for earthwire: Flexible copper bonds shall be used for good electrical continuity between the earthwire and the tower. Two bonds per suspension tower and four bonds per tension tower shall be used.

Vibration dampers for conductor/earthwire: Stockbridge vibration dampers shall be used to reduce the maximum dynamic strain caused by Aeolian vibrations to a value of 150 micro-strains.

3.11 Power line, Railway line, Road and P&T line crossing

The transmission lines shall be crossing power lines, railway lines, roads and P&T line for which suitable extension of towers shall be used. The standard extensions for normally used for various types of towers are as follows:

A & D: 3m, 6m, 9m, 18m, 25m

B & C: 3m, 6m, 9m

3.12 Obstructions Encountered on the suggested route

The proposed transmission line route passes over or through a few obstructions, which may be required to be shifted or removed. The details are as below, and are shown in detail in the enclosed drawing.

S.No.	AP No.	Obstruction Details
1	AP 4 to AP 5	11kV Line & Lighting Pole Clearance not available. Requires to be shifted.
2	AP 5	Due to close proximity of a drain, there is possibility of foundation of tower leg at the drain location, however, tower leg location shall be arranged in such a way so as to avoid the drain.

_____x_____

ANNEXURE 'A'

DETAILED SURVEY OF 400 KV INTERCONNECTING D/C T/L FOR LARA

TOWER SCHEDULE

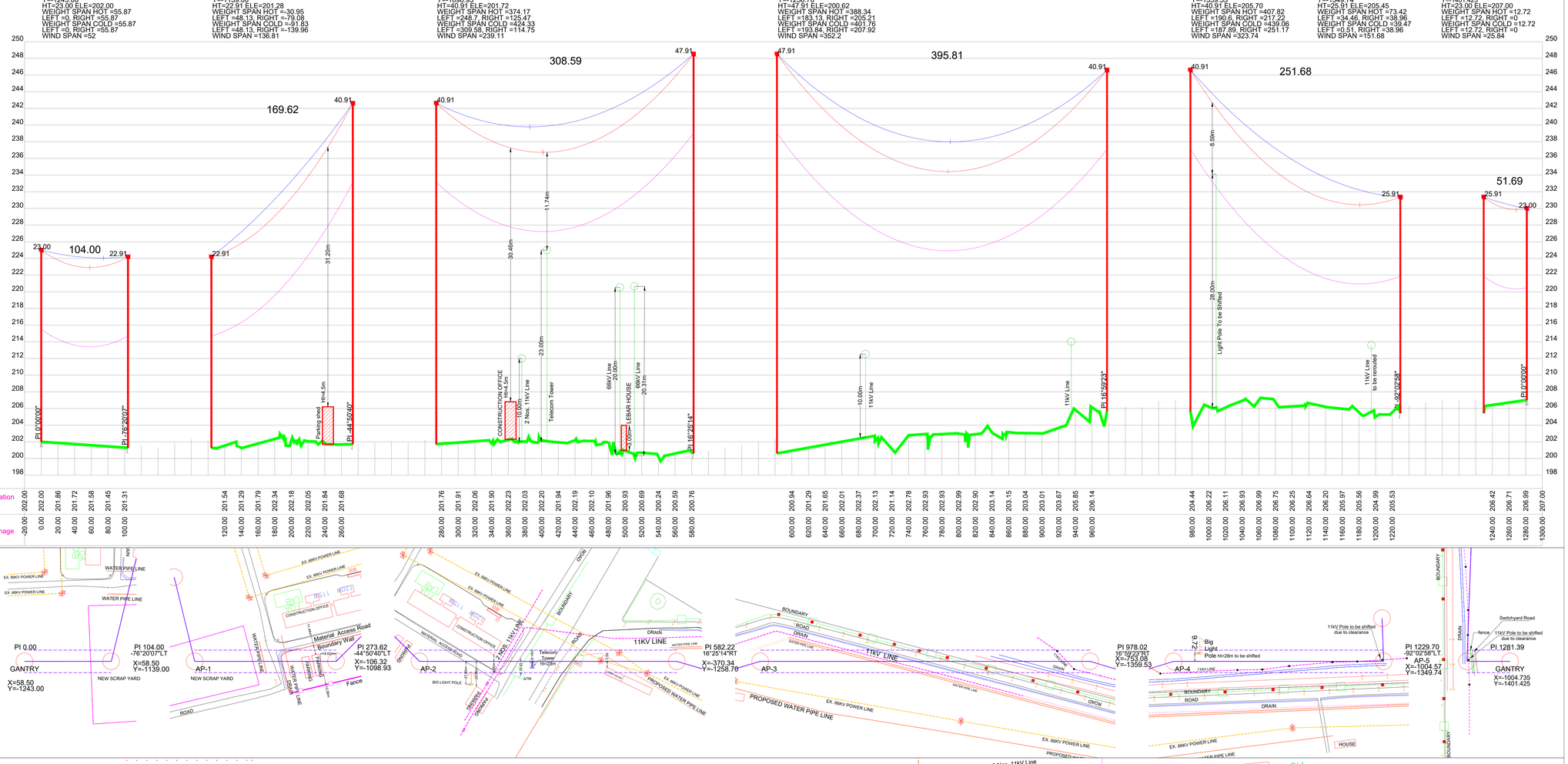
SL. No.	Location No.	Type of Tower	Angle of Deviation	Span Length (m)	Cumulative chanage (m)	Reduced Level (m)	Wind Span (m)	Weight Span Hot (m)			Weight Span Cold (m)			PLANT COORDINATES		UTM COORDINATES		COORDINATES		Crossing Details / Remarks
								Left	Right	Total	Left	Right	Total	Easting	Northing	Easting	Northing	Lat	Long	
1	Gantry	Gantry				202.00	52.00	0.00	55.87	55.87	0.00	55.87	55.87	58.500	-1243.000	754096.29	2408511.49	21.76203	83.45705	
				104.00																
2	AP-1	DD+0	76 d 20 ' 07 " L		104.00	201.28	136.81	48.13	-79.08	-30.95	48.13	-139.96	-91.83	58.500	-1139.000	754106.66	2408614.97	21.76297	83.45716	Auxiliary Crossarm
				169.62																Road, Drain
3	AP-2	DD+18	44 d 50 ' 41 " L		273.62	201.72	239.11	248.70	125.47	374.17	309.58	114.75	424.33	-106.320	-1098.929	753946.66	2408671.28	21.76350	83.45563	
				308.60																2 Nos. 11kV Line, **66kV Line**, 2 Nos.Road, **Telecom Tower**
4	AP-3	DD+25	16 d 25 ' 14 " R		582.22	200.62	352.20	183.13	205.21	388.34	193.84	207.92	401.76	-370.337	-1258.697	753668.02	2408538.65	21.76234	83.45291	
				395.81																Water Pipe Line, 11kV TL Drain, Road,11kV Line
5	AP-4	DD+18	16 d 59 ' 23 " R		978.02	205.70	323.74	190.60	217.22	407.82	187.89	251.17	439.06	-753.084	-1359.533	753277.13	2408476.50	21.76184	83.44913	
				251.68																11kV Line
6	AP-5	DD+3	92 d 02 ' 58 " L		1229.70	205.45	151.68	34.46	38.96	73.42	0.51	38.96	39.47	-1004.572	-1349.739	753027.87	2408511.33	21.76219	83.44672	Auxiliary Crossarm
				51.69																EXISTING DRAIN, SWITCHYARD ROAD AND FENCE
7	Gantry	Gantry			1281.39	207.00	25.84	12.72	0.00	12.72	12.72	0.00	12.72	-1004.735	-1401.425	753022.55	2408459.92	21.76172	83.44666	

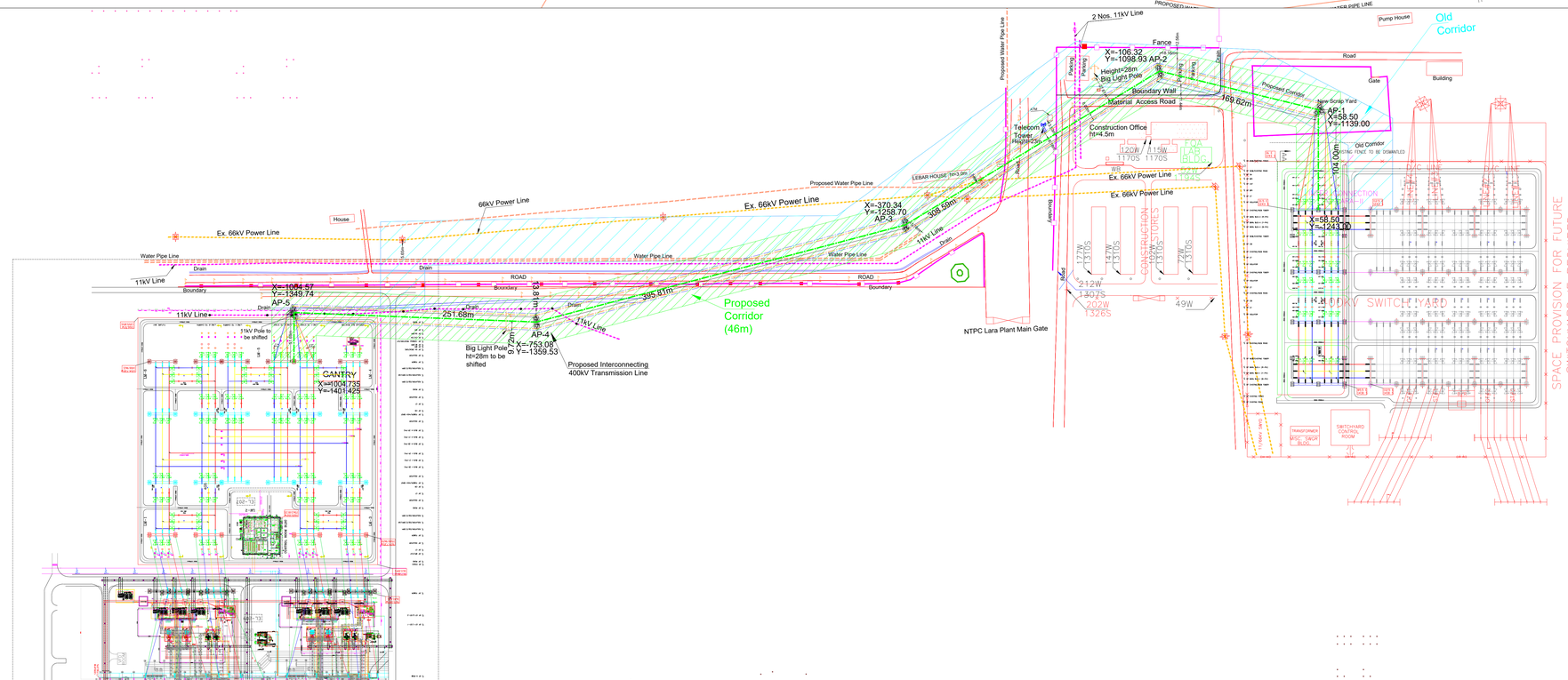
AP4 TO AP3				
TREE HEIGHT (m)	TREE GIRTH (m)	LOCAL NAME	SCIENTIFIC NAME	TAG NO
4	0.481	Sheesham	Dalbergia sissoo	1
4	0.5	Sheesham	Dalbergia sissoo	2
3.5	0.506	Sheesham	Dalbergia sissoo	3
4.2	0.35	Nilgiri	Eucalyptus globulus	4
4.2	0.35	Nilgiri	Eucalyptus globulus	5
4.2	0.35	Nilgiri	Eucalyptus globulus	6
4.2	0.35	Nilgiri	Eucalyptus globulus	7
4.2	0.35	Nilgiri	Eucalyptus globulus	8
4.2	0.35	Nilgiri	Eucalyptus globulus	9
4	0.45	Sheesham	Dalbergia sissoo	10
4	0.45	Sheesham	Dalbergia sissoo	11
4	0.45	Sheesham	Dalbergia sissoo	12
4	0.45	Sheesham	Dalbergia sissoo	13
4	0.45	Sheesham	Dalbergia sissoo	14
4	0.47	Sheesham	Dalbergia sissoo	15
3.4	0.589	Saras	Albizia lebbeck	16
3.4	0.589	Saras	Albizia lebbeck	17
3.4	0.589	Saras	Albizia lebbeck	18
3.7	0.58	Saras	Albizia lebbeck	19
4	0.456	Neem	Azadirachta indica	20
4	0.456	Neem	Azadirachta indica	21
4	0.368	Amala	Phyllanthus emblica	22
3	0.302	Amala	Phyllanthus emblica	23
4	0.37	Sheesham	Dalbergia sissoo	24
4	0.37	Sheesham	Dalbergia sissoo	25
4	0.37	Sheesham	Dalbergia sissoo	26
4	0.37	Sheesham	Dalbergia sissoo	27
4	0.37	Sheesham	Dalbergia sissoo	28
4	0.37	Sheesham	Dalbergia sissoo	29
4	0.37	Sheesham	Dalbergia sissoo	30
4	0.37	Sheesham	Dalbergia sissoo	31
4	0.37	Sheesham	Dalbergia sissoo	32
4	0.37	Sheesham	Dalbergia sissoo	33
4.5	0.37	Sheesham	Dalbergia sissoo	34
4	0.48	Saras	Albizia lebbeck	35
5	0.511	Saras	Albizia lebbeck	36
4.5	0.4	Saras	Albizia lebbeck	37
4	0.5	Akari		38
4	0.555	Akari		39
3.5	0.57	Akari		40
3	0.3	Babool	Vachellia nilotica	41
3	0.3	Babool	Vachellia nilotica	42
4	0.509	Nilgiri	Eucalyptus globulus	43
4	0.608	Nilgiri	Eucalyptus globulus	44
4	0.5	Sheesham	Dalbergia sissoo	45
4	0.5	Sheesham	Dalbergia sissoo	46
4	0.5	Sheesham	Dalbergia sissoo	47
4	0.5	Sheesham	Dalbergia sissoo	48
3	0.5	Sheesham	Dalbergia sissoo	49
3	0.5	Nilgiri	Eucalyptus globulus	50
3	0.57	Nilgiri	Eucalyptus globulus	51

AP4 TO AP3				
TREE HEIGHT (m)	**TREE GIRTH (m)**	**LOCAL NAME**	**SCIENTIFIC NAME**	**TAG NO**
2	0.359	Akari		52
2	0.301	Akari		53
3	0.35	Sheesham	Dalbergia sissoo	54
3	0.35	Sheesham	Dalbergia sissoo	55
3	0.35	Sheesham	Dalbergia sissoo	56
3	0.35	Sheesham	Dalbergia sissoo	57
3	0.35	Sheesham	Dalbergia sissoo	58
3	0.45	Sheesham	Dalbergia sissoo	59
3.5	0.45	Nilgiri	Eucalyptus globulus	60
3.5	0.35	Nilgiri	Eucalyptus globulus	61
3.5	0.35	Nilgiri	Eucalyptus globulus	62
3.5	0.35	Nilgiri	Eucalyptus globulus	63
3.5	0.35	Nilgiri	Eucalyptus globulus	64
3.5	0.35	Nilgiri	Eucalyptus globulus	65
3.5	0.35	Nilgiri	Eucalyptus globulus	66
3.5	0.35	Nilgiri	Eucalyptus globulus	67
3.5	0.35	Nilgiri	Eucalyptus globulus	68
3.5	0.35	Amala	Phyllanthus emblica	69
3.5	0.35	Neem	Azadirachta indica	70
3.5	0.35	Neem	Azadirachta indica	71
3.5	0.35	Saras	Albizia lebbeck	72
3.5	0.456	Saras	Albizia lebbeck	73
3.5	0.477	Saras	Albizia lebbeck	74
3.5	0.5	Saras	Albizia lebbeck	75
3.5	0.5	Saras	Albizia lebbeck	76
3.5	0.5	Saras	Albizia lebbeck	77
3	0.38	Jamun	Syzygium cumini	78
3	0.38	Jamun	Syzygium cumini	79
3	0.3	Jamun	Syzygium cumini	80
3	0.3	Sani	Prosopis Cineraria	81
3	0.383	Sani	Prosopis Cineraria	82
4	0.4	Neem	Azadirachta indica	83
3.5	0.4	Sheesham	Dalbergia sissoo	84
3.5	0.4	Sheesham	Dalbergia sissoo	85
3.5	0.4	Sheesham	Dalbergia sissoo	86
3.5	0.4	Sheesham	Dalbergia sissoo	87
3.5	0.4	Sheesham	Dalbergia sissoo	88
3.5	0.4	Sheesham	Dalbergia sissoo	89
3.5	0.4	Sheesham	Dalbergia sissoo	90
3.5	0.4	Sheesham	Dalbergia sissoo	91
3.5	0.4	Sheesham	Dalbergia sissoo	92
3.5	0.4	Sheesham	Dalbergia sissoo	93
3.5	0.4	Sheesham	Dalbergia sissoo	94
4.5	1.7	Keru	Semecarpus anacardium	95
3.5	0.4	Keru	Semecarpus anacardium	96
3.5	0.4	Keru	Semecarpus anacardium	97
3.5	0.4	Keru	Semecarpus anacardium	98
3.5	0.4	Keru	Semecarpus anacardium	99
3.5	0.4	Keru	Semecarpus anacardium	100
3.5	0.455	Sheesham	Dalbergia sissoo	101
3.5	0.455	Sheesham	Dalbergia sissoo	102

AP4 TO AP3				
TREE HEIGHT (m)	**TREE GIRTH (m)**	**LOCAL NAME**	**SCIENTIFIC NAME**	**TAG NO**
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*103*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*104*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*105*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*106*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*107*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*108*
3.5	*0.455*	*Sheesham*	*Dalbergia sissoo*	*109*
4	*0.44*	*Saras*	*Albizia lebbeck*	*110*
4	*0.44*	*Saras*	*Albizia lebbeck*	*111*
4	*0.44*	*Saras*	*Albizia lebbeck*	*112*
4	*0.44*	*Saras*	*Albizia lebbeck*	*113*
4	*0.44*	*Saras*	*Albizia lebbeck*	*114*
4	*0.44*	*Saras*	*Albizia lebbeck*	*115*
4	*0.5*	*Nilgiri*	*Eucalyptus globulus*	*116*
4	*0.5*	*Nilgiri*	*Eucalyptus globulus*	*117*
4	*0.5*	*Nilgiri*	*Eucalyptus globulus*	*118*
4	*0.5*	*Nilgiri*	*Eucalyptus globulus*	*119*
4	*0.5*	*Nilgiri*	*Eucalyptus globulus*	*120*
4	*0.6*	*Akari*		*121*
4	*0.6*	*Akari*		*122*
4	*0.6*	*Akari*		*123*
4	*0.6*	*Akari*		*124*

AP3 TO AP2				
TREE HEIGHT (m)	TREE GIRTH (m)	LOCAL NAME	SCIENTIFIC NAME	TAG NO
4	0.034	Saras	Albizia lebbeck	1
3.5	0.7	Saras	Albizia lebbeck	2
3.5	0.8	Saras	Albizia lebbeck	3
3.5	0.6	Saras	Albizia lebbeck	4
3.5	0.481	Saras	Albizia lebbeck	5
3.5	0.366	Saras	Albizia lebbeck	6
3.5	0.458	Saras	Albizia lebbeck	7
3.5	0.506	Saras	Albizia lebbeck	8
4	0.4	Nilgiri	Eucalyptus globulus	9
4.5	0.45	Amala	Phyllanthus emblica	10
4.5	0.305	Amala	Phyllanthus emblica	11
3.5	0.37	Amala	Phyllanthus emblica	12
5	0.38	Amala	Phyllanthus emblica	13
3.7	0.3	Amala	Phyllanthus emblica	14
2.7	0.31	Amala	Phyllanthus emblica	15
3.7	0.35	Amala	Phyllanthus emblica	16
3.5	0.411	Amala	Phyllanthus emblica	17
4	0.367	Amala	Phyllanthus emblica	18
4	0.4	Amala	Phyllanthus emblica	19
4.5	0.5	Sheesham	Dalbergia sissoo	20
4.5	0.566	Sheesham	Dalbergia sissoo	21
3.5	0.419	Sheesham	Dalbergia sissoo	22
3.3	0.309	Sheesham	Dalbergia sissoo	23
1.4	4	Pipal	Ficus religiosa	24
4	0.4	Sheesham	Dalbergia sissoo	25
4	0.3	Sheesham	Dalbergia sissoo	26
5	0.3	Sheesham	Dalbergia sissoo	27
4	0.3	Sheesham	Dalbergia sissoo	28
4.5	0.3	Sheesham	Dalbergia sissoo	29
4.5	0.511	Nilgiri	Eucalyptus globulus	30
3	0.456	Nilgiri	Eucalyptus globulus	31
4	0.316	Nilgiri	Eucalyptus globulus	32
5	0.408	Nilgiri	Eucalyptus globulus	33
6	0.45	Nilgiri	Eucalyptus globulus	34
5	0.45	Nilgiri	Eucalyptus globulus	35
5.5	0.55	Nilgiri	Eucalyptus globulus	36
3	0.301	Amala	Phyllanthus emblica	37
3	0.314	Amala	Phyllanthus emblica	38
3.5	0.55	Sheesham	Dalbergia sissoo	39
3.5	0.466	Sheesham	Dalbergia sissoo	40
4	0.71	Sheesham	Dalbergia sissoo	41
4	0.001	Sheesham	Dalbergia sissoo	42
5.5	0.569	Sheesham	Dalbergia sissoo	43
5	0.601	Sheesham	Dalbergia sissoo	44
5	0.702	Sheesham	Dalbergia sissoo	45
4	0.45	Neem	Azadirachta indica	46
4	0.47	Neem	Azadirachta indica	47
4.5	0.5	Neem	Azadirachta indica	48





1. ROAD	
2. GATE	
3. BUILDING	
4. OLD CORRIDOR	
5. BOUNDARY	
6. 33kV POWER LINE	
7. WATER PIPE LINE	
8. 400kV TRANSMISSION LINE	
9. 66kV POWER LINE	
10. TELECOM TOWER	
11. DRAIN	
12. ATM/STRUCTURE	
13. LIGHT POLE	
14. PROPOSED CORRIDOR	46M
15. 11Kv LINE	

CONDUCTOR PARAMETERS

1. NAME	:	ACSR "MOOSE"
2. DIAMETER (mm)	:	31.77
3. UNIT WEIGHT(Kg/m)	:	2.004
4. AREA (Sq.mm)	:	597

CONDITION

1. NORMAL RULING SPAN (m)	:	400
2. GROUND CLEARANCE (m)	:	9.5
3. MAXIMUM SAG (85° NW) (m)	:	13.263
4. TENSION AT 0°C NO WIND	:	4144.81Kg.
5. TENSION AT 85°C NO WIND	:	3022.04Kg.
6. SAG ERROR (m)	:	0.15
7. CONDITION OF AIR	:	STILL

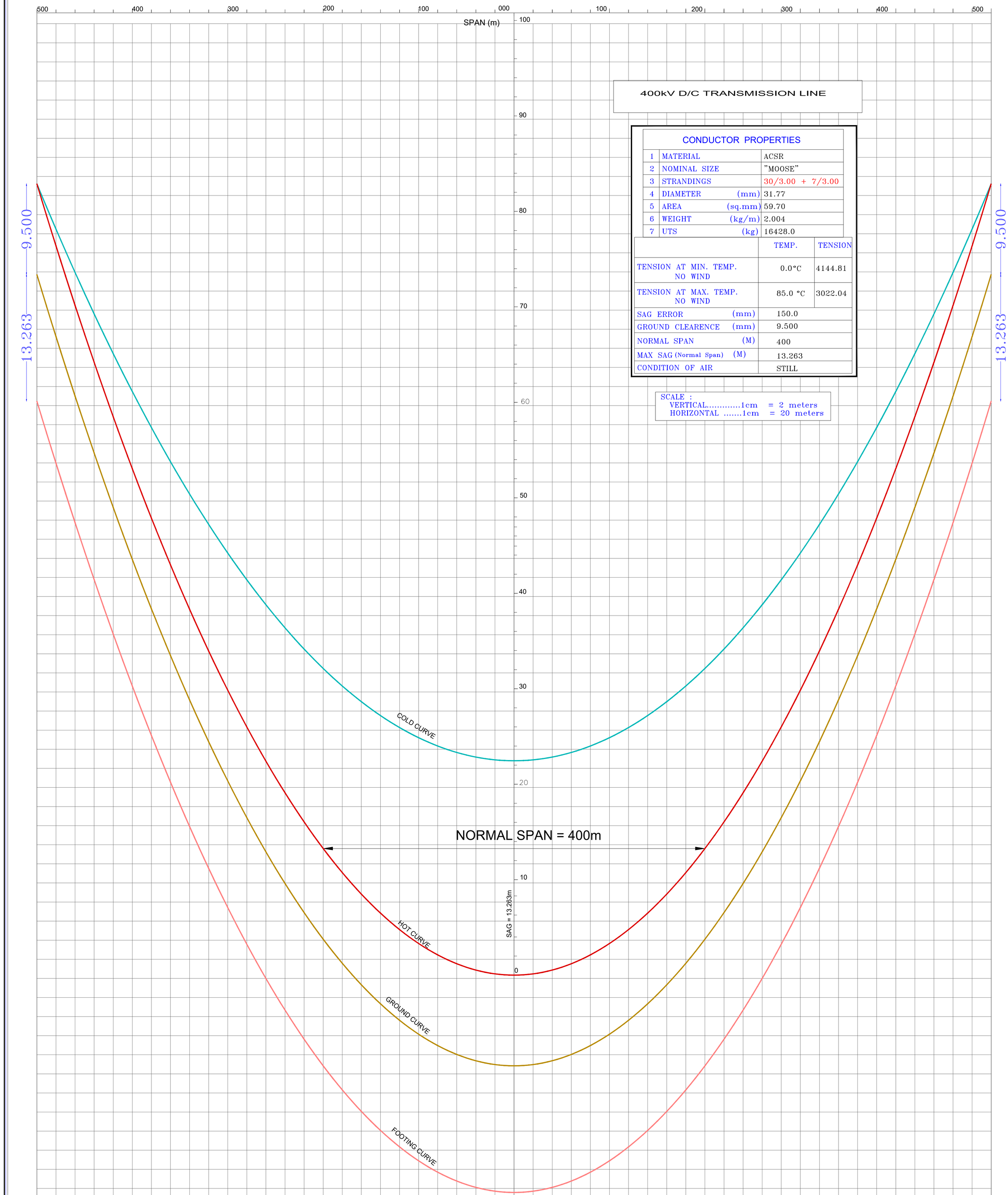
Rev. No.	Date	Description	Prepared	Checked	Approved
Owner:					
Contractor:		The Designer Consortium New Delhi, India			
Project:		*Longitudinal Ground Profile & Plan of 400kV Transmission Line for Lara substation*			
Prepared By:	----	Date:21.01.2025	Title:		
Checked By:	----	Date:21.01.2025			
Approved By:	----	Date:21.01.2025	SHEET:		REV.
SHEET SIZE:	A0	Scale NTS	DRG NO.		

400kV D/C TRANSMISSION LINE

CONDUCTOR PROPERTIES		
1	MATERIAL	ACSR
2	NOMINAL SIZE	"MOOSE"
3	STRANDINGS	30/3.00 + 7/3.00
4	DIAMETER (mm)	31.77
5	AREA (sq.mm)	59.70
6	WEIGHT (kg/m)	2.004
7	UTS (kg)	16428.0

	TEMP.	TENSION
TENSION AT MIN. TEMP. NO WIND	0.0°C	4144.81
TENSION AT MAX. TEMP. NO WIND	85.0 °C	3022.04
SAG ERROR (mm)	150.0	
GROUND CLEARENCE (mm)	9.500	
NORMAL SPAN (M)	400	
MAX SAG (Normal Span) (M)	13.263	
CONDITION OF AIR	STILL	

SCALE :
VERTICAL.....1cm = 2 meters
HORIZONTAL .....1cm = 20 meters



AP-2
AP-1
AP-3
AP-5
Gantry
AP-4
Gantry

Minutes of Meeting between NTPC Lara Project and BHEL TBG on 28 Jan 2025 through MS Teams for Detailed Route Survey report of 400kV interconnection between Stage I & Stage II Switchyard

NTPC Lara

1. Arun Kumar Dubey, AGM(PC-EED)
2. Anjan Sinha, DGM(EED)
3. Prasad Khandekar, Dy Manager (CCD)
4. Pintu, Engineer (FES)

BHEL-TBG

1. Ratheen Sarkar Sr DGM
2. H.K Santoshi DGM
3. Manvendra, Sr Manger

BHEL PSER- C. Shailesh Sr DGM

With reference to draft report submitted by BHEL TBG to NTPC Engineering and various observation of Engineering and Projects (subsequent to VC meeting with BHEL held on 24 Jan2025) BHEL had submitted revised draft report on 27Jan 2025.

Major Points Discussed and agreed on revised draft detailed Survey Report are as below.

1. All GPS Coordinates are to be incorporated.
2. AP 2 location: Revised Location accepted to meet the SAG and clearance requirements.
3. AP-2 to AP-3: As per revised draft report submitted, it is mentioned that clearance available for Construction Office, Communication tower and Labor House. During stringing of conductors BHEL TBG to ensure all necessary safety arrangements including shifting coordination of Airtel tower / any other facilities (if required).

4. AP-3: Location is inside greenbelt of NTPC land. BHEL TBG is advised to carry out material shifting and erection of tower in such a way that greenbelt is minimally affected. To meet the requirements of Shifting and Erection of AP3 all possible resources in sufficient quantity (Farana, trailer, trolley, manpower) must be ensured by BHEL TBG. Further if at all any tree required to be removed all necessary requirements /arrangements are to be done by BHEL as per Scope.
5. **Obstructions Encountered on the suggested route** (Page no 16):

   a. AP4 to AP 5- 11kV Construction Power Line and One lighting Mast. Clearance not available and requires to be shifted. BHEL PSER to change OH 11KV Construction power Line by underground cable in consultation with NTPC-EED in suit at site condition.
   b. Lighting Mast to be removed. (on request of PSER LM was kept and will be shifted by PSER at suitable location suit to site, if required)
   c. AP 5: Due to proximity of a drain, there is possibility of foundation of tower leg at the drain location, however, tower leg location shall be arranged in such a way to avoid the drain.

Arun Kumar Dubey — Digitally signed by Arun Kumar Dubey Date: 2025.01.28 16:00:52 +05'30'

28/1/25

28/01/2025 (M.S. PUNDIR) BHEL

ANJAN SINHA 28/11/2025

CCD.

(C. SHAILESH) BHEL-PSER

एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
NTPC Limited
(A Govt. of India Enterprise)
(Formerly National Thermal Power Corporation Ltd.)
(केंद्रीय कार्यालय नोएडा)
Corporate Center NOIDA

Reference : CC-ENGG-9587-001-301-POC-F-001 **Date :** 29/02/2024

From : PRATAP KALARATH SENIOR MANAGER	**To :** BHARAT HEAVY ELECTRICALS LTD NEW DELHI 110049 IN **Cc :** singhjp@bhel.in

Subject : EPC Package

Please find enclosed following drawings/ documents for necessary action at your end.

Vendor Drg. No.	:	PE-DG-508-100-M001
Orgn. Drg. No.	:	9587-001-301-POC-F-001
Revision No.	:	01
Drg. Title	:	PLOT PLAN
App. Category	:	CAT-II
Release Date	:	29/02/2024

Scan to verfiy

Comments : Comment marked

फर्स्ट एंगल प्रोजेक्शन/FIRST ANGLE PROJECTION
सभी माप मि॰ मी॰ में है/ALL DIMENSIONS ARE IN MM
ड्राॅइंग संख्या/DRAWING NO. PE-DG-508-100-M001

PLANT NORTH

WIND ROSE

Insert text here

The road layout in this area is modified to accomodate for the non-available piece of land marked as area under acquisition in this drawing.Kindly modify the layout of road and boundary wall accordingly

What are these dotted lines,kindly mark.

What is this line marked

Is this BHEL construction stage office , if yes mark properly

Not finalised yet, may be removed.

It is observed that BHEL has combined CHP and AHP MCCs in one building. Numbering of the AHP and CHP MCCs are also different. This may create confusion. BHEL to check

1.Fly Ash classification system has 1 classifier silo, 1 fine ash hopper and 2 coarse ash hopper. Where is Classifier silo located ?
2.check & revise the location of fly ash hoppers (for ash classification) as fly ash hoppers in this zone will cause dust nuisance and may affect the performance of ID fan

Indicate location of CEMS room for each unit

simplify to AHP compressor house as it houses all the compressors required for AHP

Approach road for biomass area to be connected to this side road also either directly or from somewhere else.

Portion of TP-1 is located on the sloping line, proper RCC wall or protection/RCC wall may be planned accordingly for safety

This trestle is located on a sloping road,Check and relocate at foundation/pedestale to be designed accordingly

Mark the temporary area as per specification requirement

Delete these dimensioning

Indicate approach to gypsum dewatering building and create full slope. Also gypsum dewatering building floor fgl and MG floor fgl

Locate CHP workshop, store & CHP office building

Identify location for compressor house for BOBR wagons at track hopper area

TH length to be increased such that total TH length is 330m excluding machinery hatch

Pipe routed on sloping area, check and reroute/relocate

Located on slope, check

Mark space for ash brick plant 200x60 m

CBSP to be shifted close to road at 2565.3 S and towards MCC-3

For comments on main plant layout area refer to comments marked on drg.nos. 9587-001-101-P/M/F-001

Pathway to be considered at this line with min 12 meters width in order to get sufficient straight length

1.Fly suggested to increase straight length of CW channel to reduce eddy formation in the channel. Also 2.the pit (check the length of bottom with fish missing as per HEI)

Provision to be kept for future ESP expansion area to reduce eddy formation

Pathway for clarified water make-up pipe line to common channel to be indicated

1.pls indicate space for gravity filters 2.pls indicate space for chemical lab building

1.pls check why the intake piping from two section of reservoir is routed through another section of reservoir. 2.pls indicate path for fish water line also.

Fill pond and FW pump house to be indicated

1.pls indicate space for gravity filters 2.pls indicate space for chemical lab building

Lift station for plant effluent make-up pipe line to be indicated

Drain 10-2

Drain 10-1

Drain 10-3

Drain 10-4

Drain 10-5

Drain 10-6

Drain 10-7

Drain 10-8

Drain 10-9

Drain 10-10

Drain 10-11

Drain 10-12

Drain 10-13

Drain 10-14

Drain 10-15

Drain 10-16

Drain 10-17

Drain 10-18

Drain 10-19

Drain 10-20

Drain 10-21

Drain 10-22

Drain

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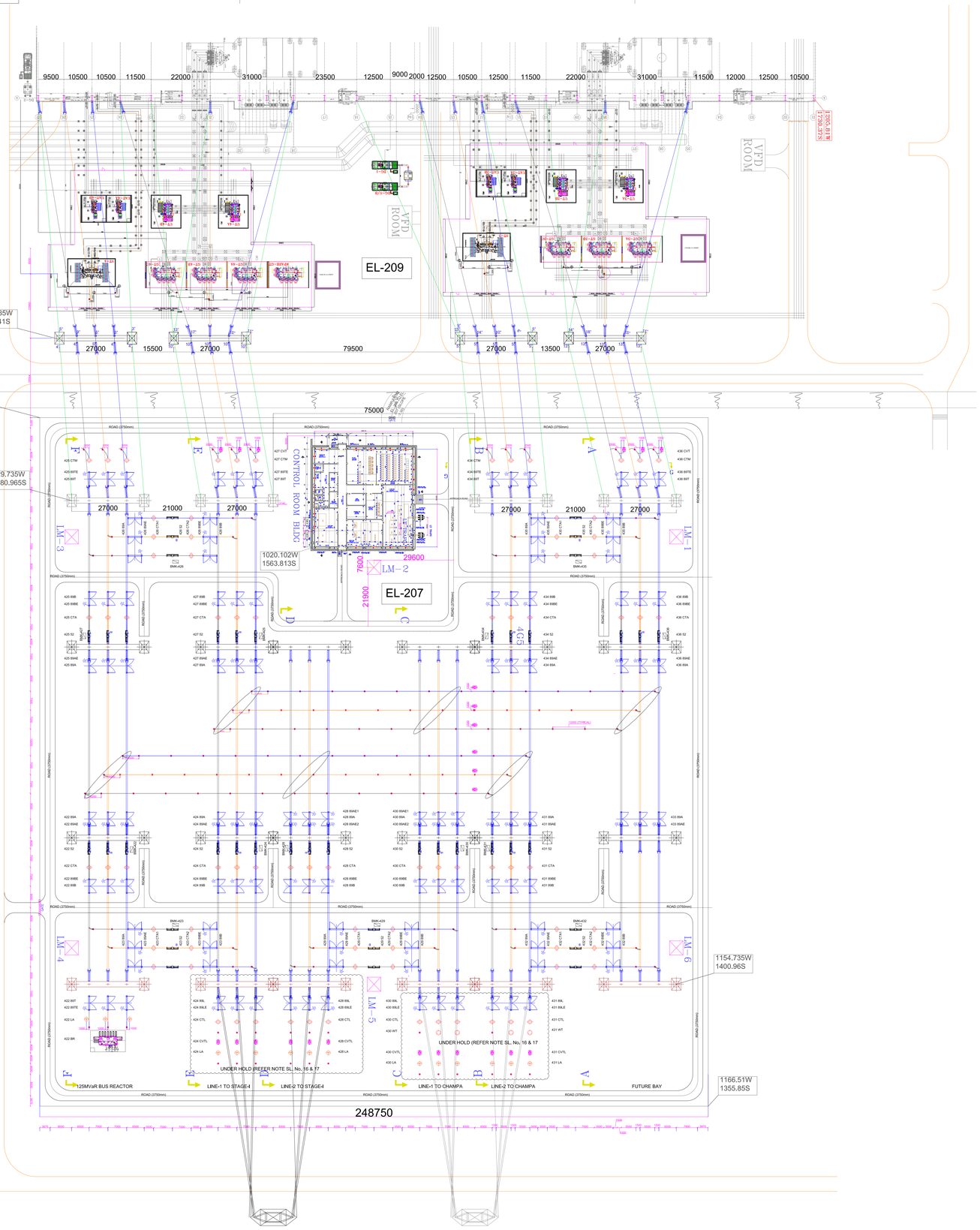
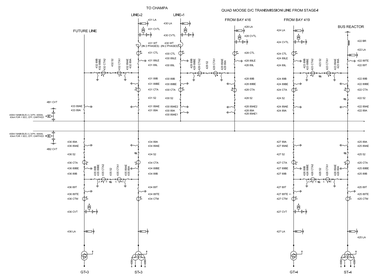
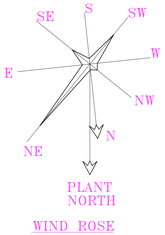
DRAWING No. TB-423-316-003

CUSTOMERS DRAWING No.



400kV SINGLE LINE DIAGRAM





WIND ROSE

400kV SYSTEM PARAMETERS

Sl.No.	DESCRIPTION OF PARAMETER	
1	SYSTEM OPERATING VOLTAGE	400kV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	420kV
3	RATED FREQUENCY	50Hz
4	NO. OF PHASES	3
5	RATED INSULATION LEVELS i) FULL WAVE IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.) ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec.) iii) ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (rms)	±1425kVp ±1050kVp 630kV (rms)
6	CORONA EXTINCTION VOLTAGE (MIN)	320kV (rms)
7	MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5MHz & 2MHz AT 266KV rms	1000 microV
8	MIN. CREEPAGE DISTANCE	25 mm/kV (10500 mm)
9	MIN. CLEARANCE i) PHASE TO PHASE ii) PHASE TO EARTH iii) SECTIONAL CLEARANCE	4000MM 3500MM 6500MM
10	RATED SHORT CIRCUIT CURRENT FOR 1SEC DURATION	63kA
11	SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED
12	SUB CONDUCTOR SPACING	450MM

LEGEND & BOQ FOR STAGE-II

S.No	ITEM DESCRIPTION	LEGEND	QTY (NOS)
1.	400kV, 3150 A, 63kA FOR 1 SEC, CIRCUIT BREAKER (3-PH)		14
2.	400kV, 3150 A, 63kA FOR 1 SEC, HCB DISCONNECTOR WITH 1 ES. (3-PH)		36
3.	400kV, 3150 A, 63kA FOR 1 SEC, HCB DISCONNECTOR WITH 2 ES. (3-PH)		2
4.	400kV BUS POST INSULATOR (EXCL. ISOLATOR AND WT)		161
5.	336kV LIGHTNING ARRESTER (1-PH)		27
6.	400kV CAPACITIVE VOLTAGE TRANSFORMER (1-PH)		24
7.	400kV PEDESTAL MOUNTED WAVE TRAP (1-PH)		04
8.	400kV CURRENT TRANSFORMER (1-PH)		81

CONDUCTOR & STRINGING DETAILS :-

SL.NO.	DESCRIPTION	400kV	
		CONDUCTOR DETAIL	CONNECTION HEIGHT (ABOVE PLINTH LEVEL)
1.	EQUIPMENT INTERCONNECTION	4.0" IPS (EH) AL. TUBE/	8mtr.
2.	JACK BUS ON GT/ST - IN GT YARD	TWIN ACSR MOOSE CONDUCTOR	23 mtr. FROM GT YARD FGL
3.	JACK BUS TOWARDS GT/ST - IN SWYD	TWIN ACSR MOOSE CONDUCTOR	23 mtr.
4.	LINE SIDE DEAD-END STRINGING	*QUAD ACSR MOOSE CONDUCTOR	16 mtr.
5.	EARTHWIRE	7/3.66mm SHIELD WIRE	31.5 mtr
6.	DROPPER ON CVT, LA	TWIN ACSR MOOSE CONDUCTOR	-

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. ALL STRUCTURE/CONDUCTOR HEIGHTS ARE ABOVE PLINTH LEVEL. PLINTH LEVEL IS 300 MM ABOVE F.G.L.
3. WAVE TRAP FOUNDATION SHALL BE PROVIDED FOR ALL THREE PHASE OF THE LINE AND SHALL BE SUITABLE FOR BPI ALSO. HOWEVER WAVE TRAP SHALL BE INSTALLED ON TWO PHASES ONLY. INSULATOR SHALL BE PROVIDED FOR ONE PHASE WHEREVER WAVETRAP IS NOT INSTALLED.
4. TYPE OF GANTRY STRUCTURES SHALL BE AS PER APPROVED STRUCTURAL LAYOUT DRAWING.
5. SWITCHYARD LIGHTNING PROTECTION SHALL BE ACHIEVED THROUGH SHIELD WIRES OR WITH 50M HIGH LM & SHIELD WIRES AS PER APPROVED DSLP.
6. SA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE / ANY EQUIPMENT KEPT NEAR LIGHTING ARRESTER AND BHEL SHALL ENSURE THE SAME DURING ERECTION AT SITE.
7. FOR SECTION DETAILS, REFER SHEET No. 02.
8. SIZE OF CONTROL ROOM BUILDING IS TENTATIVE & SEPERATE DRAWING SHALL BE SUBMITTED FOR NTPC APPROVAL.
9. DEAD END TOWERS FOR CHAMPA LINE-1 & 2 LOCATION SHALL BE CONFIRMED BY NTPC AS PER THIS LAYOUT. FOR TIE CONNECTION TO STAGE-I EXTN. DEAD END TOWERS ALONG WITH TRANSMISSION LINE TOWERS SHALL BE FINALIZED AFTER ROUTE SURVEY & NTPC APPROVAL.
10. SUPPLY AND STRINGING OF 400kV LINE CONDUCTOR, SHIELD WIRE, INSULATOR AND HARDWARE BETWEEN 400kV DEAD END TOWER AND SWITCHYARD TERMINAL GANTRY (EXCEPT FOR CONNECTION TO STAGE-I) ARE NOT IN BHEL SCOPE. HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT, JUMPERS & HARDWARE REQUIRED FOR JUMPERS ARE IN SCOPE OF BHEL.
11. DIMENSIONS OF EQUIPMENTS (SWGR PANELS,BATTERY, BATTERY CHARGER, CRP, LA, ISOLATOR,BREAKER, ETC. ARE TENTATIVE AND SHALL UPDATED AS PER ACTUAL DRAWINGS AFTER FINAL APPROVAL.
12. CONTROL & RELAY PANELS SHALL BE PLACED IN CONTROL ROOM BUILDING.
13. # DEAD END TOWER LOCATIONS INDICATED FOR STAGE-II TO STAGE-I CONNECTION ARE TENTATIVE & SHALL BE FINALISED AFTER ROUTE SURVEY OF TRANSMISSION LINE & NTPC APPROVAL ON SAME.
14. LOCATION & SECTION OF ROADS OUTSIDE SWITCHYARD SHALL BE REFERRED FROM PEM DRAWINGS AT REFERENCE DRAWINGS SL. NO. 3&4
15. LOCATION OF BAY MARSHALLING KIOSK IS INDICATED TENTATIVELY & SHALL BE FINALISED IN CABLE TRENCH LAYOUT FOR SWITCHYARD.
16. LINE SIDE EQUIPMENTS FOR BOTH STAGE-I & STAGE-II TRANSMISSION LINE ARE KEPT IN HOLD AND SHALL BE RELEASED FROM HOLD AFTER FINALISATION OF TRANSMISSION LINE TOWER.
17. FOUNDATION OF 400KV TAKEOFF GANTRY FOR LINE TOWARDS LARA STAGE-I SHALL BE KEPT ON HOLD & SHALL BE RELEASED AFTER TRANSMISSION LINE TOWER FINALISATION. FOR CHAMPA LINE NTPC TO FINALISE THE DEAD END TRANSMISSION LINE TOWER LOCATION AS WELL AS HEIGHT TO MEET THE HORIZONTAL/VERTICAL DEVAITON OF LINE CONDUCTOR & CONFIRM THE SAME TO BHEL.
18. DIMENSION OF REACTOR SOAK PIT SHALL BE AS PER THE CIVIL FOUNDATION DRAWING (DRG. NO. 9587-001-230-PVC-C-0489) WHICH SHALL BE SUBMITTED AFTER APPROVAL OF GA-REACTOR (DRG. NO. 9587-001-201-BP-PVE-B-175). THE SOAK PIT SHALL BE CONNECTED TO COMMON OIL PIT IN TRANSFORMER YARD THROUGH PIPE FOR WASTE OIL COLLECTION. HOWEVER IN CASE OF FOULING OF SOAK PIT WITH NEARBY EQUIPMENT FOUNDATION, BHEL SHALL TAKE CARE TO AVOID FOULING.

REFERENCE DRAWINGS

SL.NO.	NTPC DRAWING NUMBER	DESCRIPTION
1.	9587-001-230-PVE-P-0002	400kV SWITCHYARD SINGLE LINE DIAGRAM
2.	9587-001-301-POC-F-001	PLOT PLAN
3.	9587-001-230-PVE-U-0054	SAG TENSION CALCULATIONS
4.	9587-001-230-PVE-U-0050	SHORT CIRCUIT FORCE STRENGTH CALC. FLEXIBLE BUS
5.	9587-001-230-PVE-F-0049	400 KV Switchyard - DSLP Calculation & layout
6.	9587-001-199-PVE-F-101	BHEL Transformer Yard layout
7.	9587-001-301-PVC-C-107	LAYOUT OF ROAD
8.	9587-001-110-PVM-F-001	MAIN PLANT EQUIPMENT LAYOUT AT EL(+/-) 0.0M
9.	9587-001-230-PVE-F-018	400kV Switchyard Structure Layout Plan

CUSTOMER DRAWING NO. 9587-001-230-PVE-F-0013

CUSTOMER: NTPC LIMITED

2 X 800 MW NTPC LARA STPS STAGE-II EPC

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	APPD	B.K.BHRUNJWAA	SIGNED	18.11.2023

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01	27.03.2024	MAHENDER	B/S	B/S

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TITLE: 400kV Layout Plan & Section

DEPT.	SCALE	BHEL DRAWING NO.
SIGN		TB-423-316-003

SHEET 01 OF 03 REV. 04

SIZE:A3

COMPUTER FILE NAME: PE-DC-PTS-100-KDF---

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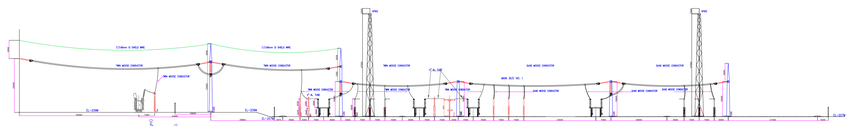
COMPUTER FILE NAME: PE-GD-PTS-100-MDF---

DRAWING No. TB-423-316-003

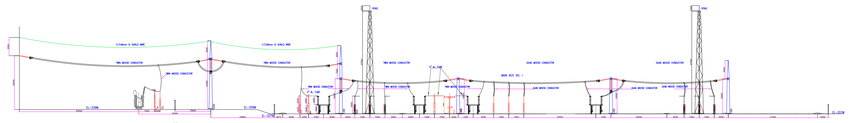
CUSTOMERS DRAWING No.

FIRST ANGLE PROJECTION

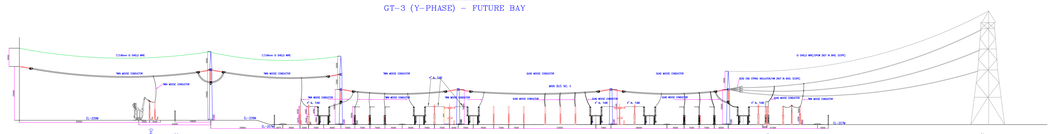
ALL DIMENSIONS ARE IN MM



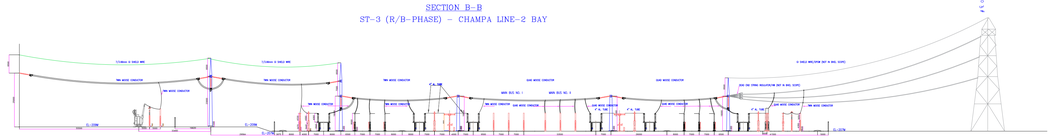
SECTION A–A
GT–3 (R/B–PHASE) – FUTURE BAY



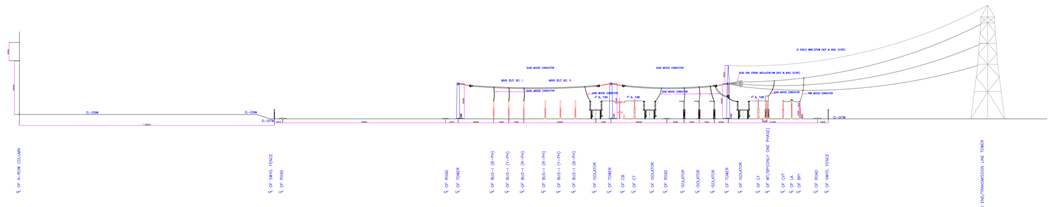
SECTION A–A
GT–3 (Y–PHASE) – FUTURE BAY



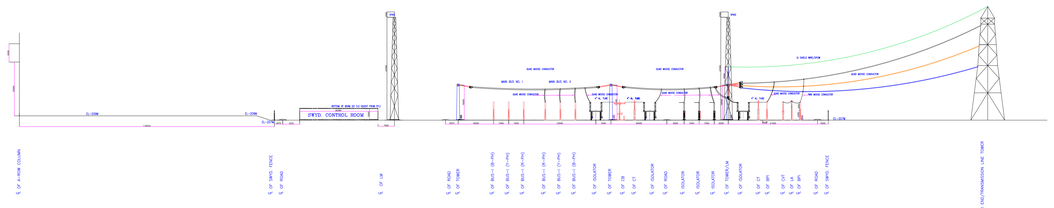
SECTION B–B
ST–3 (R/B–PHASE) – CHAMPA LINE–2 BAY



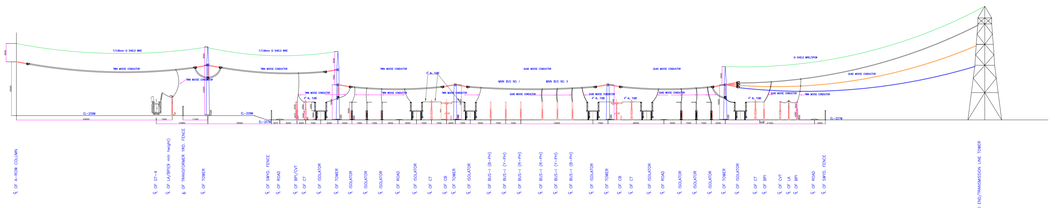
SECTION B–B
ST–3 (Y–PHASE) – CHAMPA LINE–2 BAY



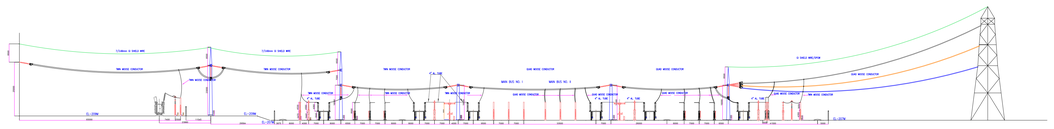
SECTION C–C
CHAMPA LINE–1 BAY



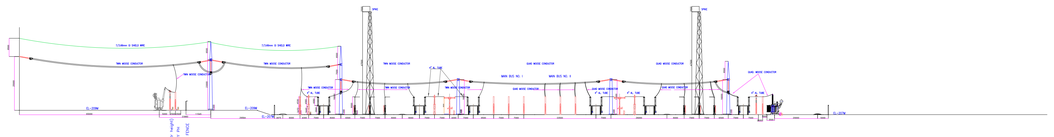
SECTION D–D
STAGE–I LINE–2 BAY



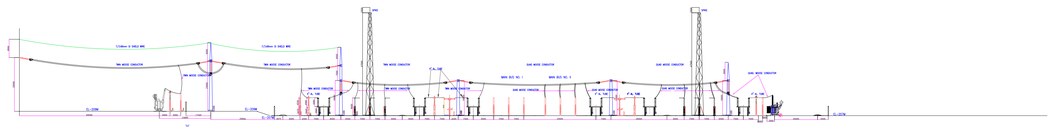
SECTION E–E
GT–4 (R/B–PHASE) – STAGE–I LINE–1 BAY



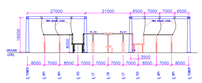
SECTION E–E
GT–4 (Y–PHASE) – STAGE–1 LINE–1 BAY



SECTION F–F
ST–4 (R/B–PHASE) – BUS REACTOR BAY



SECTION F–F
ST–4 (Y–PHASE) – BUS REACTOR BAY



SECTION G–G
GT – ST – TIE BAY

SUITABLE FOR BPI ALSO. HOWEVER WAVE TRAP SHALL BE INSTALLED ON TWO PHASES ONLY. INSULATOR SHALL BE PROVIDED FOR ONE PHASE WHEREVER WAVETRAP IS NOT INSTALLED.

4. TYPE OF GANTRY STRUCTURES SHALL BE AS PER APPROVED STRUCTURAL LAYOUT DRAWING.
5. SWITCHYARD LIGHTNING PROTECTION SHALL BE ACHIEVED THROUGH SHIELD WIRES OR WITH 50M HIGH LM & SHIELD WIRES AS PER APPROVED DSLP.
6. SA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE / ANY EQUIPMENT KEPT NEAR LIGHTING ARRESTER AND BHEL SHALL ENSURE THE SAME DURING ERECTION AT SITE.
7. FOR SECTION DETAILS, REFER SHEET No. 02.
8. SIZE OF CONTROL ROOM BUILDING IS TENTATIVE & SEPERATE DRAWING SHALL BE SUBMITTED FOR NTPC APPROVAL.
9. DEAD END TOWERS FOR CHAMPA LINE–1 & 2 LOCATION SHALL BE CONFIRMED BY NTPC AS PER THIS LAYOUT. FOR TIE CONNECTION TO STAGE–I EXTN. DEAD END TOWERS ALONG WITH TRANSMISSION LINE TOWERS SHALL BE FINALIZED AFTER ROUTE SURVEY & NTPC APPROVAL.
10. SUPPLY AND STRINGING OF 400kV LINE CONDUCTOR, SHIELD WIRE, INSULATOR AND HARDWARE BETWEEN 400kV DEAD END TOWER AND SWITCHYARD TERMINAL GANTRY (EXCEPT FOR CONNECTION TO STAGE–I) ARE NOT IN BHEL SCOPE. HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT, JUMPERS & HARDWARE REQUIRED FOR JUMPERS ARE IN SCOPE OF BHEL.
11. DIMENSIONS OF EQUIPMENTS (SWGR PANELS,BATTERY, BATTERY CHARGER, CRP, LA, ISOLATOR,BREAKER, ETC. ARE TENTATIVE AND SHALL UPDATED AS PER ACTUAL DRAWINGS AFTER FINAL APPROVAL.
12. CONTROL & RELAY PANELS SHALL BE PLACED IN CONTROL ROOM BUILDING.
13. # DEAD END TOWER LOCATIONS INDICATED FOR STAGE–II TO STAGE–I CONNECTION ARE TENTATIVE & SHALL BE FINALISED AFTER ROUTE SURVEY OF TRANSMISSION LINE & NTPC APPROVAL ON SAME.
14. LOCATION & SECTION OF ROADS OUTSIDE SWITCHYARD SHALL BE REFERRED FROM PEM DRAWINGS AT REFERENCE DRAWINGS SL. NO. 3&4
15. LOCATION OF BAY MARSHALLING KIOSK IS INDICATED TENTATIVELY & SHALL BE FINALISED IN CABLE TRENCH LAYOUT FOR SWITCHYARD.
16. LINE SIDE EQUIPMENTS FOR BOTH STAGE–I & STAGE–II TRANSMISSION LINE ARE KEPT IN HOLD AND SHALL BE RELEASED FROM HOLD AFTER FINALISATION OF TRANSMISSION LINE TOWER.
17. FOUNDATION OF 400KV TAKEOFF GANTRY FOR LINE TOWARDS LARA STAGE–I SHALL BE KEPT ON HOLD & SHALL BE RELEASED AFTER TRANSMISSION LINE TOWER FINALISATION. FOR CHAMPA LINE NTPC TO FINALISE THE DEAD END TRANSMISSION LINE TOWER LOCATION AS WELL AS HEIGHT TO MEET THE HORIZONTAL/VERTICAL DEVIAITON OF LINE CONDUCTOR & CONFIRM THE SAME TO BHEL.
18. DIMENSION OF REACTOR SOAK PIT SHALL BE AS PER THE CIVIL FOUNDATION DRAWING (DRG. NO. 9587–001–230–PVC–C–0489) WHICH

STAGE–II ELECTRICAL SECTIONS

CUSTOMER DRAWING NO. 9587–001–230–PVE–F–0013

CUSTOMER: NTPC LIMITED

2 X 800 MW NTPC LARA STPS STAGE–II EPC

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	APPD	B.K.SRIVASTAVA	SIGNED	18.11.2023

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TITLE: 400kV Layout Plan & Section

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BHEL DRAWING NO. TB-423-316-003

SHEET 01 OF 03 REV. 04

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DRAWING No. TB-423-316-003

CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

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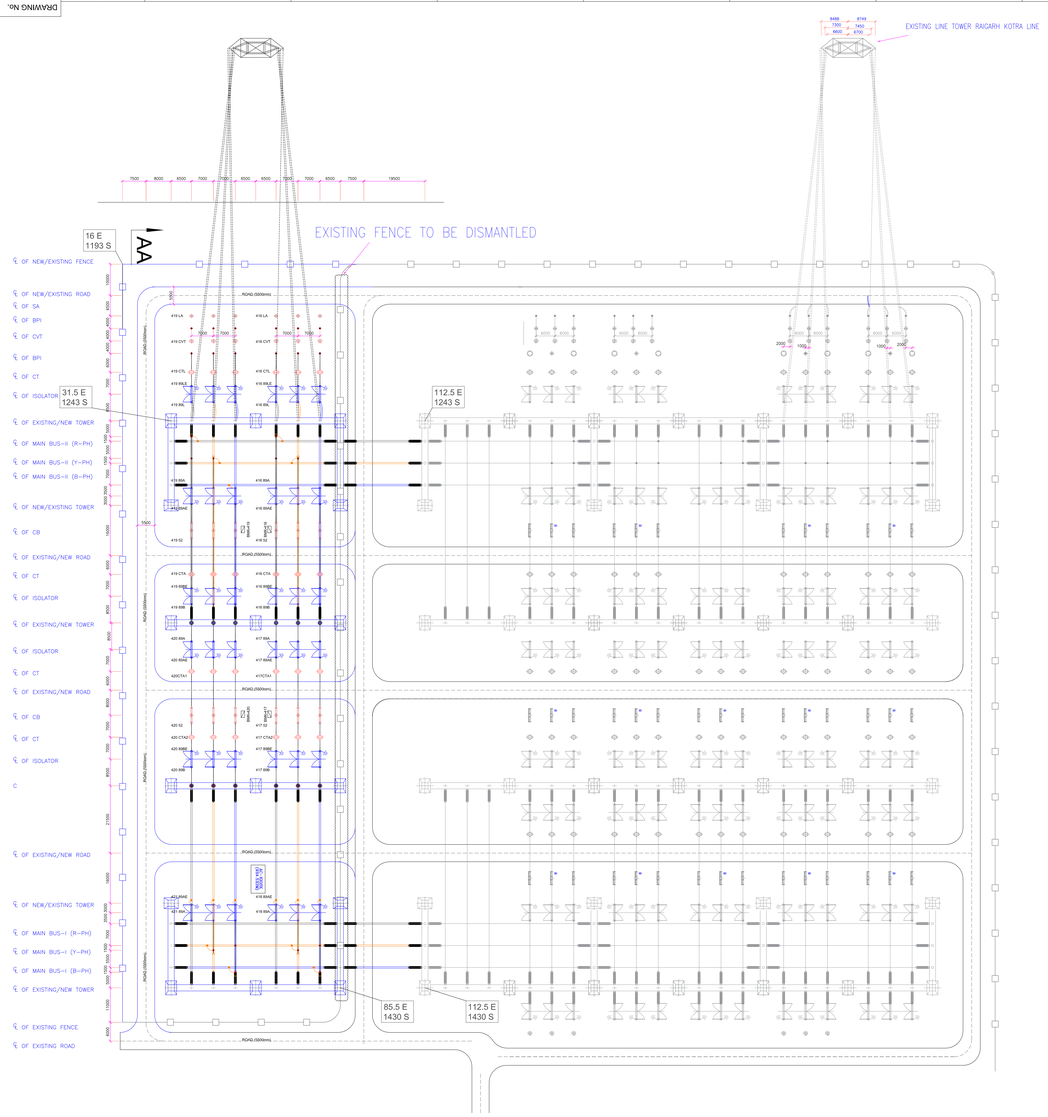
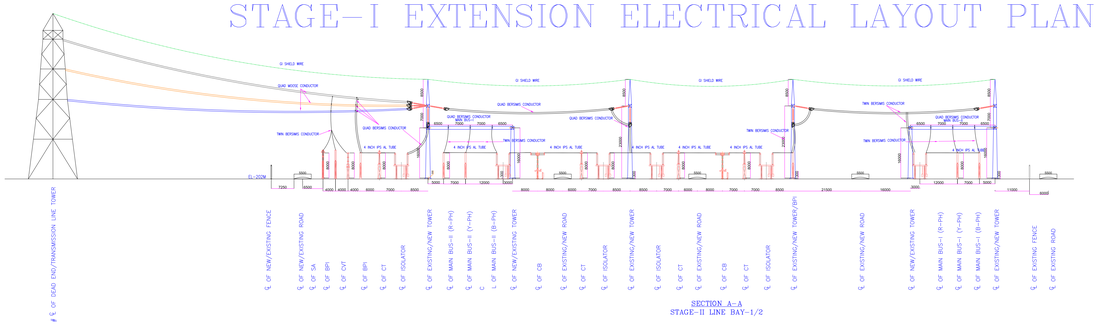
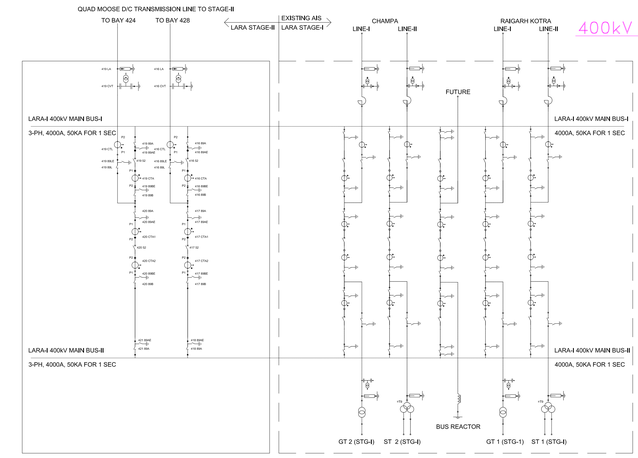
COMPUTER FILE NAME: PE-00-PTS-100-105A.dwg



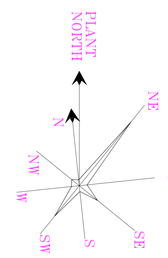
STAGE-I EXTENSION ELECTRICAL LAYOUT PLAN



STAGE-I EXTENSION ELECTRICAL LAYOUT SECTION



400kV SINGLE LINE DIAGRAM



WIND ROSE

400kV SYSTEM PARAMETERS

Sl.No.	DESCRIPTION OF PARAMETER	
1	SYSTEM OPERATING VOLTAGE	400kV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	420kV
3	RATED FREQUENCY	50Hz
4	NO. OF PHASES	3
5	RATED INSULATION LEVELS i) FULL WAVE IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.) ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec.) iii) ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (rms)	 ±1425kVp +1050kVp 630kV (rms)
6	CORONA EXTINCTION VOLTAGE (MIN)	320kV (rms)
7	MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5MHz & 2MHz AT 266KV rms	1000 microV
8	MIN. CREEPAGE DISTANCE	25 mm/kV (10500 mm)
9	MIN. CLEARANCE i) PHASE TO PHASE ii) PHASE TO EARTH iii) SECTIONAL CLEARANCE	 4000MM 3500MM 6500MM
10	RATED SHORT CIRCUIT CURRENT FOR 1SEC DURATION	63kA*
11	SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED
12	SUB CONDUCTOR SPACING	450MM

LEGEND & BILL OF QUANTITY FOR STAGE-II

S.N	ITEM DESCRIPTION	LEGEND	QTY (NOS)
1.	400kV, 3150 A, 63kA FOR 1 SEC, SF6, CIRCUIT BREAKER (3-PH)		04
2.	400kV, 3150 A, 63kA FOR 1 SEC, HCB DISCONNECTOR WITH 1 ES, (3-PH), MECHANICALLY GANGED		12
3.	400kV BUS POST INSULATOR (EXCL. ISOLATOR AND WT)		30
4.	336kV LIGHTNING ARRESTER (1-PH)		06
5.	400kV CAPACITIVE VOLTAGE TRANSFORMER (1-PH)		06
6.	400kV CURRENT TRANSFORMER (1-PH)		24
7.	EXISTING FENCE NEW FENCE		NA
8.	EXISTING ROAD NEW ROAD		NA

CONDUCTOR & STRINGING DETAILS :-

SL.NO.	DESCRIPTION	400kV	
		CONDUCTOR DETAIL	CONNECTION HEIGHT (ABOVE PLINTH LEVEL)
1.	EQUIPMENT INTERCONNECTION	4.0" IPS (EH) AL. TUBE/	8mtr.
2.	JACK BUS ON GT/ST SIDE	TWIN ACSR BERSIMIS CONDUCTOR	23 mtr.
3.	JACK BUS LINE SIDE (LARA STAGE-II)	QUAD ACSR BERSIMIS CONDUCTOR	23 mtr.
4.	LINE SIDE DEAD-END STRINGING	*QUAD ACSR MOOSE CONDUCTOR	23 mtr.
5.	EARTHWIRE	7/3.66mm SHIELD WIRE	31.5 mtr
6.	DROPPER ON CVT, LA	TWIN ACSR BERSIMIS CONDUCTOR	-
7.	MAIN BUS-I/II	QUAD ACSR BERSIMIS CONDUCTOR	16 mtr.

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. ALL STRUCTURE/CONDUCTOR HEIGHTS ARE ABOVE PLINTH LEVEL. PLINTH LEVEL IS 300 MM ABOVE F.G.L.
3. TYPE OF GANTRY STRUCTURES SHALL BE AS PER APPROVED STRUCTURAL LAYOUT DRAWING.
4. SWITCHYARD LIGHTNING PROTECTION SHALL BE ACHIEVED THROUGH SHIELD WIRES AS PER APPROVED DSLP.
5. SA PRESSURE RELIEF VALVE SHALL NOT BE TOWARDS TRANSFORMER SIDE / ANY EQUIPMENT KEPT NEAR LIGHTING ARRESTER AND BHEL SHALL ENSURE THE SAME DURING ERECTION AT SITE.
6. # DEAD END TOWERS LOCATION FOR TIE CONNECTION TO STAGE-II ALONG WITH TRANSMISSION LINE TOWERS SHALL BE FINALIZED AFTER ROUTE SURVEY & NTPC APPROVAL.
7. PHASE TO PHASE CLEARANCE SHALL BE KEPT 7M TYPICAL & GANTRY WIDTH OF 27M.
8. * AS PER NTPC, THE EQUIPMENT IN STAGE-I EXTENSION SHALL BE SUITABLE FOR SC RATING OF 63kA FOR 1 SEC
9. # DEAD END TOWER LOCATIONS INDICATED FOR STAGE-II TO STAGE-I CONNECTION ARE TENTATIVE & SHALL BE FINALISED AFTER ROUTE SURVEY OF TRANSMISSION LINE & NTPC APPROVAL ON SAME.
10. LOCATION OF BMK & AC KIOSK SHOWN ARE INDICATIVE & SHALL BE DECIDED AFTER TRENCH ROUTE FINALISATION.

REFERENCE DRAWINGS:

1. BHEL-400 kV Switchyard Single Line Diagram-9587-001-230-PVE-P-0002, REV.01
2. STAGE-I LAYOUT FOR 400kV SWITCHYARD-9548-572-PVE-F-0005 REV.06

CUSTOMER DRAWING NO. 9587-001-230-PVE-F-0013

CUSTOMER: NTPC LIMITED

2 X 800 MW NTPC LARA STPS STAGE-II EPC

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03	24.05.2024	MAHVENDER	SKS	SKS	REVISED INLINE WITH CUSTOMER COMMENTS VIDE NTPC LETTER REF: CC-ENGG-9587-001-230-PVE-F-0013 DTD 07.05.2024
02	01.05.2024	MAHVENDER	SKS	SKS	REVISED INLINE WITH CUSTOMER COMMENTS VIDE NTPC EMAIL DTD 17.04.2024, FURTHER REFER CRS DTD 02.05.24
01	27.03.2024	MAHVENDER	SKS	SKS	REVISED INLINE WITH CUSTOMER COMMENTS VIDE NTPC EMAIL DTD 17.02.2024

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	DESN	MAHVENDER	SIGNED	18.11.2023
	CHD	NEERAJ KR.	SIGNED	18.11.2023
	APPD	S.K.SHRIVASTAVA	SIGNED	18.11.2023

TITLE: 400kV Layout Plan & Section

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BHEL DRAWING NO. TB-423-316-003

SHEET 03 OF 03 REV. 04

SIZE-A3

SECTION-2:
NTPC TECHNICAL SPECIFICATION FOR 400kV TRANSMISSION LINES

SUB-SECTION-B – 17

SWITCHYARD ELECTRICAL

CHAPTER: SWITCHYARD ELECTRICAL

1.00.00 SCOPE AND GENERAL INFORMATION

1.01.00 In addition to the detailed scope and other requirements specified in Part-A, the intent of the specifications for various electrical equipments shall also cover the following scope:

1.01.01 Contractor shall be responsible for design and engineering of overall system/station, and all elements, systems, sub-systems, facilities, equipments, material, etc. The Contractor shall submit design calculations, drawings, codes, codes of practices, construction drawings, etc. for Employer's approval.

1.01.02 The basic design shall include, but not limited to, the following:

a) Development of general arrangement.
b) Development of detailed layout (plan & section/elevation) drawings.
c) Development of single line diagram with parameters of equipment and details of protection.
d) Protection and control philosophy and selection of protection, control and annunciation schemes.
e) Development of interlocking schemes.
f) Development of switchyard structure loading details.
g) Development of earthing system.
h) Development of direct stroke lightning protection system.
i) Insulation coordination of the EHV equipment.
j) Calculation of static and dynamic force load, and selection of spacer spans and equipment terminal loading.
k) Development of clearance diagrams.
l) Lighting design, Lux level calculation and conduit wiring diagram.
m) Development of power & control cable laying and termination schedules.
n) Relay setting calculations.
o) Development of erection key diagram with bill of material.
p) Foundation design and construction drawings.
q) Development of cable trench layout and sections and construction drawings.

1.01.03 Contractor shall furnish the detailed drawings for the various equipments covered in their scope , design calculations and construction drawings for all civil works, schematics, schedules, panel wiring diagrams , general arrangement drawings, schedules, interconnection schemes, cable schedules , interconnection schedules. etc for employers approval. Contractor shall also furnish the recommended relay settings to be adopted.

1.01.04 Exposed live parts shall be placed high enough above ground to meet the requirements of Indian Electricity Rules and other statutory codes. All responsibilities regarding co-ordination with Electrical Inspection Agencies and obtaining clearance certificate from them rests with the Contractor. The necessary fees for such clearances shall be borne by the Owner.

1.01.05 All equipment shall be supplied with suitable terminal connectors.. The terminal connectors shall be well coordinated with type/size of conductor and equipment to be connected. The conductor terminations for equipment shall be either rigid or expansion type suitable for horizontal or vertical take off suitable for tube/quadruple/twin/single moose conductor. For Jack Bus Line side Quad ACSR Moose and rest Twin ACSR Moose shall be used. The subconductor spacing for quadruple and twin moose ACSR conductor shall be 450 mm for 400kV.. The terminal pads shall preferably be capable of taking the required conductor span

under normal, short circuit and meteorological conditions, without effecting the performance of the equipment.

1.01.06 The rigid busbars for equipment inter connections shall have rigid connections at one end and expansion /flexible at other end. The tubular Al. connections shall have not more than one joint per span. Corona Bell shall be provided at the end of the rigid busbars.

1.01.07 Not used.

1.01.08 In 400kV Switchyard, for One dia (i.e. two (2) feeders & one (1) tie) two (2) Bay Marshalling Boxes (BMKs) are to be provided. The duplicated power supplies for two (2) BMKs shall be looped.

1.01.09 All equipments shall be suitable for hot lie washing .The sag tension, conductor spacing, short circuit forces, spacer location, conductor swing and clearances shall be carried out in accordance with IEC 60865 to achieve the specified clearances. Short circuit force calculation shall be submitted by the bidder as per relevant IEC for Flexible bus and rigid bus. This short circuit force shall be considered for designing of Tower, Girder and equipment structure and their foundation

1.01.10 All overhead stringing shall be carried out by minimum double tension string insulator assembly. The earth wire for shielding purpose shall be double anchored at the towers/ other locations and shall run through with out cutting wherever feasible so as to avoid snapping. The earth wires crossing each other shall also be bolted together for additional safety.

1.01.11 Post insulators shall be provided at line entry and near transformers and other jumpers to avoid mechanical forces on the LA's and Bushings etc.

1.01. 12 Necessary fire wall shall be provided between single phases of reactors. The fire wall height shall be 500mm above reactor bushing.

1.01. 13 The pit size of reactors shall be designed for minimum 1000mm beyond the physical dimension of the reactor.

1.01. 14 i) The towers and gantries shall be suitable for a normal conductor tension of minimum 2T/conductor in case of twin moose and 1.5T/conductor in case of quad moose conductor. 0.8T/conductor in case of ground wire. The foundations and structures etc. shall be designed accordingly.

ii) The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or supporting insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550 mm. All Gantries and towers (Including intermediate/ required for turning etc.) as required from GT, ST stringing , earth wire & its anchoring on A-Row column of TG Building and line take off gantry / with in plant boundary are to be provided by the contractor. Minimum height of 400KV gantry for AIS shall be 16M+8.5MPeak however intermediate gantry height for O/H connection for GT shall be min. 22m+8.5m. Minimum height of 400KV AIS equipment level shall be 8.0M from the plinth level. The gantry width for 400kV AIS shall be min. 27mt or as required to meet the specified clearances.

Various minimum heights of the 400KV AIS switchyard shall be as given below from plinth level:

Voltage Level	Equipmt.1st level	2nd level	3rd level
400KV (1½ breaker scheme.)	8000mm	16000mm	23000mm

The peak of towers for 400kV shall be 8500mm. The Bay width (Beam Span) for 400kV gantry structures should be 27mt . All 'T'off connection associated with lines/transformers shall be provided with a bye pass utilizing two PG clamps for each 'T'off. As far as possible, the conductor shall pass without cut/joint unless otherwise necessary for planned shutdown/maintenance.

1.01.15 The switchyard shall be provided with peripheral roads and roads for maintenance/approach for major AIS equipment for maintenance purpose.

1.01.16 CVT JB shall have fuses for each core of the CVT. Further separate lockable JBs with TTBs for ABT metering cores (0.2 class) / owners supplied meters shall also be provided by the contractor.

1.01.17 The illumination level for AIS shall be 20 lux in general and minimum 50lux on equipment boxes. No lighting fixture shall be mounted on gantries, they shall be mounted on Lightning Masts/ High lighting masts only. Specification of lighting is provided elsewhere in the specification.

1.01.18 Contractor shall provide panel mounted automatic start / stop type centrifugal self-priming pump for sump pit to drain the water in approximately one (1) hour . The contractor shall also provide suitable pedestal/ foundation for this pump. The pump shall be complete with all necessary fittings such as NRV, inlet & outlet pipes of suitable length and dia.

1.01.19 As far as possible the conductor shall pass without cut/joint unless otherwise necessary for planned shutdown/maintenance.

1.01.20 75mm thick base layer of M5 grade PCC shall be provided over the prepared sub grade in the present scope of switchyard bays & area of Stage-II switchyard . The fence excluding foundations, roads, drains, cable trenches as per detailed engineering drawing. In switchyard area earth resistance measurement points shall be marked in the layout where the PCC shall not be provided. For easy drainage of water, adequate slope is to be provided from the ridge to the nearest drain. A final layer of minimum 75mm thickness of stone aggregate of 40mm nominal size shall be spread uniformly over PCC layer. In Switchyard before laying of PCC layer, the subgrade shall be properly compacted, and the top layer of the soil shall be treated for anti-weed considering the type of weeds found in the vicinity.

1.01.21 The control & protection panels belongs to LARA Stage-II switchyard bays in stage-I area shall be placed in AC kiosk . The kiosk shall be provided with adequate air conditioning , fire alarm system with at least two detectors and it shall be wired to SAS system of 400kV System. Two nos. of suitable separate power supply from existing LT switchgear shall be provided to each AC kiosk to cater power supply to panels and AC separately. All internal power supply distribution shall be provided accordingly. MCC / ACDB, DCDB, EDB etc panels shall be placed in Lara Stage-II switchyard control room building. The Control & protection panels belongs to extension bays of LARA Stage-I switchyard shall be placed in AC kiosk with adequate air conditioning. MCC / ACDB, DCDB , EDB etc panels shall be placed in existing LARA Stage-1 switchyard building. Adequate AC & Ventilation in Control room building and Ventilation of switchgear room / MCC room etc. is to be provided by the

contractor for the buildings in the Bidder scope . Specification of AC & Ventilation is specified elsewhere in the specification (Part-B Mechanical).

1.01.22 The cable trenches from control room to switchyard shall be designed to cater as required for bays indicated in SLD. The contractor shall construct the common sections suitably of appropriate sizes upto common points so that the same can be extended in future.

1.01.23 Voltage drop for sizing of power cables shall not be more than 6%.

1.01.24 one no(1no) suitable industrial socket and suitable power cable for oil filtration equipment for Bus reactor shall be provided.

1.01.25 The cable trenches , cable trays & supports, accessories , Roads , drains & its interconnection to strom water drain , fencing with gate required for present scope of bays.

1.01.26 Contractor shall make earth resistivity measurements at site (based on four electrode method) and design the earthing grid as per IEEE: 80 (Latest edition) and Gravel filling of switchyard . Earthing of all switchyard equipments and its connection to earthing grid. Also connection of switchyard earthing grid with main plant earthing grid. Earth pit as per IS 3043 as required.

1.01.27 Complete Direct Stroke Lightning Protection using Lightning Mast and/or shield wire and its connection to earth mat as required of 400kV switchyard of present scope of Bays , Transformer yard.

1.01.28 Supply & laying of power, control cables , Screen cable, Fibre optic cable and cabling between Contractor supplied equipment and Owner supplied equipment required. etc , from owner feeders , panels and from present scope of panels to existing panels to complete the system is in the scope of Bidder.

1.01.29 Lighting, earthing , lightning protection of Present scope of bays .

However any items though not specifically mentioned but which are required to make the switchyard complete in all respects for its safe, efficient, reliable and trouble free operation shall be supplied and erected by the Contractor, unless they are specifically excluded in the text of exclusions given in the specification.

1.01.30 Scope of work at Existing LARA Stage-I (2X800MW) 400kV Switchyard:

In LARA Stage-I (2X800MW) the existing 400kV Switchyard is provided with QUAD BERSIMIS ACSR conductor as main Busbar for Bus#1, Bus #2. The equipment interconnection is with 4" IPS Al. tube . The existing 400kV switchyard is of one and half breaker scheme with I-type configuration as shown in the single line diagram 9587-999-POE-J-002 associated with LARA TPP Stage-II (2X800MW).

The scope of work comprises of present scope of 400kV Switchyard bays as marked as LARA Stage-II AIS SWYD at LARA Stage-I (2X800MW) 400kV Switchyard as shown in single line diagram and other tender drawings.

i) 420 KV, 4000A, 63kA AIS , ,3-phase, comprising of SF6 gas AIS circuit breakers with CSD / With out CSD , disconnectors, earth switches, terminal boxes, support structures etc complete . Including Extension of main BUS#1 & II of LARA -Stage#1 400kV SWYD for Bus sectionalization. Necessary modification for installation of bus section is in Bidders scope.

iii) 400kV Switchyard Erection , commissioning of equipments for present scope of bays including civil works, gantry Structure, support structure for equipments, cabling, earthling, lighting & lightning protection etc. for above equipments. Consists of 400 kV bays with one and half breaker scheme .

v) The cable trenches , cable trays & supports, accessories , Roads , drains required for present scope of bays and its interconnection to existing cable trenches , sump pit , drains and to existing strom water drain.

vi) Removal of gravel in present scope of bays for equipment foundation / erection and its re laying with new gravel is in the scope of bidder.

vii) Dismantling of existing fencing, Roads , Foundations, Re-routing of Pipe lines above the ground & below the ground available in the present scope of Bays in the scope of Bidder.

viii) The new fencing, Roads , Drains , cable trenches shall be inter connected with existing fencing , Roads.

ix) Supply & laying of power, control cables , Screen cable, Fibre optic cable and cabling between Contractor supplied equipment and Owner supplied equipment required. etc , from owner feeders , panels and from present scope of panels to existing panels to complete the system is in the scope of Bidder.

x) Power, Control cables, screen cable, fibre optic cable and cabling among Bidder / Contractor supplied equipment ,panels etc

x) The owner will provide Two (2nos) 415 AC feeders in existing SWGR / MCC/ AC Boards & Two (2nos) 220V DC Feeders for 415V, 220V DC requirement for the Present scope of Bays as Tie feeders for Stage-II requirement . The Bidder shall indicate the rating of Feeders during detailed Engg stage. The Bidder shall provide SWGR / MCC/ AC Boards & DC Boards for further distribution of 415V AC supply, 220V DC supply for the requirement of Present scope of Bays and these Boards shall be placed in Existing LARA Stage-I SWYD panel room.

xi) Entire area of Switchyard of Present scope of bays shall be provided with broken stone filling which shall consist of two layers.. The first layer shall be 75mm thick base course of 20mm of normal size and a final layer of minimum 75mm thickness of stone aggregate of 40mm nominal size shall be spread uniformly. In Switchyard before laying o base course , the subgrade shall be properly compacted, and the top layer of the soil shall be treated for anti-weed considering the type of weeds found in the vicinity. In existing 400kV switchyard , removal of gravel in present scope of bays / new bays for equipment foundations and re laying with new gravel is in the scope of bidder.

xii) Contractor shall make earth resistivity measurements at site (based on four electrode method) and design the earthing grid as per IEEE: 80 (Latest edition) and Gravel filling of switchyard . Interconection of Main earth grid with existing Main earth grid .Earthing of all switchyard equipments and its connection to earthing grid. Also connection of switchyard earthing grid with main plant earthing grid. Earth pit as per IS 3043 as required.

xiii) Complete Direct Stroke Lightning Protection using Lightning Mast and/or shield wire and its connection to earth mat as required of 400kV switchyard of present scope of Bays , Transformer yard

1.02.00 **CLEARANCES :** The minimum clearances for 400kV AIS shall be as given below:

	400kV
Phase to earth clearance	3500mm
Phase to Phase clearance	4000mm
Sectional clearance	6500mm

The Contractor shall supply the structures suitable to meet the above clearances. The Contractor shall furnish clearance diagram in support of same for approval of Owner.

1.03.00 EARTHING : For earthing 50x6 mm GS flat shall be used in all cabinets, MOM boxes, panels and balance all other earthing such as all equipments, towers, cable trenches etc shall be through 75x12mm GS Flat. The Switchyard earthing criteria is given in **Annexure-II of this specification.**

1.04.00 LIGHTING :The illumination level shall be minimum 20 lux in general and 50 lux on equipment boxes, at equipments of switchyard . Detailed specification covered in Section - VI, Part-B, B-11(Lighting)

1.05.00 EQUIPMENT CONNECTOR RATING :The connectors and clamps shall be rated same as the connected equipments.

1.06.00 CIVIL DESIGN :The civil design criteria is given in Civil Chapter of Technical specification .

1.07.00 CONTROL PHILOSOPHY :The switchyard control philosophy and protection system is described in chapter B13 Substation Automation System of section-VI Part-B.

1.08.00 **SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING SUPPLIED:**
The system shall be designed to limit the power frequency over voltage of 1.5 p.u. and the switching surge over voltage to 2.5 p.u. In 400 kV system the initial value of temporary over voltage could be 2.0 p.u. for 1-2 cycles. All the equipment/materials covered in this specification shall perform all its function satisfactorily without undue strain, restrike etc. under such over voltage conditions.

1.09.00 **SITE SUPERVISION OF EQUIPMENTS**
The contractor shall ensure that, erection, testing and commissioning of, AIS, Circuit Breaker, Isolator, Instrument Transformer, Surge Arrestor, Substation Automation System & protective relays is carried out, under the supervision of manufacturer of respective equipment.

1.10.00 **Insulation Co-Ordination and Selection of Surge Arrestor**

1.10.01 The contractor shall be fully responsible for complete insulation co-ordination of switchyard. Contractor shall ensure that adequate protective margin is available. If surge arrestors at some more locations other than those indicated in the tender drawings are required to be provided, the same shall be deemed to be included in the offer.

1.11.00 **General Parameters :**

1.11.01 **AIS 400kV** Switchyard :

Sl.no	Description	400KV system

a	i)Highest System voltage	420kV rms
	ii)Rated / Nominal system voltage	400kV rms
b)	Lightning impulse voltage (ph to earth& between phases)	±1425kVp
	Across isolating distance	1425(+240) KVp
c)	Switching impulse voltage (ph to earth)	±1050kVp
	Across isolating distance	900(+345) KVp
d	Power frequency withstand (for I min. rms.) to earth & between phases	520 & 610kVrms as per IEC
e	i)Max.fault level(1sec)	63kA
d	Rated dynamic with stand current	157.5 kAP
f	PD Level	<5pico coulomb
g	Rated frequency	50Hz
h	Rated Ambient Temperature	50.deg.Cen
i	System earthing	Effectively earthed
j	Min.creepage (25mm/kV)	10500mm
k	Seismic acceleration	0.3g
l	Max. radio interference for freq. between 0.5 MHz and 2.0 MHz at 266 kV rms	1000micro volt
m	Corona extinction voltage	Not less 320kV rms

Note: Bidder to consider above parameters for all the equipments of AIS. For other Parameters bidder to refer respective chapter.

1.12.00 **TYPE TEST REQUIREMENTS**

1.12.01 **TYPE TEST REQUIREMENTS FOR EQUIPMENTS OTHER THAN 400KV AIS CIRCUIT BREAKER :**

a) All equipments to be supplied shall be of type tested design. During detail engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification. The validity period of reports shall be as per CEA Guidelines for the validity period of Type test(s) conducted on Major Electrical Equipment in power Transmission-May2020 & with latest amendments for the from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a Client.

b) However if contractor is not able to submit report of the type test(s) conducted as per CEA Guidelines for the validity period of Type test(s) conducted on Major Electrical equipment in power Transmission-May2020 & with latest amendments from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/ owners representative and submit the reports for approval.

c) All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

1.12.02 **TYPE TEST REQUIREMENTS FOR 400KV AIS CIRCUIT BREAKER:**

a) The Contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The Bidder shall indicate the charges for each of these

type tests separately in the relevant schedule of BPS and the same shall be considered for the evaluation of bids. The type test charges shall be paid as per the charges quoted for each of these type tests separately in the relevant schedule of BPS (Bid Proposal Sheet) & no qty variation is allowed. only for the test(s) conducted successfully under the contract and upon certification by the Employer's engineer.

b) The type tests shall be carried out in the presence of the Employer's representative, for which minimum 60 days' notice shall be given by the Contractor. The Contractor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set up, instrument to be used, procedure, acceptance norms, recording of various parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out

c) In case the Contractor has conducted such specified type test(s) according to the relevant standard and / or specification as per CEA Guidelines for the validity period of Type test(s) conducted on Major Electrical equipment in power Transmission-May2020 & with latest amendments as on date of bid opening, submit the type test reports to the Employer for waiver of conductance of such type test(s). These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a Client. The Employer reserves the right to waive conducting of any or all the specified type tests(s) under this contract. In case the type tests are waived, the type test charges shall not be payable to the Contractor.

1.12.03 **Type tests to be conducted on 400KV AIS Circuit Breaker**

a) Dieelctric tests	b)Radio interference voltage test
c) Temperature rise test	d) shor time withstand current, peak with stand test, short circuit test duties , short line fault test
e) Mechanical endurance	f)out of phase making & breaking test
g)Line charging current breaking test	h) Coronal test for 400kV
i) IP: 55test on each type of box	j)Seismic with stand test with structure for 400kV
k) Test for reactor switching duty for 400kV CB(for Bus reactor)	

1.13.00 **CORONA AND RIV TESTS AND SEISMIC WITHSTAND TEST (for 400kV AIS only):**

The corona and RIV tests shall confirm to the requirements as per **Annexure- A** to this chapter. The seismic withstand test shall conform to requirements as per **Annexure -B** to this section.

Annexure – A

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST (For 400 kV AIS only)

1.0 **General:**

Unless otherwise stipulated, all equipment together with its associated connectors where applicable shall be tested for external corona both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and measurement of radio interference voltage (RIV).

2.0 **Test Methods for RIV:**

2.1 RIV tests shall be made according to measuring circuit as per International Special – committee on Radio Interference (CISPR) Publication 16 -1 (1993) Part – I. The measuring circuit shall preferably be tuned to frequency with 10 % of 0.5 MHz but other frequencies in the range of 0.5 MHZ to 2 MHz may be used, the measuring frequency being recorded. The result shall be in microvolts. Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107 – 1964 except otherwise noted herein. In measurement of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

2.2 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, 115% and 130% for the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 420 KV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.0 **Test Methods for visible Corona :**

The purpose of this test is to determine the corona extinction voltage of the apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 130 % of RIV test voltage and maintained there for five minutes. In case corona inception does not take place at 130 %, the voltage level shall be raised till inception of corona or rated voltage whichever is lower. The voltage will then be decreased slowly until all visible corona disappears. The test procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which the visible corona (negative or positive polarity) disappears.

Annexure – B

SEISMIC WITHSTAND TEST (for 400 kV AIS only)

a.) The seismic withstand test on the complete equipment (except BPI) shall be carried out along with supporting structure.

b.) The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the terminal pad of the equipment and at any other point as agreed by the owner. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the purchaser.

2.00.00 CIRCUIT BREAKER:

2.01.00 GENERAL

2.01.01 Circuit Breakers shall be outdoor type, comprising three identical single pole units, complete in all respects with all fittings and wiring. The circuit breakers and accessories shall conform to IEC- 62271-100 or equivalent Indian Standard.

2.02.00 DUTY REQUIREMENTS:

2.02.01 Circuit breaker shall meet the requirements of Capacitive class : C2, Mechanical Endurance class:M2, Electrical Endurance class:E2 type of duty as per IEC for 400kV and under all duty conditions and shall be capable of performing their duties without opening resistor. The circuit breaker shall meet the duty requirement

	of any type of fault or fault location and shall be suitable for line charging and dropping when used on 400kV effectively grounded or ungrounded systems and perform make and break operations as per the stipulated duty cycles satisfactorily .
2.02.02	The circuit breaker shall be capable for breaking the steady & transient magnetizing current corresponding to 400/132 kV transformers up to 630 MVA rating. It shall also be capable of breaking line charging currents as per IEC 62271-100 with a voltage factor of 1.4
2.02.03	The rated transient recovery voltage for terminal fault and short line faults shall be as per IEC:62271-100.
2.02.04	The circuit breakers shall be reasonably quiet in operation. Noise level in excess of 140 dB measured at base of the breaker would be unacceptable. Bidder shall indicate the noise level of breaker at distance of 50 to 150 m from base of the breaker.
2.02.05	The Bidder may note that total break time of the breaker shall not be exceeded under any duty conditions specified such as with the combined variation of the trip coil voltage, pneumatic/hydraulic pressure and arc extinguishing medium pressure, etc. While furnishing the proof of the total break time of complete circuit breaker, the Bidder may specifically bring out the effect of non-simultaneity between same pole and poles and show how it is covered in the guaranteed total break time
2.02.06	While furnishing particulars regarding the D.C. component of the circuit breaker, the Bidder shall note that IEC-62271-100 requires that this value should correspond to the guaranteed minimum opening time under any condition of operation
2.02.07	The critical current which gives the longest arc duration at lock out pressure of extinguishing medium and the duration shall be indicated.
2.02.08	All the duty requirements specified above shall be provided with the support of adequate test reports to be furnished.
2.03.00	CONSTRUCTIONAL FEATURES.
	All making and breaking contacts shall be sealed and free from atmospheric effect. In the event of leakage of extinguishing medium to a value, which cannot withstand the dielectric stresses specified in the open position, the contacts shall preferably self close. Main contacts shall be easily accessible for inspection and replacement. If there are no separately mounted arcing contacts, then the main contacts shall be easily accessible for inspection and replacement. Main contacts shall have ample area and contact pressure for carrying the rated current under all conditions. The interrupter sectional drawing showing the following conditions shall be furnished.
	a) Close position b) Arc initiation position c) Full arcing position d) Arc extinction position e) Open position.

2.03.01	All the three poles of the breaker shall be linked together either electrically/pneumatically or electro hydraulically
2.03.02	Circuit breakers shall be provided with two (2) independent trip coils, suitable for trip circuit supervision. The trip circuit supervision relay would also be provided. Necessary terminals shall be provided in the central control cabinet of the circuit breaker.
2.04.00	SULPHUR HEXAFLOURIDE (SF6) GAS CIRCUIT BREAKER
2.04.01	Circuit breakers shall be single pressure type. Design and construction of the circuit breaker shall be such that there is minimum possibility of gas leakage and entry of moisture. There should not be any condensation of SF6 gas on insulated surfaces of the circuit breaker
2.04.02	In the interrupter assembly, there shall be absorbing product box to eliminate SF6 decomposition products and moisture. The details and operating experience with such filters shall be brought out in additional information schedule.
2.04.03	Each pole shall form an enclosure filled with SF6 gas independent of two other poles. Common monitoring of SF6 gas can be provided for the three poles of circuit breaker having a common drive. The interconnecting pipes in this case shall be such that the SF6 gas from one pole could be removed for maintenance purposes
2.04.04	Material used in the construction of circuit breakers shall be such as fully compatible with SF6
2.04.05	The SF6 gas density monitor shall be adequately temperature compensated to model the density changes due to variations in ambient temperature within the body of circuit breaker as a whole. It shall be possible to dismantle the monitor without removal of gas.
2.04.06	Sufficient SF6 gas shall be supplied to fill all the circuit breakers installed plus an additional 20% of the quantity as spare.
2.05.00	**OPERATING MECHANISM:**
2.05.01	Circuit breaker shall be operated by pneumatic mechanism or electrically spring charged mechanism or electro-hydraulic mechanism or a combination of these. It shall be gang operated in case of 3-phase reclosing operation as applicable.
2.05.02	The operating mechanism shall be anti-pumping and trip free (as per IEC definition) electrically and either mechanically or pneumatically under every method of closing. The mechanism of the breaker shall be such that the position of the breaker is maintained even after the leakage of operating media and/or gas.
2.05.03	The operating mechanism shall be such that the failure of any auxiliary spring will not prevent tripping and will not cause trip or closing operation of the power operated

closing devices. A mechanical indicator shall be provided to show open and close positions of breaker. It shall be located in a position where it will be visible to a man standing on the ground with the mechanism housing door closed. An operation counter shall also be provided.

2.05.04 Closing coil shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. Shunt trip coils shall operate correctly under all operating conditions of the circuit breaker upto the rated breaking capacity of the circuit breaker and at all values of supply voltage between 70% and 110% of rated voltage. If additional elements are introduced in the trip coil circuit their successful operation for similar applications of outdoor breaker shall be clearly brought out in the bid.

2.05.05 Working parts of the mechanism shall be of corrosion resisting material. Bearings requiring grease shall be equipped with pressure type grease fittings. Bearing pin, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of the breaker

2.05.06 Operating mechanism shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coil. Provision shall also be made for local electrical control. 'Local / remote' selector switch and close & trip push buttons shall be provided in the breaker central control cabinet. Remote located push buttons and indicating lamps shall also be provided.

2.05.07 Operating mechanism and all accessories shall be in local control cabinet. A central control cabinet for the three poles of the breaker shall be provided along with supply of necessary tubing, cables, etc.

2.05.08 Provisions shall be made on breakers for attaching an operation analyser to perform speed tests after installation at site to record contact travel against time and measure opening time.

2.05.09 The Bidder shall furnish curve supported by test data indicating the opening time under close-open operation with combined variation of trip coil and operating media along with the bid.

2.06.00 **PNEUMATICALLY OPERATED MECHANISM**

2.06.01 Bidder shall offer unit compressor with each circuit breaker. The unit compressor are to be located outdoor near the breaker(s).

2.06.02 The breaker local air receivers shall comply with the requirement specified, and shall have sufficient capacity for two 'CO' operations of the breaker at the lowest pressure for reclose duty without refilling.

2.06.03 Independently adjustable pressure switches with potential free ungrounded contacts to actuate lockout device shall be provided. This lock out device with provision for remote alarm indication shall be incorporated in the circuit breaker to prevent operation whenever the pressure of the operating medium is below that required

for satisfactory operation at the specified rating. The scheme should permit operation of all block and alarm relays as soon as the pressure transient present during the rapid pressure drop has been damped and a reliable pressure measurement can be made. Such facilities shall be provided for following conditions: a) Trip lockout pressure - 2 nos. b) Close lockout pressure - 1 no. c) Extreme low pressure - 1 no. d) Auto reclose lock out pressure - 1 no.

2.06.04 The compressed air mechanism shall be capable of operating the circuit breaker under all duty conditions with the air pressure immediately before operation between 85% and 110% of the rated supply pressures. The make/break time at this supply pressure shall not exceed the specified make/ break time within any value of trip coil supply voltage as specified.

2.07.00 **SPRING OPERATED MECHANISM**

2.07.01 Spring operated mechanism shall be complete with motor, opening spring & closing spring with limit switch for automatic charging and other necessary accessories to make the mechanism a complete operating unit. Opening spring shall be supplied with limit switch for automatic charging and other necessary accessories.

2.07.02 As long as power is available to the motor, a continuous sequence of closing and opening operations shall be possible. The motor shall have adequate thermal rating for this duty. After failure of power supply to the motor, one close-open operation shall be possible with the energy contained in the operating mechanism.

2.07.03 Breaker operation shall be independent of the motor, which shall be used solely for compressing the closing spring.

2.07.04 Motor ratings shall be such that it requires not more than 30 seconds for fully charging the closing spring.

2.07.05 Closing action of the circuit breaker shall compress the opening spring ready for tripping.

2.07.06 When closing springs are discharged, after closing a breaker, closing springs shall automatically be charged for the next operation and an indication of this shall be provided in the local and remote control cabinet.

2.07.07 The spring operating mechanism shall have adequate energy stored in the operating spring to close and latch the circuit breaker against the rated making current and also to provide the required energy for the tripping mechanism in case the tripping energy is derived from the operating mechanism.

2.08.00 HYDRAULICALLY OPERATED MECHANISM

2.08.01 Hydraulically operated mechanism shall comprise operating unit with power cylinder, valves, and low pressure reservoir, motor, etc

2.08.02 The hydraulic oil used shall be fully compatible for the specified temperature range.

2.08.03 The oil pressure controlling the oil pump and pressure in the high pressure reservoir shall have adequate number of spare contacts for continuous monitoring of low pressure, high pressure, etc., in control room. The necessary remote equipment shall also be provided.

2.08.04 The mechanism shall be suitable for at least two close open operations after failure of ac supply to the motor starting at pressure equal to lowest pressure of auto reclose duty

2.08.05 The hydraulically operated mechanism shall be capable of operating the circuit breaker correctly and performing the duty cycle specified under all conditions with the pressure of hydraulic operated fluid in the operating mechanism at the lowest permissible pressure before make up. The operating time at the lowest pressure for a particular operation shall not exceed the guaranteed operating time within any value of trip coil-supply voltage as specified.

2.08.06 Trip lockout shall be provided to prevent operations of the circuit breaker below the minimum specified hydraulic pressure. Alarm contacts for loss of nitrogen shall be provided and wired suitably upto the central control cabinet.

2.08.07 All hydraulic joints shall have no oil leakage under the site conditions and joints shall be tested at factory against oil leakage at a minimum of 1.5 times maximum working pressure.

2.09.00 FITTINGS AND ACCESSORIES

2.09.01 Following is partial list of some of the major fittings and accessories to be furnished as integral part of the breakers. Number and exact location of these parts shall be indicated in the drawing.

2.09.02 Control unit / Central control cabinet complete and provided with the following:

Double compression type cable glands, lugs, ferrules, etc. b) Local/remote changeover switch c) Operation counter d) Fuses, as required e) Anti-pumping relay/contactor f) Rating and diagram plate in accordance with IEC including year of manufacture, etc. g) Gauges for SF6 gas pressure, pneumatic/hydraulic pressure. h) Gas density monitor with alarm and lockout contacts.

2.09.03 Hollow insulator columns

a)The insulators shall conform to requirements stipulated else where in the specification . All routine tests shall be conducted on the insulators as per relevant IEC. In addition the following routine tests shall also be conducted on hollow column insulators.

a) Ultrasonic test b) Pressure test c) Bending load test in 4 directions at 50% specified bending load. D)Bending load test in 4 directions at 100% specified Bending load as a sample test. The tested insulator will not be used in CB. e) Burst pressure test as a sample test

2.09.04 SUPPORT STRUCTURES

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550 mm. The height of center line of conductor shall be as given elsewhere in the specification.

2.09.05 Terminal connectors shall conform to requirements stipulated else where in the specification

2.10.00 ADDITIONAL FITTINGS FOR PNEUMATIC CIRCUIT BREAKER

a) Unit compressed air system. b) Breaker local air receivers c) Pressure gauge, spring-loaded safety valve and pressure switch with adjustable contacts d) Pressure switch to initiate an alarm if the pressure in the auxiliary reservoir falls below a preset level for longer than it is normally necessary to refill the reservoir. e) Stop, non-return and other control valves, piping and all accessories upto breaker mechanism housing.

2.10.01 **UNIT COMPRESSED AIR SYSTEM**

The unit compressed air system for each breaker shall be provided with compressed air piping, piping accessories, control and non-return valves, filters, coolers of adequate capacity, pressure reducing valves(if any), isolating valves, drain ports, etc.

2.10.02 **Air Compressor**:

a) The air compressor shall be driven by automatically controlled motor. It shall be of air cooled type complete with preferably oil-less cylinder lubrication. The compressors or pumps shall be mounted within the operating mechanism housing or a separate weather-proof and dust-proof housing.

b)The compressor size shall be such that it is capable of performing following operations satisfactorily :

i) Total running time of compressor not exceeding 45 minutes per day, considering 2% leakage and 2 CO-operations

ii) ii) Air charging time not exceeding 20 minutes after one CO operation of the breaker

c) The compressor shall be provided with automatic adjustable unloading device, if necessary, during starting. Each compressor shall be equipped with a time totalizer

d) The compressors and its accessories shall conform to the type tests and shall be subject to routine tests as per applicable standards.

2.10.03 **Intercooler and After cooler** :

Intercooler between compressor stage and after cooler at discharge of H.P. cylinder shall be included in Contractor's scope. They shall be of air cooled type and shall be designed as per ASME Code of IEMA Standards. The design pressure on the air side of cooler shall be 1.25 times the working pressure. A corrosion allowance of 3mm shall be included for all steel parts

2.10.04 **Air Receivers**

a)The capacity of receivers shall be sufficient for two (2) CO operations of the breaker

b)Air receiver shall be designed in accordance with the latest edition of the ASME Code for Pressure Vessel - Section VIII of BS:5179. A corrosion allowance of 3.0 mm shall be provided for shell and dished ends. Receivers shall be hot dip galvanized

c) Accessories such as suitable sized safety valve to relieve full compressor discharge at a

set pressure equal to 1.1 times the maximum operating pressure, dial type pressure gauge with isolating and drain valve and test connection shall be provided.

d)Quality of Air : Compressed air used shall be dry and free of dust particles. Arrangement for conditioning the compressed air shall be provided as an integral part of air compressor system. The quality of air shall be compatible with the parts used in the system. All necessary components required to make it compatible shall be included.

2.10.05 **Controls and Control Equipment** :

a)The compressor control shall be of automatic start stop type initiated by pressure switches on the receiver. Supplementary manual control shall also be provided.

b)All control equipment shall be housed in a totally enclosed cabinet. Pressure gauges and other indicating devices, control switches shall be mounted on the control cabinet.

c) Facility to annunciate failure of power supply to the compressor control shall also be provided.

2.10.06 **Compressed Air Piping, Valves and Fittings**

a) The flow capacity of all valves shall be at least 20% greater than the compressor capacity.

b) The high pressure system shall be such that after one 0 - 0.3 Sec - CO operation, the breaker shall be capable of performing one CO operation within 3 minutes.

c) All compressed air piping shall be bright annealed, seamless phosphorous Deoxidized Non-Arsenical Copper alloy or stainless steel pipe (C-106 of BS:2871).

d) All joints and connections in the piping system shall be brazed or flared as necessary.

e) Compressed air piping system shall be supplied in clean, sealed and packed condition. Before installation, the pipes shall be again cleaned properly to remove dust, brazing particles, etc

2.10.07 **Spare Parts and Mandatory Maintenance Equipment** :

The Contractor shall include in O&M manual, the requirement of mandatory spare parts and maintenance equipment etc .

2.11.00 TESTS : The circuit breakers along with its operating mechanism shall be type tested for all the type tests.

2.11.**01** **ROUTINE TESTS**

Routine tests as per IEC-62271-100 on the complete breaker/ pole along with its own operating mechanism and pole column shall be performed on all circuit breakers.

2.11.02 SITE TESTS :

All routine tests except power frequency voltage dry withstand test on breaker shall be repeated on the completely assembled breaker at site.

2.12.00 CIRCUIT BREAKER **PARAMETERS:**

Sl.no	Description	
a)	Type of Circuit breaker	Out door SF6 insulated, Single pressure, Live Tank Type, 50Hz
b)	No. of poles	Three(3poles)
c)	Rated operating duty cycle	O - 0.3 sec. - CO - 3min. – CO
d)	Total closing time	Not > than 150ms
e)	Reclosing	1ph & 3ph high speed auto reclosing as required .
f)	Trip and closing coil voltage	220V DC
g)	Auxiliary contacts	As required plus10NO & 10NC contacts per breaker as spare.
h)	Noise level	Maximum 140dB at 50m distance from base of circuit breaker
i)	Rated terminal load	Adequate to withstand 100kg static load as well as wind, seismic and short circuit forces without impairing reliability or current carrying capacity
k)	Temperature rise over	As per IEC:62271-100
l)	Type of operating mechanism	Pneumatic/spring/hydraulic/or a combination of these
m)	Minimum creepage distance	25mm/Kv
n)	Support structure height	Adequate so that lowest part of support insulator of equipment is minimum 2550mm from plinth level.

2.12.01 **400kV Class Circuit Breakers (AIS)**

Sl.no	Description	
a)	Rated continuous current	Minimum: 3150A/2000A at rated ambient temperature current capacity as per the SLD.
b	Rated out-of-phase breaking	15.75kA rms
c)	Rated line charging breaking current (voltage factor of 1.4)	600A at 90deg.cen leading power factor with maximum permissible switching overvoltage of 2.3 pu
d)	Rated small inductive current Breaking capacity	Corresponding to interrupting steady and transient magnetising current of 50 to 630 MVA transformers with overvoltage

		less than 2.3 pu
e)	First pole to clear factor	1.3
f)	Rated break time	As per IEC
g)	Phase to phase spacing	7000mm
h)	Controlled switching Device (CSD)	The controlled switching requirements of Circuit Breaker as per the SLD. The details of CSD are given at Annexure-I

2.13.00 **Mandatory Maintenance Equipments :**

1. SF6 Gas Handling Plants:-

a) SF6 gas filling and evacuating equipment(Portable), Qty : 1no:

The capacity of this plant shall be such that it shall not take appreciable time for filling or evacuating of the complete 3 pole breaker. The required vacuum for complete evacuation shall be attained with the help of this plant.

b) **SF6 gas filtering, drying, storage and recycling plant, Qty : 1no:**

i)The plant shall be complete with accessories and fittings so that SF6 gas from the breaker can be directly filled in the plant storage reservoir.

ii)In case purging of the equipment before filling with SF6 gas is desirable, then the required equipment for dry gases etc. shall be furnished as a part of the plant.

iii)For heavy items within the plant, the lifting hooks shall be provided for lifting and moving with the overhead cranes.

iv)The capacity of the plant shall be such as to handle and store 300 kg of SF6 gas.

v) These SF6 gas handling plants shall be complete with all the necessary pipes, couplings flexible tubes and valves for coupling to the equipment.

vi) The design and construction of the plant, valves, couplings, connections shall be such that leakage of SF6 gas shall be minimum. Similarly valves, couplings and pipe work shall be so arranged that accidental loss of gas to the atmosphere shall be minimum.

2. SF6 Gas leak detector, Qty: 1no: The SF6 gas leak detector shall meet the following requirements: a) The detector shall be free from induced voltage effects. b) The sensing probe shall be such that it can reach all the points on the breaker where leakage is to be sensed. c) The accuracy of the equipment shall be at least 10 ppm.

3.Operational Analyser (along with DCRM Kit) , Qty:1no : The operational analyser shall meet the following requirements:

a) Operational analyser shall be one complete system, which once installed should record all the parameters, as laid down in subsequent clauses.

b)It shall have facility to record the breaker contact movement during opening, closing, auto reclosing and make-break operation, the speed of contacts at various stages of operation, travel of contacts, opening time, closing time and make break time etc. The analyser shall have provisions for recording at least 12 different functions of the circuit breaker. All necessary transducers (i.e., three nos. for complete 3 phase speed and travel record of breaker), cables, pickups, attachments required for the breaker shall be supplied with the analyser. The cables supplied shall be sufficient for recordings at site on a completely assembled and erected breaker.

c)All the necessary catalogues write up for operation and maintenance of the analyser shall be furnished along with each analyser and peripheral system. The necessary equipments for monitoring various parameters of circuit breaker termed as signature analysing shall be supplied along with all software, laptop computer, devices etc. with the breaker. The same shall be demonstrated at site on a fully assembled breaker.

4.**Self-powered hydraulic aerial working platform with articulated and fly boom for General purpose maintenance in switchyard and Transformer yard. (Suitable for 24m working height)- Qty : 1no .**

All above maintenance equipments shall be demonstrated at site during handover.

ANNEXURE-I

Requirement of Controlled Switching Device for 400KV Circuit Breaker

The circuit breaker with controlled switching as indicated in single line diagram shall meet the following requirement:

1. The Switching controlled Device shall be used to reduce increased over voltages, re ignition between circuit breaker contacts that may be caused by normal switching of high voltage circuit breakers and hence optimize the stresses on circuit breaker while switching the circuit. The switching-controlled device will be called device henceforth.
2. Circuit breaker should be able to be switched while switching controlled device is not in operation e.g., during maintenance work or power supply is not connected, a bypass shall be provided to the device. In these cases, the switching commands will then be forwarded directly to the circuit breaker via this Bypass. The switching time will not be controlled with these switching operations.
3. The controller shall get command to operate the breakers manually or through auto re-close relay at random. The controller shall be able to analyze the current and voltage waves available through the signals from secondaries of CTs & CVTs for the purpose of

calculation of optimum moment of the switching the circuit breaker and issue command to circuit breaker to operate.

4. The device should have display facility at the front for the settings and measured values, alternatively a laptop shall be supplied with each CSD to facilitate display at the front for the setting and measured values.
5. The device shall have self-monitoring facility.During the switching operations, current and voltage waveforms and other parameters shall be recorded and saved together with calculated values. The control switching device provided shall be networked to an Engineering workstation (EWS) located in the switchyard control room. It shall be possible to extract the switching oscillographic records and to do CSD parameterization from this EWS. All necessary software & hardware shall be in bidder's scope. .
6. It shall have self-monitoring facilities. Faults which impair the functioning of the device or peripheral components, failure of trip voltage or sensors shall be displayed visually and shall give alarm.
7. The device shall be designed to operate correctly and satisfactorily with the excursion of auxiliary A/C & DC voltages and frequency as specified elsewhere in the specification.
8. The device shall have time setting resolution of 0.1 ms or better.
9. Test reports for the following type tests shall be submitted:
    a. Dielectric withstand test as per IEC 60255-27.
    b. High voltage Impulse test as per IEC 60255-27.
    c. Slow damped oscillatory wave test as per IEC60255-26
    d. Fast transient test as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-4)
    e. Electrostatic Discharge test as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-2)
    f. Surge Immunity test as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-5)
    g. Power frequency magnetic field test as per IEC 60255-26 (class 5 installation as per base standard IEC 61000-4-8)
    h. Radiated radio frequency electromagnetic field test as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-3)
    i. Conducted disturbance induced by radio frequency field as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-6)
    j. Power frequency immunity test on binary input as per IEC 60255-26 (class 4 installation as per base standard IEC 61000-4-16)

3.00.00 **DISCONNECTOR : GENERAL**

3.01.01	The isolators and accessories shall conform in general to relevant IEC 62271-102 (or equivalent Indian Standard) except to the extent explicitly modified in specification. Earth switches shall be provided on isolators as marked on SLD. Isolators shall be horizontal centre break type.
3.01.02	The isolators and earth switches shall be A. C / D.C. motor operated.
3.02.00	**DUTY REQUIREMENTS**
	Isolators and earth switches shall be capable of withstanding the dynamic and thermal effects of the maximum possible short circuit current of the system in their closed position. They shall be constructed such that they do not open under influence of short circuit current and wind pressure together. The earth switches wherever provided shall be constructional interlocked so that the earth switches can be operated only when the isolator is open and vice-versa.
3.02.01	The earth switches wherever provided shall be constructional interlocked so that the earth switches can be operated only when the isolator is open and vice-versa. Mechanical Endurance : M2 type of duty as per IEC for 400kV and earthing switches shall be of class M0 / M1 duty.
3.02.02	In addition to the constructional interlock, isolator and earth switches shall have provision to prevent their electrical and manual operation unless the associated and other interlocking conditions are met. All these interlocks shall be of failsafe type. Suitable individual interlocking coil arrangements shall be provided. The interlocking coil shall be suitable for continuous operation from DC supply and within a variation range as stipulated in relevant section. The interlock coil shall be provided with adequate contacts for facilitating permissive logic for 'DC' control scheme of the isolator as well as for AC circuit of the motor to prevent opening or closing of isolators when the interlocking coil is not energised.
3.02.03	The earthing switches shall be capable of discharging trapped charges of the associated lines. Isolator and earth switches shall be able to bear on the terminals the total forces including wind loading and electrodynamic forces on the attached conductor without impairing reliability or current carrying capacity.
3.02.04	The isolator shall be capable for making / breaking normal currents when no significant change in voltage occurs across the terminals of each pole of the isolator on account of making / breaking operation.
3.03.00	**CONSTRUCTIONAL FEATURES :**
3.03.01	The isolators shall be provided with high pressure current carrying contacts on the hinge/ jaw ends and all contact surfaces shall be silver plated. The thickness of silverplating should not be less than 25 microns. The contacts shall be accurately machined and self aligned.
3.03.02	The isolator shall be provided with a galvanised steel base provided with holes and designed for mounting on a lattice/pipe support structure. The base shall be rigid and self supporting. The position of movable contact system (main blades) of each of the isolator and earthing switch shall be indicated by a mechanical indicator at the lower end of the vertical rod of shaft for the isolator and earthing switch. The indicator shall be of metal and shall be visible from operating level.

3.03.03	All metal parts shall be of non-rusting and non-corroding metal. Current carrying parts shall be from high conductivity electrolytic copper/aluminium. Bolts, screws and pins shall be provided with lock washers. Keys or equivalent locking facilities, if provided on current carrying parts, shall be made of copper silicon alloy or equivalent. The live parts shall be designed to eliminate sharp joints, edges and other corona producing surfaces.
3.03.04	The isolators shall be so constructed that the switch blade will not fall to the closed position if the operating shaft gets disconnected. Isolators and earthing switches including their operating parts shall be such that they cannot be dislodged from their open or closed positions by gravity, wind pressure, vibrations shocks or accidental touching of the connecting rods of the operating mechanism. The switch shall be designed such that no lubrication of any part is required except at very infrequent intervals.
3.03.05	The insulator of the isolator shall conform to the requirements stipulated under clause no: 08.00.00 as specified in the specification and shall have a min. cantilever strength of 800 kg for 400kV. Pressure due to the contact shall not be transferred to the insulators after the main blades full close. The insulators shall be so arranged that leakage current will pass to earth and not between terminals of the same pole or between phases. The terminal connectors shall conform to requirements stipulated under clause no:08.00.00 as specified else where in the specification.
3.04.00	EARTHING SWITCHES:
	Where earthing switches are specified these shall include the complete operating mechanism and auxiliary contacts. The earthing switches shall form an integral part of the isolator and shall be mounted on the base frame of the isolator. Earthing switches shall be suitable for local operation only. The earthing switches shall be constructional interlocked with the isolator so that the earthing switches can be operated only when isolator is open and vice versa.
3.05.00	**OPERATING MECHANISM AND CONTROL**
	The Contractor shall offer, motor operated switches having padlock arrangement on both 'ON' and 'OFF' positions. Limit switches for control shall be fitted on the isolator/ earth switch shaft, within the cabinet to sense the open and close positions of the isolators and earth switches. It shall not be possible, after final adjustment has been made for any part of the mechanism to be displaced at any point in the travel sufficient enough to allow improper functioning of the isolator when the isolator is opened or closed at any speed. Control cabinet/operating mech. box shall conform to requirements stipulated in clause no: 08.00.00 else where in the specification and IS:5039/IS 8623/IEC 439 as applicable
3.05.01	**OPERATION**
	Isolator shall be gang operated for main blades and earth switches. The operation of the three poles shall be well synchronised and interlocked.
3.05.02	The design shall be such as to provide maximum reliability under all service conditions. All operating linkages carrying mechanical loads shall be designed for negligible deflection. The length of inter insulator and interpole operating rods shall be capable of adjustments.
3.05.03	The design of linkages and gears be such so as to allow one man to operate the handle with ease for isolator and earth switch
3.06.00	TESTS

3.07.01 In continuation to the requirements stipulated under Part-I the isolator alongwith operating mechanism shall conform to the type tests and shall be subjected to routine tests and acceptance tests in accordance with IEC 62271-102. Minimum 50 nos. mechanical operations will be carried out on 1 (one) isolator assembled completely with all accessories as acceptance test. During final testing of isolator sequential closing/ opening of earth switch shall also be checked only after isolator is fully open/close. Acceptance test shall be carried out with operating box

3.06.02 The insulator shall conform to all the type tests as per IEC60168. In addition to all type, routine and acceptance tests, as per IEC-60168, the following additional routine/ acceptance tests shall also be carried out:

a)Bending load test in four directions at 50% min. bending load guaranteed in all insulators. b) Bending load test in four directions at 100% min. bending load guaranteed on sample insulators in a lot. c) Torsional test on sample insulator of a lot.

3.7.00 **General PARAMETERS:**

	Description	Parameter
a)	Type of isolator	Out door type , 50Hz
b)	No. of poles	Three(3poles)
c)	Rated operating time	Not > than 12sec
d)	Control voltage	220VDC
e)	Auxiliary contacts on isolator	Min.8NO & 8NC contacts per pole/isolator .
f	Auxiliary contacts on earth/ safety/grounding/high speed switch	Min.6NO & 6NC contacts per pole/isolator .
g)	Operating mechanism of isolator and earth switch	AC/DC/universal motor
h)	Minimum creepage distance	25mm/Kv
i)	Rated ambient temperature	50 degree Celsius
j)	Support structure height	Adequate so that lowest part of support insulator of equipment is minimum 2550 mm from plinth level
k	Temperature rise	As per Table III of IEC 60694 for an ambient of 50 deg. C

3.07.01 400KV Isolator :

	Description	Parameter
a)	Rated continuous curren	Minimum 3150/2000 A at rated ambient temperature as per the Single line diagram
b)	Rated short time withstand current of	63 kA rms for One (1) second

	isolator and earthswitch	
c)	Rated Insulation levels	
d)	Rated one minute power. Frequency withstand voltage	i) 520 kV rms between live terminals and earth ii) 610 kV rms across isolating distance
e)	Rated lightning impulse Withstand voltage	i) ±1425 kVp between live terminals and earth. ii) ± 1425 kVp impulse on one terminal and 240 kVp power freq. Voltage of opposite polarity on other terminal (across isolating distance).
f	Rated switching impulse Withstand voltage	i) ± 1050 kVp between live terminals and earth. ii) ii) ± 900 kVp impulse on one terminal and 345 kVp power freq.voltage of opposite polarity on other terminal (across isolating distance).
g)	Phase to phase spacing	7000mm

4.00.00 INSTRUMENT TRANSFORMER : CODES AND STANDARDS

Current transformers	IEC 61869-1&2, IS: 2705, IS:16227
Voltage transformers	IEC 61869-1&5, IEC 60358, IS: 3156
Insulating oil	IS: 335, IEC:60296

4.01.00 GENERAL REQUIREMENTS (For AIS)

4.01.01 The instrument Transformers i.e Current and voltage transformers / CVT shall be single phase transformer units and shall be supplied with a common marshaling box for a set of three single phase units. All exposed mild steel shall be hot dip galvanised or painted with Grey color of shade RAL 9002.The instrument transformers shall be hermetically sealed units. The instrument transformers shall be provided with filling and drain plugs. Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block. For Current transformers , no oil shall come in contact with zinc galvanized surface.

4.02.0 The Instrument transformer shall be with Polymer Insulator. For Current transformer shall have cantilever strength of not less than 500kg for 400kV. For 400kV CVT cantilever strength shall not be less than 250kg.

4.03.00 Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block .

4.04.00 **CURRENT TRANSFORMERS (CTs)**

4.04.01 The CTs shall have single primary of either ring type or hair pin type or bar type. Wound primary is not acceptable.

4.04.02	In case of "Bar Primary" inverted type CTs, the following requirements shall be met: a)The secondaries shall be totally encased in metallic shielding providing a uniform equipotential surface for even electric field distribution. b) The lowest part of insulation assembly shall be properly secured to avoid any risk of damage due to transportation stresses. c) The upper part of insulation assembly sealing on primary bar shall be properly secured to avoid any damage during transportation due to relative movement between insulation assembly and top dome.
4.04.03	The insulator shall be one piece without any metallic flange joint. The CT shall be provided with oil sight glass.
4.04.04	The core lamination shall be of cold rolled grain oriented silicon steel or other equivalent alloys. The cores shall produce undistorted secondary current under transient conditions at all ratios with specified parameters.
4.04.05	Different ratios shall be achieved by secondary taps only, and primary reconnections shall not be accepted.
4.04.06	The guaranteed burdens and accuracy class are to be intended as simultaneous for all cores.
4.04.07	The instrument security factor at all ratios shall be less than five (5) for metering core. If any auxiliary CT/reactor is used, then all parameters specified shall be met treating auxiliary CTs/reactors as integral part of CT. The auxiliary CT/reactor shall preferably be in-built construction of the CT. In case it is separate, it shall be mounted in secondary terminal box.
4.04.08	The physical disposition of protection secondary cores shall be in the same order as given under CT requirement table(s) given below.
4.04.09	The CTs shall be suitable for high speed auto-reclosing
4.04.10	The secondary terminals shall be terminated on stud type suitable no's of non disconnecting and disconnecting terminal blocks inside the terminal box of degree of protection IP:55 at the bottom of CT.
4.04.11	The CTs shall be suitable for horizontal transportation
4.04.12	The CTs shall have provision for taking oil samples from bottom of CT without exposure to atmosphere to carry out dissolved gas analysis periodically. Contractor shall give his recommendations for such analysis, i.e. frequency of test, norms of acceptance, quantity of oil to be withdrawn, and treatment of CT. Contractor shall supply 2nos. oil sampling device for every 20nos. Minimum 2nos. oil sampling device for each substation.
4.04.13	The CT shall have provision for measurement of capacitance and tan delta as erected at site
4.05.00	**VOLTAGE TRANSFORMERS (CVTs) (AIS):**
4.05.01	Voltage transformers shall be of capacitor voltage divider type with electromagnetic unit.The CVTs shall be thermally and dielectrically safe when the secondary terminals are loaded with guaranteed thermal burdens. The electro-magnetic unit (EMU) shall comprise of

compensating reactor, intermediate transformer, and protective and damping devices. The oil level indicator of EMU with danger level marking shall be clearly visible to maintenance personnel standing on ground.

4.05.02 The secondaries shall be protected by HRC cartridge type fuses for all windings. The secondary terminals shall be terminated on stud type non-disconnecting terminal blocks via the fuse inside the terminal box of degree of protection IP: 55. The access to secondary terminals shall be without the danger of access to high voltage circuit..

04.05.03 The damping device shall be permanently connected to one of the secondary winding and shall be capable of suppressing ferro-resonance oscillations.

04.05.04 CVTs shall be suitable for high frequency (HF) coupling for power line carrier communication. Carrier signals must be prevented from flowing into potential transformer (EMU) metering circuit by means of RF choke/reactor suitable for effective blocking the carrier signals over the entire frequency range of 40 to 500 kHz. HF terminal shall be brought out through a suitable bushing and shall be easily accessible for connection to the coupling filters of the carrier communication equipment. The HF terminal shall be provided with earthing link with fastener.

04.05.05 A protective surge arrester/spark gap shall preferably be provided to prevent break down of insulation by incoming surges and to limit abnormal rise of terminal voltage of shunt capacitor, tuning reactor, RF choke, etc. due to short circuit in transformer secondary. The details of this arrangement (or alternative arrangement) shall be furnished by Contractor for Employer's review.

04.05.06 The accuracy of metering core shall be maintained through the entire burden range upto 75VA on all four windings without any adjustments during operations. The protection cores shall not saturate at about 1.5 times the rated voltage for a min. duration of 30 secs

04.06.00 MARSHALLING BOX : Marshaling box shall conform to all requirements as given in clause no:08.00.00. The wiring diagram for the interconnection of three phase instrument transformer shall be pasted inside the box. Terminal blocks in the marshaling box shall have facility for star/delta formation, short circuiting and grounding of secondary terminals. The box shall have enough terminals to wire all control circuits plus 20 spare terminals .

04.07.00 GENERAL PARAMETERS FOR CURRENT TRANSFORMERS:

Sl.no	Description	Parameter
a)	One minute power frequency withstand voltage between secondary terminal and earth	5kV
b)	Partial discharge level	10 pico Coulombs max.
c)	Temperature rise	As per IEC
d)	Type of insulation	Class A
e)	Number of cores	Five (5): Details are given in table-1 below
f	Rated frequency	50 Hz
g)	System neutral earthing	Effectively earthed
h)	Installation	Outdoor (up right)
i)	Seismic acceleration	0.3 g horizontal
j	Number of terminals in marshalling box.	All terminals of control circuits wired

		up to box marshalling box plus 20 terminals spare.

04.07.01 400 kV Current Transformers (oil filled type)

Sl.no	Description	Parameter
a)	Rated Short time thermal current	63kA for 1sec
b)	Rated Dynamic current	125kA(peak)
c)	Rated Extended Primary current	120% of rated primary current as per SLD

04.08.00 **PARAMETERS FOR VOLTAGE TRANSFORMERS (For AIS): General Parameters**

Sl.no	Description	
a)	Standard reference range of frequencies	96% to 102% for protection. 99% to 101% for measurement
b)	High frequency .capacitance	With in 80% to 150%
c)	Equivalent resistance over entire carrier frequency range	<40 ohms
d)	One min.power frequency with stand voltage (B/W LV(HF) terminal	10KV rms & earth for exposed terminals or 4kV rms for terminals enclosed in weather proof box .
e)	No of terminals in cabinet mFor secondary winding	Required , plus 10nos spare.
f	Rated thermal burden	750VA.
g)	Partial discharge	Max.10 pico coulombs
h)	Rated voltage factor	1.2continuous, 1.5 for 30sec
i)	No of cores	As per details given I Table-II below
j	CVT HF capacitance	4400/8800pf (as required) for 400kV system.

04.09.00 **TESTS**

a) The current and voltage transformers (For AIS) shall confirm to type tests and subjected to routine tests in accordance with the relevant IEC/IS and shall also conform to the following additional type tests as applicable:

i) Radio Interference and Corona test

ii) Thermal withstand test i.e. application of rated voltage and rated current simultaneously by synthetic circuit (For CT only)

iii) Seismic withstand test along with structure (for 400kV only)

iv) Thermal co-efficient test i.e. measurement of Tan-Delta as function of temperature (at ambient and between 80 deg. C and 90 deg. C) and voltage (at 0.3, 0.7, 1.0 and 1.1 Um).(for CT only)

v) Multiple chopped impulse test on Primary winding.

vi) In addition to routine tests as per IEC/IS, measurement of partial discharge in continuation with power frequency withstand test required for 400 kV current transformer. ISF (Instrument Security Factor) test will be done as part of Routine acceptance test.

TABLE-I

CORE DETAILS OF 400kV CTs

Following details shall be applicable for all protection class CT cores.
The rated extended primary current of the CTs shall be 120% continuous of 3000A. / 2000A

CT No./Core No.	Current Ratio (A)	Output Burden (VA)	Accuracy Class as per IEC	Min Knee Point Voltage (Vk)	Max CT Sec Winding Res. (Ohm)	Max Exciting Current in mA at Vk	Application
1	3000/ 2000//1000/ 1	-----	PS	3000/2000 /1000	15/10/5 Ohm	20/30/ 60	Bus Differential check
2	3000/2000/1 000/1		PS	3000/2000 /1000	15/10/5 Ohm	20/30/ 60	Bus Differential main
3	3000/2000/1 000/500/1	20/20/ 20/20	0.2S				Metering and synch.
4	do	do	0.2S				For ABT Metering
5	3000/2000/ 1000/500/1		PS	3000/2000 /1000/500/ 1	15/10/5 /2.5Ohm	20/30/ 60/120	Transformer Back up / line protection
6	3000/2000/ 1000/500/1		PS	3000/2000 /1000/500/ 1	15/10/5 /2.5Ohm	30/ 60/120	Trans Diff./ Line protection

Physical arrangement of CTs shall be as per Protection SLD.

Note : The supporting calculation to be furnished during detail engineering For CT Parameters.

CORE DETAILS OF 400kV CVT — **TABLE – II**

Primary Voltage : 400/ v3 for Primary I,II,III

Secondary Core	Application	Rated Secondary Voltage (V)	Accuracy	Output Burden – Minimum
I	Protection	110/v3	3P	75 VA
II	Protection	110/v3	3P	75 VA
III	Metering	110/v3	0.2	75 VA
IV	ABT Metering	110/v3	0.2	75VA

The accuracy of 0.2 on secondary III should be maintained through the entire burden range up to total simultaneous burden 75 VA on all the three windings without any adjustments during operation.

* This is minimum burden specified, however bidder to consider VA burden to suit the requirement of the offered system. The supporting calculation to be furnished during detail engineering.

05.00.00 SURGE ARRESTOR

05.01.00 **GENERAL : T**he surge arrestors shall conform in general to IEC-60099-4 and IS:3070 -part3 / IS:15086(part-4) except to the extent modified in the specification.

05.01.01 Arrestors shall be hermetically sealed single phase units, self-supporting construction, suitable for mounting on lattice/tubular type support structures.

05.02.00 **DUTY REQUIREMENTS**

05.02.01 The Surge Arresters (SAs) shall be capable of discharging over-voltages occurring due to switching of unloaded transformers, reactors and long lines. The reference current of SAs shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. The SAs shall be capable of withstanding meteorological and short circuit forces under site conditions.

05.03.00 **CONSTRUCTIONAL FEATURES (FOR AIS)**

05.03.01 The non linear blocks shall be sintered metal oxide material. The SA construction shall be robust with excellent mechanical and electrical properties. SAs shall have pressure relief devices suitable for preventing violent failure of insulator housing and providing path for flow of rated fault currents in the event of arrester failure.

05.03.02 Outer insulator of Surge arrestor shall be of Polymer type. The SA shall not fail due to polymer contamination. Polymer housing shall be so coordinated that external flashover will not occur due to application of any impulse or switching surge voltage up to maximum design value for SA. The cantilever strength of the surge arrestor shall be minimum 500kg for 400kV and above voltage class system.

05.03.03 The end fittings shall be made of corrosion proof material and preferably be non-magnetic. The sealing arrangement of the Surge Arrester stacks shall be done incorporating grooved flanges with O-rings/elliptical cross section gasket of Neoprene or Butyl rubber.

05.04.00 **FITTINGS AND ACCESSORIES FOR AIS**

05.04.01 Each SA shall be complete with insulating base for mounting on structure. SAs shall be provided with grading and/or corona rings as required.

05.04.02 i)Self-contained discharge counters, suitably enclosed for outdoor use (with Min.IP:56 degree of protection) and requiring no auxiliary or battery supply shall be fitted with each SA along with necessary connections to SA and earth. Suitable leakage current meters shall also be supplied in the same enclosure. The reading of milliammeter and counter shall be visible through an inspection glass panel to a man standing on ground. A pressure relief vent/suitable provision shall be made to prevent pressure build up.

ii)The surge counter shall be provided with a potential free contact which shall close whenever a surge is recorded by the surge monitor. Necessary arrangement shall be provided for extending the contact information to substation Automation system.

iii) Insulated copper conductor of adequate size and length shall be used for connecting discharge counter terminal and lightning arrester earth terminal. Insulation level of the conductor shall not be less than 5 kV.
Suitably sized bypass copper shunts shall be provided for bypassing the discharge counter for removal / maintenance of the counter.

iv) Necessary arrangement shall be provided for extending the reading of surge counter, leakage current indication in the SAS.

05.05.00 **PARAMETERS: General (400kV)**

Sl.no	Description	
a)	Nominal discharge current	20kA of 8/20 microsec.wave
b)	Long duration discharge class	3 or 4
c)	Current for pressure relief test	63kA rms
d)	Prospective symmetrical fault current	63kA rms
e)	Low current duration test value	As per IEC.
f	Partial discharge at 1.05MCOV	Not >than 50pc
g)	System neutral earthing	Effectively earthed
h)	Installation	Out door

05.05.01 400kV Class Surge Arrestor

Sl.no	Description	
a)	Rated Arrestor Voltage	336kV
b)	Minimum Discharge capability	12 kJ/kV
c)	Continuous operating voltage (COV) at 50 deg. C	267rms
d)	Min. Switching surge residual (1 kA)	730 kVp minimum, 780 kVp maximum
e)	RIV at 266 kV (rms)	Less than 1000 micro volts

The surge arrestors are provided to protect the following equipment whose insulation levels are indicated in the **Table** I given below..

TABLE-1

Sl.no	Equipment to be Protected	Lightning impulse(kVp)	Switching impulse(kVp)
a)	Power Transformer	± 1425	± 1050
b)	Instrument Transformer	± 1425	± 1050
c)	Reactor	± 1300	± 1050
d)	CB/isolator (Ph to ground)	± 1425	± 1050
	Across open contacts	± 1425(± 240)	± 900(± 340)

Surge arrestors shall be capable of discharge on severe re-energisation switching surges on a 400 kV line upto 450 km. length with surge impedance of 300 ohms and capacitance of 11.986 nF/km amd over voltage factor of 2.3 p.u. Surge arrestor shall be capable of discharging energy equivalent to class 3 or 4 of IEC for a 420 kV system on two successive operations followed immediately by 50 Hz energization.

05.06.00 **TESTS**

05.06.01 Surge arrestors (AIS) shall confirm to all type tests (as applicable) as per IEC 60099-4 and shall be subjected to routine and acceptance tests in accordance with IEC-60099-4. The

resistive current drawn by the arrestor for at rated voltage shall be indicated in the routine test report.

06.00.00 POST INSULATOR

06.01.00 **GENERAL :**The post insulators shall conform in general to latest IS: 2544 and IEC – 60815, 60168.

06.02.00 **CONSTRUCTIONAL FEATURES**

06.02.01 Post type insulators shall consist of a porcelain / Polymer part permanently secured in a metal base to be mounted on the supporting structures. They shall be capable of being mounted upright. They shall be designed to withstand any shocks to which they may be subjected to by the operation of the associated equipment. Only solid core insulators shall be accepted. Height of post insulator shall be preferably as given under parameters of this part. The other requirements of insulator as given under auxiliary requirements shall also be applicable.

06.03.00 **TESTS**

06.03.01 In accordance with the stipulations elsewhere the post insulators shall conform to type tests and acceptance, sample and routine tests as per IS: 2544, IEC-60168 shall be carried out.

06.03.02 In addition to acceptance/sample/routine tests as per IS: 2544, IEC-60168, the following tests shall also be carried out.

a) Ultrasonic tests on all cut shells as routine check.
b) Visual examination and magna flux test on all flanges prior to fixing.
c) Check for uniformity of thickness and weight of zinc coating as a sample test from each lot of flanges prior to fixing.
d) Bending load test shall be carried out at 50% minimum failing load in four directions as a routine test.
e) Bending load in four directions at 100% minimum bending load guaranteed on samples as per clause-2.3 of IEC. Subsequently this post insulator shall not be used.
f) Tests for deflection measurement at 20, 50, 70% of specified minimum failing load on sample.

06.04.00 **PARAMETERS**

06.04.01 400 kV class Post Insulators

Sl.no	Description	
a)	Type	Solid core
b)	Dry and wet one min.power frequency voltage	680kV rms
c)	Dry impulse withstand positive and negative(kVp)	1550rms
d)	Wet switching surge withstand (kVp)	1175 rms
e)	Total min.cantilever strength(kg)	800
f	Min. torsional moment(kg- m)	600
g	Total height of insulator(mm)	3650

Note: If corona extinction voltage is to be achieved with the help of corona ring or any other similar device, the same shall be deemed to be included in the scope of the bidder without any price implication.

07.00.00 WAVE TRAP : GENERAL:

The Wave Trap covered under the package shall conform to IEC 353 or IS:8792, IS:8793 and relevant IEC/IS Specifications except to the extent modified by the specification.

07.01.00 **LOCATION OF EQUIPMENT :**

07.01.01 Wave Traps as specified under this section shall be installed at the respective transmission line bays as indicated in single line diagram.

07.02.00 **TECHNICAL REQUIREMENTS**

07.02.01 Wave Trap shall be inserted into high voltage transmission line to prevent undue loss of carrier signal for all power system conditions. Its impedance shall be negligible at power frequency (50 Hz) so as not to disturb power transmission but shall be relatively high over the frequency band appropriate to carrier transmission.

07.02.02 Wave trap shall consist of a main coil designed to carry continuously the rated current without exceeding the limit of temperature rise. It shall be supplemented with a protective device and tuning device. Wave trap shall be Broad Band tuned for its entire carrier frequency range. Resistive component of impedance of the Wave trap within its carrier frequency blocking range shall not be less than 570 ohms.

07.02.03 Wave trap shall be provided with a protective device in the form of lightning arrestor which shall be designed and arranged such that neither significant alternation in its protective function nor physical damage shall result from either temperature rise or the magnetic field of the main coil at continuous rated current or rated short time current The protective device shall be shunt connected to the main coil and tuning device. The lightning arrestor provided shall have a rated discharge current of 10 kA. Coordination, however, shall be done by taking 20 kA discharge current into account.

07.02.04 The lightning arrestor provided with the Wave trap of each rating shall fully comply with the requirements of IS-3070-Part-I (1974)/IEC-60099. It shall conform to type tests as applicable and type test certificate for the same shall be submitted by the Bidder.

07.02.05 The lightning arrester provided with the Wave trap shall be subject to routine and acceptance tests as per IEC – 60099. The Wave trap on 400 kV lines shall show no visual corona at extinction voltage of 320 kV rms. Suitable corona rings shall be incorporated in the line trap for 400 kV. Wave trap shall be equipped with bird barriers.

07.02.06 Wave trap shall preferably be spray painted with light admiralty Grey paint (shade 697 of IS-5) or may have its natural epoxy colour.

07.02.07 Wave trap shall conform to IEC - 60353 fulfilling the following technical particulars.

Sl.no	Description	
a)	Nominal discharge current of protective device	10kA
b)	Type of tunning	Broad band
c)	Rated Blocking band width	90-500KHZ

d)	inductance	1.0 mH / 0.5 mH
e)	Radio intergerence voltage level at 266kVTotal min.cantilever strength(kg)	Not > than500micro volts

07.02.08 In accordance with the requirements stipulated elsewhere, the Wave Trap shall confirm to following type tests and shall be subjected to routine and acceptance tests as per IEC-60353.

a) Measurement of inductance of the main coil
b) Measurement of temperature rise
c) Insulation tests
d) Short time current tests
e) Corona Extinction Voltage Measurement
f) Radio Interference Voltage measurement

07.03.00 **WAVE TRAP MOUNTING**

07.03.01 The Wave Trap for 400kV shall be suitable for outdoor pedestal mounting and shall be mechanically strong enough to withstand the stresses due to maximum wind pressure of 195 kg/square meter. For pedestal mounting, each Wave trap shall be mounted on a lattice structure formed by three solid core type insulators.

08.00.00 REQUIREMENT OF AUXILIARY ITEMS

08.01.00 **ALUMINIUM TUBULAR CONDUCTOR**

08.01.01 The aluminium tube shall be grade 63401 WP (range2) as per IS 5082.There shall be no negative tolerance on OD and thickness of the tube. Other tolerances shall be as per IS:2678 and 2673.

08.01.02 Tests: In accordance with stipulations of specification routine tests shall be conducted on tubular conductor as per IS:5082. Also, the wall thickness and ovality shall be measured by ultrasonic method. In addition, 0.2% proof tests on both parent material and aluminium tube after welding shall be conducted.

For 400kV:

a)	size	4"IPS(EH Type)
b)	Outer diameter	114.20mm with no negative tolerance
c)	Thickness of tube	8.51 mm with no negative tolerance
d)	Cross-sectional area	2825.61 sq. mm.
e)	weight	7.7kg/m

08.02.00 **ACSR CONDUCTOR**

a)	Code and standard & Name	IS:398, MOOSE ACSR
b)	Overall diameter	31.77mm
c)	Strands and wire diameter of	
	a) Aluminium	54/3.53mm
	b)steel	7/3.53mm

BERSIMIS CONDUCTOR :

a)	Code and standard & Name	IS:398, Bersimis ACSR
b)	Overall diameter	35.05mm
c)	Strands and wire diameter of	
	a) Aluminium	42/4.57mm
	b)steel	7/2.54mm

08.03.00 **CLAMPS AND CONNECTORS**

08.03.01 The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of IS:617 for connecting to equipment terminals and conductors of aluminium. In case equipment terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetal.

08.03.02 The material of clamps and connectors shall be Galvanised mild steel for connecting to G.S. shield wire.

08.04.00 **INSULATOR STRING HARDWARE**

08.04.01 The insulator hardware shall be of bolted type and shall be of forged steel except for insulator cap, which can be of malleable cast iron. It shall also generally meet the requirements of clamps and connectors as specified above. In one span, Tension string assembly at one end shall be supplied with suitable turn buckle.

08.04.02 Disc Insulator for porcelain type insulator

The disc insulator shall meet the following parameters:

a)	Type	Antifog type insulator
b)	Size of insulator	255X145
c)	Electro mechanical strength	120KN
d)	Leakage distance(mm)	Min.430 or as required to meet the total creepage
e)	Power frequency voltage- dry & wet	80kV, 50kV

08.04.03 Insulator string (400KV) **: Porcelain type / composite long rod type)**

a)	Creepage distance size	Min.10500
b)	One Minute Power frequency voltage	680KV
c)	Lightning impulse	+/- 1550 KV
d)	Switching impulse	+/- 1050 KV
e)	No of disc.insulator (for porcelain)	25nos
f)	Eelctromechanical strength	120KN (porcelain)

08.05.00 **SPACERS :** Spacers shall conform to IS:10162. They shall be of non-magnetic material except nuts and bolts, which shall be of hot dip galvanised mild steel.

08.05.01 Spacers shall generally meet the requirements of clamps and connectors as specified above. Its design shall take care of fixing and removing during installation and maintenance.

08.05.02 In addition to the type tests as per IS:10162, clamp slip test should have been conducted. In this test the sample shall be installed on test span of twin/quad bundle string at a tension of 44.2 kN (4500 kg). One of the clamps when subjected to a longitudinal pull of 2.5 kN (250 kg) parallel to the axis of conductor shall not slip, i.e. permanent displacement between conductor and clamp after the test shall not exceed 1.0 mm. This test should have been performed on all other clamps of the sample.

08.06.00 **EARTHING CONDUCTOR:**

a) The main conductor buried in earth shall be 40mm dia rod for main and auxiliary mat. The earthing conductors over the ground shall be of 75x12 mm GS flat. The earthing leads for

columns and auxiliary structures, cable trenches shall be of 75x12 mm GS flat. The earthing of the lighting fixtures shall be carried out by 16 SWG wire.

b) All earthing conductors above the ground level shall be galvanised steel only. Refer Annexure-II.

08.07.00 **Earthwire for Lightning Protection**

a)	Number of strands	7 of steel
b)	Strand diameter	3.66mm
c)	Overall diameter	10.98mm
d)	Weight	583 kg/km approx.
e)	Ultimate tensile strength	68.4 kN minimum
f)	Total cross-sectional area	73.65sq.mm
g)	Calculated d.c. resistance	2.5 ohms/km at 20 deg.C
h)	Direction of lay of outer layer	Right hand

08.08.00 CABLE RACKS INCLUDING SUPPORTS, TRAYS AND ACCESSORIES:

Cable Support Structures & Accessories :

08.08.01 The Contractor shall fabricate and install mounting arrangements for the support and installation of all the cables on GI angles / Cable tray supports in the trenches/ above ground.. These mounting shall be fabricated from structural steel members (channels, angles and flats) of the required size. The fabrication, welding and erection of these structures shall conform to the relevant clauses of Part-C0.

08.08.02 Un galvanised M.S. Cable supports shall be painted after installation. The painting shall be in conformity with stipulated in Chapter-C0. All welding works inclusive of the consumables required for fabrication and installation shall be in the scope of the Contractor.

08.09.00 Cable Trays :

08.09.01 Hot dip galvanised ladder type cable trays of adequate width are to be provided for cables in the control room building, out door, above ground cable tray arrangement

08.09.02 Aux. power cables are to be laid on the top tray and DC control cables in bottom trays. Cable trays shall be designed to carry cables load without bending and proper tray supports shall be provided at every 1 mt interval.

08.09.03 Cable trays having power and control cable are spaced at 300 mm and between control cable trays, the spacing is 225 mm. For tray lengths more than 2.5 m coupler plates are to be used for joining the two standard tray lengths. Suitable 'L' and 'T' bends are included under the scope of this contract.

08.09.04 Cable trays shall be made of 2 mm thick sheet steel having a slotted rung spacing of 250 mm. Height of cable tray channel shall be 75 mm and the standard length of trays shall be 2.5 m.

08.09.05 All nuts, bolts, washers etc. to be supplied by the Contractor shall be hot dip galvanised after fabrication.

08.09.06 The Contractor shall perform all tests and inspection to ensure that material and workmanship are according to the relevant standards

For Detailed specification Refer Chapter B-10 (cabling , earthing, lighting) of Part-B, Section-VI.

08.10.00 **BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS, AND DISC INSULATORS:**

08.10.01 Bushings shall be manufactured and tested in accordance with IS:2099 & IEC:60137 while hollow column insulators shall be manufactured and tested in accordance with IEC 62155/. The support insulators shall be manufactured and tested as per IS:2544 / IEC 60168/IEC 60273. The insulators shall also conform to IEC 60815 as applicable having alternate long and short sheds.
Support insulators/ bushings/ hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

08.11.00 **CABINETS, BOXES, KIOSKS, PANELS, ETC.**

08.11.01 All types of control cabinets, junction boxes, marshaling boxes, lighting panels, terminal boxes, operating mechanism boxes, Kiosks etc. shall generally conform to IS:5039, IS:8623 and IEC: 60439 as applicable. They shall meet all other requirements specified elsewhere in the specification.

08.11.02 Suitable 240V, single phase, 50Hz ac heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10deg. above the ambient.

08.12.00 **BAY MARSHALLING BOX**

08.12.01 Bay Marshaling Box located at a convenient location to receive and distribute cables shall be provided as required. It shall meet all the requirements as specified for cabinets/boxes.

08.12.02 It shall have three separate distinct compartments for following purposes:

- To receive two incoming 415V, three phase, AC supplies controlled by 100A four pole MCBs with auto changeover provision, and to distribute five (5) three phase ac supplies controlled by 32A four pole MCBs. It shall also be provided with 63A, 3 phase 4 pin industrial grade receptacle with rotary switch.
- To receive three phase incoming from first compartment and to distribute ten (10) single phase ac supplies controlled by 16A two pole MCBs.
- 150 nos. terminal blocks in vertical formation for interlocking facility.

08.13.00 **TERMINAL BLOCKS:**

08.13.01 They shall be non-disconnecting stud type of extensible design equivalent to Elmex type CAT-M4.

08.13.02 The terminal blocks shall be of 850 V grade, and rated to continuously carry maximum expected current. The conducting part shall be tinned or silver plated.

08.13.03 Unless otherwise required (expected current rating) or specified, terminal blocks shall be suitable for connecting the following conductors on each side:

a) All CT & VT circuits - Min. four 2.5 sq.mm. copper flexible conductor
b) AC & DC power supply -Two 16 sq.mm. aluminium conductor.
c) Circuits Other control circuits - Min. two 2.5 sq.mm. copper flexible conductor.

08.14.00 Wiring:

All wiring shall be carried out with 1100 V grade stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows: a) All circuits except CT circuits 2.5 sq.mm b) CT circuits 4 sq. mm (minimum number of strands shall be 3 per conductor).

08.15.00 CABLE GLANDS AND LUGS :

08.15.01 Cable glands shall be Double compression type, tinned/Nicked plated (coating thickness not less than 20 microns in case of tin and 10 to 15 microns in case of nickel) brass cable glands for all power and control cables. They shall provide dust and weather proof terminations. They shall comprise of heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components. used in cable glands shall be neoprene and off tested quality. Required number of packing glands to close unused openings in gland plates shall also be provided.

08.15.02 The cable glands shall be tested as per BS:6121. The cable glands shall also be duly tested for dust proof and weather proof termination.

08.15.03 Cables lugs shall be tinned copper solder less crimping type conforming to IS:8309 and 8394 suitable for aluminum or copper conductor (as applicable). The cable lugs shall suit the type of terminals provided. The cable lugs shall be of Dowell make or equivalent.

08.16.00 CONDUITS, PIPES AND ACCESSORIES

08.16.01 The Contractor shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes, etc. including all necessary sundry materials, such as tees, elbows, check nuts, bushing reduces, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes, etc

08.16.02 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate conversion coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/ pipes shall be of a reputed make

08.16.03 Flexible conduits shall be heat-resistant lead coated steel, water-leak, fire and rust proof, and be of PLICA make or equivalent.

08.17.00 Specification of AC bay kiosk shall be as per Annexure-I to this chapter if applicable .

08.18.00 **Type tests**

All equipment with their terminal connectors, control cabinets, main protective relays, etc. as well as insulators, insulator strings with hardwares, clamps and connectors, marshalling boxes, etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with the requirements stipulated under respective equipment sections.

ANNEXURE-I

Specification for Bay Kiosk:

1. Construction:

The Bay Kiosk (7mX3.5mX3m) shall be made of "sandwich insulated panels" 80 mm thick with polyUrethane Foam (PUF) as filler material between polyester pre-coated cold rolled Steel. The insulation characteristics of PUF material shall conform to following requirement

Sl. No.	Particular	Parameters
1.	Thickness	78.6 mm
2.	Density	40 kg/m3
3.	Compressive Strength	1.2 kg.cm3
4.	Tensile Strength	3.6 kg/m2
5.	Bending Strength	4.0 Kg/m2
6	Adhesion Strength	2.9 Kg/m2
7.	Dimension Stability	At -25° C : 0.1% and at 38°C : 0.4%
8.	Temperature Range	-15°C to 95°C
9.	Thermal Conductivity	0.02 kcal/hr/m/oC
10.	Fire Resistance	As per BS-4735 Horizontal Burn <125 mm
11.	Water absorption	0.2% @ 100% RH
12.	Vapour Permeability	0.08/0.12 g/hr/m2
13.	Self Extinguishing	Yes

The thickness of the inner-side and outer steel sheet except floor panel sheet shall be minimum 0.8 mm and 0.6 mm respectively. The outer bottom sheet shall be hot dip galvanised steel sheets of minimum 1.0 mm thickness to avoid rusting at bottom. The sandwich panels shall be manufactured by high pressure injection techniques. The floor of the kiosk shall be suitably designed for accommodating the control and relay IEDs in the panels. The kiosk shall be provided with min, two 3Ton AC (One Main and One Stand by).The adequate lighting shall be provided in the kiosk. The Kiosk shall have adequate space for working and maintain Clearances as per requirement of Indian Electricity Rules. The kiosk shall be provided with locking arrangement. The Kiosks shall have IP-55 degree of protection. The cable entries in the Kiosk shall be provided only from the side of the Kiosk. It shall be possible to lay additional cables in future for the panels without disturbing the existing facilities.

2. Air-Conditioning:

The air conditionings system shall be provided in the Kiosks to be used for housing panels having control and protection IEDs for performing sub-station automation and protection functions. generally comply with relevant IS codes–. These kiosks shall be placed in the switchyard area generally unmanned; therefore, the air-conditioning system shall be rugged, reliable, maintenance free and designed for long life.

i. Operation:

The air conditioning is required for critical application i.e. for maintaining the temperature for critical sub-station control and protection equipment. To provide redundancy for such critical applications, each kiosk shall be installed with environment control system comprising of two units of air conditioners working in conjunction through a micro processor based controller for desired operation. The system shall be designed for 24 Hours, 365 Days of the year to maintain the inside kiosk temperature for proper operation of the critical equipment. One of the air-conditioner shall be running at a time and on failure of the same or as described

hereunder, the other unit shall start automatically. To ensure longer life of the system, the redundant units shall also be running in cyclic operation through the controller. However, during running of one air-conditioner unit, if inside temperature of the shelter reaches to a predefined (i.e. 35ºC), the other unit shall start running to maintain the temperature to specified value (i.e.23+2ºC) and gives alarm for such situation. After achieving this temperature, the other unit shall again shut off.

ii. Sequence of Operation of the Unit:

Suitable arrangement shall be made to operate the unit in the following order. However, the actual operation arrangement shall be finalised during detailed engineering.

1. Evaporator Fan
2. Condenser Fan
3. Compressor

iii. Construction:

The air conditioning unit shall be completely self-contained. All components of the units shall be enclosed in a powder coated cabinet and colour of same shall be matched with kiosk colour. The unit shall be assembled, wired, piped, charged with refrigerant and fully factory tested as a system to ensure trouble free installation and start up. Suitable isolation or other by passing arrangement shall be provided such that any unit/component could be maintained/ repaired without affecting the running standby unit. The maintenance of unit shall be possible from outside the kiosk.

iv. Required Features of Various Components:

The compressor shall be very reliable, trouble free and long life i.e. hermitically sealed Scroll type of reputed make suitable for operation. Compressor should be installed on vibration isolated mountings or manufacturer's recommended approved mounting. Valve shall be provided for charging/topping up of refrigerant. The bidder shall furnish details of their compressor indicating the MTBF, life of compressor and continuous run time of compressor without failure. The contractor shall also furnish details of all accessories i.e. refrigeration system, evaporator coil, condenser coil, evaporator blower filter, cabinet, indoor supply and return grill etc.

v. The kiosk shall be erected at least 300 mm above the finished ground level with suitable pedestal to avoid any entry of water.

3. Proto Testing:

One kiosk meeting the specified requirement as described above, shall be fabricated at the factory and offered for proto inspection at the factory. This proto shall be equipped with all required accessories like air-conditioning system, fire and smoke detector, lighting, various cut outs etc. The offered kiosk shall be inspected for finish, all fittings and accessories, opening including doors and locks. The kiosk shall be tested for dust and rain protection to check out any leakage and air tightness. The following main tests shall be carried out:

(a) Illumination inside the kiosk shall be switched off and it shall be checked that no light enters through panel joints, holes and other joints in the kiosk.

(b) Water Leakage Test (with a water pipe with suitable pressure from all sides for one hour.)

(c) Working and functional tests of all accessories like air-conditioning system, fire and smoke detector, lighting arrangements as per technical specification

(d) Start up test for air conditioner

(e) Satisfactory operation of air conditioner installed on Kiosk.

(f) The total heat load for panels and devices to be placed inside the kiosk including PLCC, all IEDs etc. shall be calculated and equivalent calculated heating load (maximum value from among the calculated values for various kiosk) shall be placed inside the kiosk and the kiosk shall be made operational for four hours with all accessories and inside & outside temperature of kiosk shall be recorded.

On successful completion of proto testing, all other system shall be manufactured after incorporation of all alteration/modifications observed/suggested during/after proto testing.

The detail test procedure shall be submitted by the contractor and get it approved from the owner before commencement of proto testing.

09.00.00 INSTALLATION

09.01.00 **EARTHING:** The earthing shall be done in accordance with requirements given in **Annexure-II** of this section and drawing enclosed with the specifications. Earthing of panels shall be done in line with the requirements given in respective equipment section of this specification.

09.02.00 **CIVIL WORKS :**The civil works shall be done in accordance with requirements stipulated elsewhere in the specification.

090.03.00 **STRUCTURAL STEEL WORKS :**The structural steel works shall be done in accordance with requirements stipulated elsewhere in the specification.

09.04.00 BAY EQUIPMENT

09.04.01 The disposition of equipment to be supplied are shown in enclosed single line diagrams and layout drawings.

09.04.02 The Contractor shall prepare layout drawings and submit the same for approval of the Employer. The approval of drg. shall not absolve Contractor from his responsibility regarding designing & engineering of switchyard and Contractor shall be fully responsible for all works covered in the scope of this specification.

09.05.00 **LIGHTNING PROTECTION**

09.05.01 Direct stroke lightning protection (DSLP) shall be provided in the switchyard by lightning masts (at least 50 m high) and shield wires.

09.05.02 Lightning protection System down conductors shall not be connected to other conductors above ground level. Also no intermediate earthing connection shall be made to Surge arrester, Voltage Transformer, earthing leads for which shall be directly connected to rod electrode. Every down conductor shall be provided with a test joint at about 150mm above ground level. The test joint shall be directly connected to the earthing system. The lightning protection system shall not be in direct contact with underground metallic service ducts and cables.

09.06.00 **EQUIPMENT ERECTION NOTES**

a) All support insulators, circuit breaker interrupters and other fragile equipment shall be handled with cranes with suitable booms and handling capacity. The contractor shall strictly follow manufacturer's recommendations for handling and erection of equipment.

b) The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc. Handling equipment, sling ropes etc. should be tested before erection and periodically thereafter for strength.

c) Bending of piping should be done by a bending machine and through cold bending only. Bending shall be such that inner diameter of pipe is not reduced. The pipes shall be thoroughly cleaned before installation.

09.07.00 STORAGE OF EQUIPMENT: Contractor is responsible for the proper storage and maintenance of all materials/equipment entrusted to him. The Contractor shall provide & construct adequate storage shed for proper storage of equipment. Sensitive equipment shall be stored indoors. All equipment during storage shall be protected against damage due to acts of nature or accidents. Contractor shall take all required steps to carryout subsequent inspection of materials/equipment stored as well as erected until the same is taken over by the Employer. The storage instruction of the equipment manufacturers/Engineer-in-Charge shall be strictly adhered to.

09.08.00 **CABLING**

09.08.01 Cabling shall be on cable racks, in trenches, vertical shafts, excavated trenches for direct burial, pulled through pipes and conduits run clamped on steel structures etc. in accordance with the requirements specified elsewhere in the specification.

09.08.02 Cables inside the switchyard shall be laid on bolted GI angle supports/ cable trays at 600mm spacing with separate tiers for control and power cables. The GI angles shall be bolted / welded to galvanized insert plates inside RCC trenches.

09.08.03 Cabling in the control room shall be done on ladder type cable trays with supports at an interval of 2000mm.All interpole cables (both power & control circuit) for equipments shall be laid in cable trenches/G.I. Conduit Pipe of NB 50/100mm which shall be buried in the ground at a depth of 300mm.

09.09.00 CONDUITS, PIPES AND ACCESSORIES :The conductor shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes etc. including all necessary sundry materials, such as tees, elbows, check nuts, bushings, reducers, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes etc. The size of the conduit/pipe shall be selected on the basis of maximum 40% fill criterion. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed in an approved manner, to prevent damage to threaded portion and entrance of moisture and foreign material.

09.09.02 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/pipes shall be of a reputed make.

09.09.03. The hume pipes and accessories shall be of reinforced concrete conforming to class NP2 of IS: 458. All tests on hume pipes shall be conducted as per IS: 458.

09.09.04 Flexible conduits shall be of heat-resistant lead coated steel, water-leak, fire and rust proof and be of PLICA make or equivalent.

09.10.00 **JUNCTION BOXES:**

Contractor shall supply and install junction boxes complete with terminals as required. The brackets, bolts, nuts and screws required for the erection shall be included in the installation price.

09.11.00 CABLE SUPPORTS AND CABLE TRAY MOUNTING ARRANGEMENTS :-

09.11.01 Cable trays in the control room are normally provided with embedded steel inserts on concrete floors/walls. The Contractor shall secure supports by welding to these inserts or available building steel structures.

09.11.02 However, in cases where no such embedded steel inserts are available, the Contractor shall have to secure the supports on wall or floors by suitable anchoring at no extra cost to the Employer. Details of fixing steel plates by anchor fasteners shall be decided during detailed engineering stage. The provision of fixing arrangement including supply of necessary angles etc. shall be included in the installation rates quoted by bidder.

09.11.03 The cable supports shall conform to the requirements as mentioned in some where in the Specification.

09.11.04 Insert plates will be provided at an interval of 600mm wherever cables are to be supported without the use of cable trays, while at all other places these will be at an interval of 2000mm.

For Detailed specification Refer Chapter B-10 (cabling , earthing, lighting) of Part-B, Section-VI.

ANNEXURE-II

09.11.05 a) EARTHING NOTES FOR SWITCHYARD

GENERAL

i) Earthing of operating boxes, cubicles shall be done by 50 X 6 mm GS flat while cable trenches and structure by 75 X 12 mm GS flat. Neutral points of systems of different voltages, metallic enclosures and frame works associated with all current carrying equipments and extraneous metal works associated with electric system shall be connected to a single earthing system unless stipulated otherwise.i. Earthing system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, relevant Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.

b) DETAILS OF EARTHING SYSTEM

Item	**Size**	**Material**
Main Earthing conductor	40mm dia rod	Mild steel
Conductor above ground & earthing leads	75 x 12 G.S. Flat 50 x 6	Galvanized steel Galvanised steel

(for equipment)

Rod Electrode	:40mm dia, 3000mm	Mild steel
G.I. Earth wire	:7/8 SWG	GI
Copper Flat (if required)	as per requirement	

c) For Step and Touch Potential the following parameters shall be considered
   i) Current distribution factor – 1 (one)
   ii) Duration of fault current – 0.5 sec
   iii) Human body weight – 50kg

d) Grid resistance shall be less than 1(one) ohm.

f) **EARTHING CONDUCTOR LAYOUT**

i. Earthing conductors in outdoor areas shall be buried at least 600mm below finished grade level unless stated otherwise.

ii. Minimum 6000mm or higher spacing between rod electrodes shall be provided based on the earth mat design calculations.

iii. Wherever earthing conductors cross cable trenches, underground service ducts, pipes, tunnels, railway tracks etc., it shall be laid at least 300mm below them and shall be re-routed in case it fouls with equipment/structure foundations.

iv. Earthing conductor along their run-on cable trench ladder columns, beams, walls, etc. shall be supported by suitable welding/cleating at intervals of 750mm. Wherever it passes through walls, floors etc. galvanized iron sleeves shall be provided for the passage of the conductor. Both ends of the sleeves shall be sealed to prevent the passage of water through the sleeves.

v. Earthing conductor around the building shall be buried in earth at a minimum distance of 1500mm from the outer boundary of the building. In case high temperature is encountered at some location, the earthing conductor shall be laid minimum 1500mm away from such location.

vi. In outdoor areas, tap connections shall be brought 300mm above ground level for making connections in future in case equipment is not available at the time of grid installations.

vii. Earthing conductors crossing the road shall be either installed in Hume pipes or laid at greater depth to suit the site conditions.

viii. Earthing conductors embedded in the concrete fibre shall have approximately 50mm concrete cover.

ix. Contractor shall also provide interconnection (two interconnection per Unit) of Switchyard Earth mat with the Plant earth mat.

g) **EQUIPMENT AND STRUCTURE EARTHING**

i. The connection between earthing pads and the earthing grid shall be made by short and direct earthing leads free from kinks and splices.

ii. Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval

iii. Metallic conduits shall not be used as earth continuity conductor.

iv. A separate earthing conductor shall be provided for earthing lighting fixtures, lighting poles, receptacles, switches, junction boxes, lighting conduits, etc.

v. Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam, conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.

vi. Cable and cable boxes/glands, lockout switches etc. shall be connected to the earthing conductor running along with the supply cable which, in turn, shall be connected to earthing grid conductor at minimum two points, whether specifically shown or not.

vii. Railway tracks within switchyard area shall be bonded across fish plates and connected to earthing grid at several locations.

viii. Earthing conductor shall be buried 2000mm outside the switchyard fence. Every post of the fence and gates shall be connected to earthing loop by one lead.

ix. Flexible earthing connectors shall be provided where flexible conduits are connected to rigid conduits to ensure continuity.

h) **JOINTING: shall be as per enclosed drawing equipment earthing standard drawing details shown in this specification.**

i) **POWER CABLE EARTHING:**

Metallic sheaths and armour of all multi core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.

j) **SPECIFIC REQUIREMENT FOR EARTHING SYSTEMS**

i. Earthing terminal of each surge arrester, capacitor voltage transformer and lightning down conductors shall be directly connected to rod electrode which in turn, shall be connected to station earthing grid.

ii. Auxilliary earthing mat of 1500mm X 1500mm size comprising of closely spaced conductors at (300mm x 300mm) spacing and at 300mm below ground shall be provided below the operating handles of the isolators. Operating handle shall be directly connected to earthing mat.

k) **SPECIFIC REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEM**

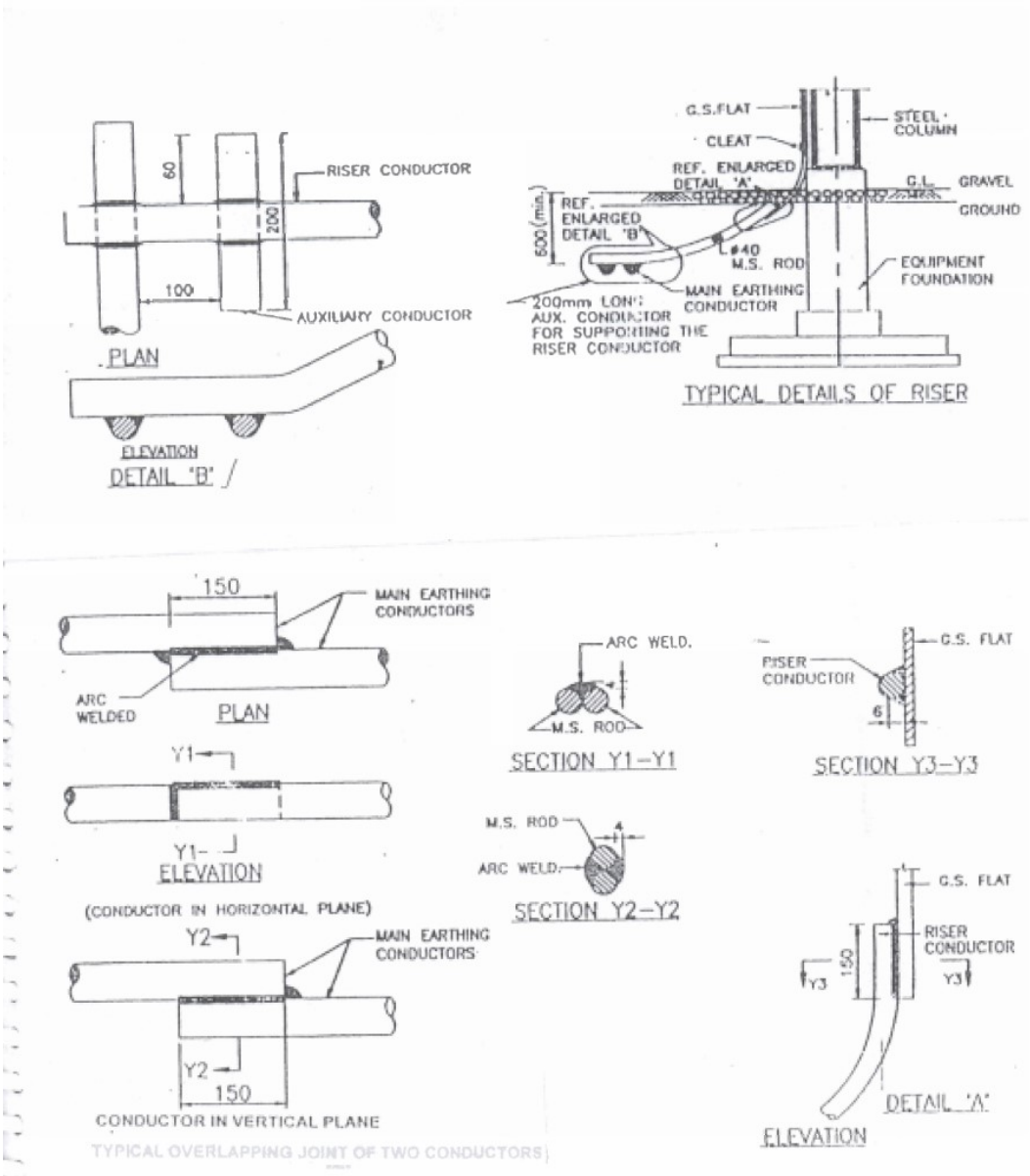
i. Conductors of the lightning protection system shall not be connected with the conductors of the safety earthing system above ground level.

ii. Down conductors shall be cleated on the structures at 2000mm interval.

iii. Connection between each down conductor and rod electrodes shall be made via test joint located approximately 150mm above ground level.

iv. Lightning conductors shall not pass through or run inside G.I. conduits.

v. Lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.



NOTE : WELDING OF EARTHING CONDUCTOR SHALL BE CONDUCTED IN VERTICAL PLANE WHEREVER POSSIBLE

EQUIPMENT EARTHING DETAILS

STANDARD DRAWING

10.00.00 SITE TESTING AND COMMISSIONING

10.01.00 **INTRODUCTION**

An indicative list of tests for AIS and as applicable is given below. Contractor shall perform any additional test based on specialties of the items as per the field QP/ instructions of the equipment supplier or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall get the list of instruments approved from the Employer.

10.02.00 **GENERAL CHECKS**

a) Check for physical damage.
b) Visual examination of zinc coating/ plating
c) Check from name plate that all items are as per older/ specification.
d) check tightness of all bolts, clamps and connecting terminals using toque wrenches.
e) For oil filled equipment check for oil leakage, if any. Also check oil level and top up.
f) Check ground connections for quality of weld and application of zinc rich paint over weld joint of galvanized surfaces.
g) Check cleanliness of insulator and bushings.
h) All checks and tests specified by the manufactures in their drawings and manuals as well as all tests specified in the relevant code of erection.
i) Check for surface finish of grading rings (corona control ring.)
j) Pressure test on all pneumatic lines at 1.5 times the rated pressure shall be conducted.

10.03.00 **CIRCUIT BREAKERS**

a) Insulation resistance of each pole.
b) Check adjustments, if any, suggested by manufacturer.
c) Breaker closing and tripping time.
d) Slow and power closing operation and opening
e) Trip free and anti-pumping operation.
f) Minimum pick-up volts of coils
g) Contact resistance
h) Functional checking of compressed air plant and all accessories
i) Functional checking of control circuits, interlocks, tripping through protective relays and auto-reclose operation.
j) Insulation resistance of control circuits, motor etc.
k) Resistance of closing and tripping coils.

10.04.00 **ISOLATORS**

a) Insulation resistance of each pole
b) Manual and electrical operation on interlocks
c) Insulation resistance of control circuits and motors.
d) Ground connections
e) Contact resistance
f) Proper alignment to minimise the vibration to the extreme possible during operation.
g) Measurement of operating torque for isolator and Earth switch
h) Resistance of operating and interlocking coils.

10.05.00 **CURRENT TRANSFORMERS**

a) Insulation Resistance Test
b) Polarity test.
c)Ratio identification test-checking of all ratios on all cores by primary injection of current.
d) Dielectric test of oil (wherever applicable).
e) Magnetizing characteristics test.
f) Capacitance and tan delta measurement at minimum 10kV.

10.06.00 **VOLTAGE TRANSFORMERS/CAPACITOR VOLTAGE TRANSFOREMER**

a) Insulation resistance test.
b) Polarity test.
c) Ratio test.
d) Dielectric test of oil (if applicable).
e) Capacitance and tan delta measurement at minimum 10kV.

10.07.00 **SURGE ARRESTER**

a) Grading leakage current.
b) Resistance of ground connection.
c) Resistive current drawn at rated voltage after energisation.

10.08.00 **PHASING OUT**

The phasing out of all supplies in the station system shall be carried out.

10.09.00 **STATION EARTHING**

a) Check soil resistivity
b) Check continuity of grid wires
c) Check earth resistance of the entire grid as well as various sections of the same.
d) Check for weld joint and application of zinc rich paint on galvanised surface.
e) Dip test on earth conductor prior to use.

10.10.00 **CONDUCTOR STRINGING AND POWER CONNECTORS**

a) Physical check for finish
b) Electrical clearance check
c) Testing of torque by torque-by-torque wrenches on all bus power connectors and other accessories.
d) Sag and tension check on conductors.

10.11.00 **INSULATORS**

Visual examination for finish damage, creepage distance, etc.

10.12.00 **WAVE TRAP**

a) Insulation resistance Test
b) Visual check

11.00.00	**400KV TRANSMISSION LINES – GENERAL**
11.01.00	**SCOPE AND GENERAL INFORMATION** In addition to the project information and scope of work given in Part-A, of this specification, the following is the scope of work for overhead Transmission line work:
11.01.02	This specification covers detailed survey, tower spotting, optimization of tower location, soil resistivity measurements and geo-technical investigation, tower design, fabrication and supply of all types of transmission line towers including tower which are already designed and tested for equal or higher loads as specified in this specification, bolts, nuts and washers, hanger, D-shackle and all type of tower accessories like phase plate, number plate, danger plate, anti-climbing device, etc.; foundation design, selecting type of foundation for different towers and casting of foundation for towers and erection of towers, tack welding of bolts and nuts along with subsequent application of zinc coating on the welded portion, supply and application of zinc rich paint, tower earthing, fixing of insulator string, stringing of conductors and earth wires along with all necessary line accessories and testing and commissioning of the erected transmission lines. Further for type tested towers bidder shall furnish design calculation for transmission line tower structures along with foundation design and drawing meeting the requirements of this technical specification.
11.01.03	This specification includes the design and supply of insulator and their hardware conductor, OPGW and earthwire, earthwire suspension and tension clamps and all the other lien accessories to be incorporated in the towers during erection and stringing.
11.01.04	All the raw materials such as steel, zinc for galvanising, reinforcement steel and cement for foundation, coke and salt for earthing, bird guards, anti climbing devices, bolts, nuts, washers, D-shackles, hangers, links, danger plates, phase plate, number plate etc. required for tower manufacture and erection shall be included in the scope of supply.
11.01.05	The entire stringing work of conductor and earthwire shall be carried out as per standard stringing practice.
11.01.06	The Contractor shall carry out the detailed survey and shall submit report/results for employer approval. No other details except those included in tender documents shall be furnished by the Owner. Also no topographical maps shall be furnished by Owner. However, Owner's assistance may be given in obtaining these maps from Survey of India.
11.01.07	The tree-cutting shall be responsibility of the Contractor. The Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut. Contractor may note that Owner shall not pay any compensation for any loss or damage to the properties or for tree cutting due to Contractor's work.

11.02.00 ROUTE AND TERRAIN

11.02.01 Right of way and way leave clearance shall be arranged by the Owner.

To evaluate and tabulate the trees and bushes coming within 26 meters on either side of the central line alignment, the trees will be numbered and marked with quality paint serially from angle point 1 onwards and the corresponding number will be painted on the stem of trees at a height of one meter from ground level. The trees list should contain the following:

a) Girth (circumference) measured at a height of 1 meter from ground level.
b) Approximate height of the tree with an accuracy of + 2 meters.
c) Name of the type of the species/tree.
d) The bushy and under growth encountered in the 1.5 meters belt should also be evaluated with its type, height, girth and area in square meters, clearly indicating the growth in the tree/bush statement.

11.02.02 Payment of compensation towards the clearances, etc. will be the responsibility of the Owner.

11.03.00 DETAILED SURVEY

11.03.01 The detailed survey shall be carried out along the Transmission Line alignment by successful bidder/contractor. The report shall be in line with CBIP-Manual-Transmission line -323 guidelines.

11.03.02 **Route Marking**

At the starting point of the commencement of route survey, an angle iron spike of 65 x 65 x 6 mm section and 1000 mm long shall be driven firmly into the ground to project only 150 mm above the ground level. A punch mark on the top section of the angle iron shall be made to indicate location of the survey instrument. Teak wood peg 50 x 50 x 650 mm size shall be driven at prominent position at intervals of not more than 750 meter along the transmission line to be surveyed upto the next angle point. Nails of 100 mm length should be fixed on the top of these pegs to show the location of instrument. The pegs shall be driven firmly into the ground to project 100 mm only above ground level. At angle position stone/concrete pillar with “NTPC” marked on them shall be put firmly on the ground for easy identification.

11.03.03 Profile Plotting & Tower Spotting

From the field book entries the route plan with route details and level profile shall be plotted and prepared as per approved procedure. Reference levels at every 20 meters along the profile are also to be indicated on the profile besides R/Ls at undulations. Areas along the profile, which in the view of the Contractor are not suitable for tower spotting, shall also be clearly marked on the profile plots. If the

difference in levels is too high, the chart may be broken up according to requirement. A 10mm overlap shall be shown on each following sheet. The chart shall progress from left to right. Sheet shall be in accordance with the IS Standard. For `as built' profile these shall be A1 size.

11.03.04 Sag Template

Necessary data in respect of conductor, earthwire and insulator have been given in the specifications. On the basis of these, the Contractor shall prepare the sag template drawing and tower spotting data and submit the same alongwith sag tension calculations for the approval of the Owner. Sag template prepared based on the approved sag-template curve drawing shall only be used for tower spotting on the profiles. Two numbers of the approved template, prepared on rigid transparent plastic sheets, shall be provided by the Contractor to the Owner for the purpose of checking the tower spotting. The templates shall be on the same scale as that of the profile.

11.03.05 Tower Spotting

With the help of approved sag template and tower spotting data, tower locations shall be marked on the profiles. While locating the towers on the profile sheet, the following shall be borne in mind:

a) Span

The number of consecutive spans between the section points shall not exceed 15 spans Section point shall comprise of tension point with B type, C type or D Type towers as applicable. For all crossing spans such as major road crossings, railway crossings, power line crossings etc. the span shall not exceed 80% of design span.

b) Extension

An individual span shall be as near to the normal design span as far as possible. In case an individual span becomes too short with normal supports on account of undulations in ground profile, one or both the0 supports of the span may be extended by inserting standard body extension designed for the purpose according to technical specification.

c) Road Crossing

At all important road crossings, the towers shall be fitted with double tension insulator strings depending on the type of towers but the ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken in adjacent span, ground clearance of the conductor from the road surfaces shall be in line with IE rules. At all national highway crossings, tensions towers shall be used.

d) Railways Crossings

i)At the time of detail survey all the railway crossings coming enroute the transmission line shall be finalised as per the regulation laid down by the Railway Authorities. The following are the important features of the prevailing regulations (revised in 1987):

ii)The crossing shall be supported on D type tower on either side of railway line with double tension insulator strings.

iii)The crossing shall normally be at right angle to the railway track.

iv)The crossing span shall be limited to 80% of design span.

v)The minimum distance of the crossing tower shall be at least equal to the height of the tower plus 6 meters away measured from the centre of the nearest railway track.

vi)No crossing shall be located over a booster transformer, traction switching station, traction sub-station or a track cabin location in an electrified area.

vii)Minimum ground clearance above rail level of the lowest portion of any conductor under condition of maximum sag shall be maintained as per IE rules.

viii)The approval for crossing railway track shall be obtained by the Owner from the Railway Authority. However, six copies of profile and plan, tower and foundation design and drawings, required for the approval from the Railway Authority shall supplied by the Contractor to the Owner.

e) River Crossings

In case of major river crossing, towers shall be of suspension type and the anchor towers on either side of the main river crossing shall be C type tower. Clearance required by navigation authority shall be provided. For non navigable river, clearance shall be reckoned with respect to highest flood level (HFL).

f) Power Line Crossing

Where this line is to cross over another line of the same voltage or lower voltage, towers with suitable extension shall be used. Provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the Indian Electricity Rules, 1956. The Contractor may be required to under-cross higher voltage lines by erecting gantry structures.

g) Telecommunication Line Crossing

The angle of crossing shall be as near 90 degree as possible. However, deviation to the extent of 30 degree may be permitted under exceptionally difficult situations. When the angle of crossing has to be below 60 degree, the matter will be referred to the authority incharge of the telecommunication system. On a request from the Contractor, the permission of the telecommunication authority may be obtained by the Owner. Also, in the crossing span power line support will be as near the

telecommunication line as possible, to obtain increased vertical clearance between the wires.

h) Details Enroute

All topographical details, permanent features, such as trees, building etc. 13.5m on either side of the alignment shall be detailed on the profile plan.

i) Ash Pipe Line (If applicable)

Adequate clearances shall be maintained from ash pipe line and adjacent road.

11.03.06 Clearance from Ground, Building, Trees, etc.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended upto date.

11.04.00 **PRELIMINARY LINE SCHEDULE**

The profile sheets, duly spotted, alongwith preliminary schedules indicating type of towers, wind span, weight span, angle of deviation, river, power line, railway or road crossing and other details shall be submitted for the approval of the Owner. After approval, the Contractor shall submit six more sets of the approved reports along with two sets in soft copy of final profile drawings to the Owner for record purpose.

11.05.00 CHECK SURVEY OF TOWER LOCATIONS

11.05.01 The detailed survey shall be conducted to locate and peg mark the tower positions on ground conforming to the approved profile and tower schedule. In the process, it is necessary to have the pit centers marked according to the excavation marking charts. The levels, up or down of each pit center with respect to the center of the tower locations shall be noted and recorded for determining the amount of earthwork required to meet the approved design parameters.

11.05.02 Changes, if required, after detailed survey in the preliminary tower schedule shall be carried out by the Contractor and he shall thereafter submit a final tower schedule for the approval of Owner. The tower schedule shall show position of all towers, type of towers, span length, type of foundation for each tower and the deviation at all angles as set out with other details.

11.06.00 ELECTRICAL SYSTEM DATA

Nominal voltage	400 kV
Maximum system voltage	420kV
Lighting Impulse	1425 kVp
Switching Impulse	1050KVp
Power frequency withstand voltage (wet)	630 kV (rms)

LIST OF STANDARDS

1.	IS:209	Specification for Zinc	ISO/R/752-1968 AST, B6
2.	IS:2062	Structural Steel (Standard Quality)	ISO/R/6F30-1967 CAN/CSA G40.21 BS 4360
3.	IS:269	Ordinary rapid hardening & low heat Portland Cement.	ISO/R/597-1967
4.	IS:278	Specification for barbed wire	ASTM A 121
5.	IS:383	Coarse and fine aggregates from natural sources for concrete.	CSA A 23.1/A 23.2
6.	IS:398	Alum. Condr. galvanised steel reinforced	
7.	IS:406	Methods of Chemical Analysis of Slab Zinc	
8.	IS:432 (Part 1 & 2)	Mild steel and medium tensile bars and hard drawn steel wire for concrete reinforcement	CSA-G-30
9.	IS:456-1978	Code of practice for plan and reinforced concrete	
10.	IS:731-1971	Porcelain Insulators for Overhead Power lines with a Nominal Voltage greater than 1000 volts	BS:137-1973 (I & II) IEC:274-1968 IEC:383-1976
11.	IS:800-1984	Code of practice for use of structural steel in general Building construction	CSA STEAM 16.1
12.	IS:802	Code of practice for use of structural steel in overhead transmission Line. (Load, Permissible stresses. Fabrication, Galvanising, Inspection, and Packing and Testing)	IEC 826 ASCE 52 BS 8100
13.	IS:1139-1966	Hot rolled mild steel medium tensile steel and high yield strength deformed Bars for concrete reinforcement	CAN / CSA G 30 18
14.	IS:1367-1967	Technical supply conditions for threaded fasteners	
15	IS:1489-1991	Portland Pozzolena Cement	ISO/863-1968

16.	IS:1521-1972	Method of Tensile Testing of Steel wire	
17.	IS:1573-1976	Electroplated Coating of Zinc on Iron & Steel	
18.	IS:1778-1980	Reels and Drums of Barewire	
19.	IS:1786-1985	High strength deformed steel bars and wires for concrete reinforcement	
20	IS:1893-1984	Criteria of Earthquake resistant design of structures.	IEEE 693
21.	IS:2016-1967	Plain Washers	ISO/R/887-1968 ANSI B 18.22.1
22.	IS:2070- 1962	Method of impulse voltage testing	
23.	IS:2071	Method of high voltage testing	
24.	IS:2121-1981 Part-I Part-II	Specification for conductors and earthwire Accessories for Overhead Power Lines Armour Rods Mid-span joints & repair sleeves for conductors	
25.	IS:2131-1967	Method of Standard penetration test for soils.	ASTM D 1883
26.	IS:2551-1982	Danger Notice Plates	
27.	IS:2486	Specification for Insulator Fittings for overhead Power Lines with a nominal voltage greater than 1000 volts Part- I General Requirements and Tests Part-II Dimensional Requirements Part-III Locking Devices	 BS:3288-1972 IEC:120-1960 IEC:372-1976
28.	IS:2629-1985	Recommended practice for hot dip galvanising of iron & steel.	ASTM A 123 CAN/CSA G 164
29.	IS:2633-1986	Method of testing uniformity of coating of zinc coated articles.	ASTM A 123 CAN/CSA G 164
30.	IS:3043-1987	Code of Practice for earthing (with amendment No. 1 & 2).	
31.	IS:3063-1994	Single Coil Rectangular Section spring	DIN - 127-1970

		washers for bolts, nuts, screws.	
32.	IS:3138-1966	Hexagonal bolts and nuts	ISO/R 947 and ISO/R 272
33.	IS:3188-1980	Characteristics of string insulator units	IEC:305-1906
34.	IS:4091-1979	Code of practice for design and construction of foundation for transmission line tower and poles.	ASCE / IEEE 691
35.	IS:4218-1976	Metric Screw Threads.	ISO:68-1969 R-26-1963, R-262-1969 R-965-1965
36.	IS:4826-1979	Galvanised coatings on round steel wire	BS:443-1969
37.	IS:5300-1980	Porcelain Guy strain insulators	
38.	IS:5358-1969	Hot dip galvanised coatings on fasteners	ASTM A 153 CAN/CSA G 164
39.	IS:5613 (Part-II) 1985	Code of practice for Design, installation & maintenance of overhead power lines	
40.	IS:6610-1972	Specification for heavy washers for steel structures.	
41.	IS:6639 -1972	Hexagonal bolts for structure	ASTM A 394 CSA B 33.4
42.	IS:6745-1972	Methods for determination of weight of Zinc coated iron and steel articles	ASTM A 90
43	Pub. No. 19 (N)/ 700-1963	Regulation for Electrical Crossing of Railway Tracks.	
44.	IS:7814-1985	Phosphor bronze sheet, strip and foil	BS:2870-1968
45.	IS:8263-1976	Method of Radio Interference tests on high voltage insulators	NEEMA:107 – 1964 CISPR/IEC:437-1973
46.	IS:8269-1976	Method of switching impulse test on high voltage insulators	IEC:506-1975
47.	IS:8500-1991	Specification for weld-able structural steel (Medium and High strength qualities).	BS : 4360

48.	IS:9708-1993	Specifications for Stockbridge Vibration Dampers for overhead power lines	
49.		Thermal mechanical performance test and mechanical performance test on String insulator units	IEC: 575-1974

12.00.00 GENERAL DESCRIPTION OF TOWERS

12.01.01 The towers shall be of self supporting lattice steel type, designed to carry the line conductors with necessary insulators, earth wires and all fittings under all loading conditions.

12.01.02 The tower shall be of a fully galvanised structure, using structural mild steel sections for members. Bolts and nuts with spring washers shall be used for connections.

12.01.03 Bidders can also use high tensile steel and cold formed steel for fabrication of towers provided they furnish the justification for use of such steel with reference to national or international standards. However, the factors of safety, limitation on member length, requirement of fasteners and galvanisation shall be as specified in this specification.

The towers shall be classified as given in Table -1

Table T-1

Type of Tower	Deviation limit (Degrees)	Typical use
A	0 to 2	To be used as tangent/suspension tower
B	0 to 15 0	a) Angle towers/Tension tower with tension insulator string. b) To be used where the towers are subject to uplift loads. c) To be used as section tower
C	15 to 30	a) Angle tower/Tension tower with tension insulator string
		b) To be used where the towers are subject to uplift loads.
		c) To be used as section tower
	NA	d) Complete dead end. (for 33kV line only)
D	30 to 60	a) Angle tower/Tension tower with tension insulator string
		b) To be used where the towers are subject to uplift loads.

		c) To be used as section tower
	0	d) Complete dead end.

NOTE:
1) For double circuit tower types, A, B, C and D shall be prefixed by 'D'.
2) Special type of tower/ higher voltage class towers, wherever required shall also be provided by the bidder under the contract at no extra cost.

12.01.04 **Extension**

The single and double circuit tower shall be designed with 9 M body extension so as to be suitable for adding 3M, 6M and 9M body extension. In case of requirement of higher body extensions, the tower shall be designed for the highest extension required.

For under line crossing of EHV transmission lines the bidder extensions to D type tower or provide tower-gantry arrangement.

12.01.05 **Stub Setting templates.**

Stub templates shall be designed and arranged by the contractor at his own cost for all types of tower with or without extension and also for leg extension. Stub templates for standard towers and tower with extension shall be of adjustable type. The stub templates shall be painted. One set of each type of stub setting template for single and double circuit tower shall be supplied to the Owner, on completion of the project, at no extra cost.

12.02.00 **SPANS AND CLEARANCES**

12.02.01 **Ruling Span**

The normal ruling span of the line shall be 400 meters for 400 KV towers.

12.02.02 **Wind Span**

The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equals to normal ruling span.

12.02.03 **Weight Span**

The weight span is the horizontal distance between lowest point of the conductors on the two spans adjacent to the tower. For design of structures, the span limits given below shall prevail.

Tower type	Normal Condition		Broken Wire Condition	
	Max. (m)	Min. (m)	Max. (m)	Min. (m)
A,	600	-200	360	-100
B, C	600	0	360	-200
D	600	0	360	-300

12.02.04 Electrical Clearance

A) Ground clearance

The minimum ground clearance from the bottom conductor shall be as per IE rules at the maximum sag conditions i.e. at maximum temperature and still air. However, to achieve the above clearance the height of tower shall be increased in the following manner:

a) Allowance of 150 mm shall be provided to account for errors in stringing.

b) Conductor creep shall be compensated by over tensioning the conductor at a temperature lower than the ambient temperature. The creep correction temperature along with calculations shall be furnished by the Contractor.

c) Minimum spacing
The minimum electrical clearance between conductors shall be as per relevant standards.

B) Rail Crossing

In case of rail crossing the min. height above rail level of the lowest portion of any conductor under condition of max. sag, in accordance with the regulations for Electrical Crossing of Railway tracks as prevailing at the time of construction of line shall be applicable.

C) Power Line Crossing

Minimum clearance between power line to power line crossing shall be as per IE rules.

D) Live Metal Clearance

The minimum live metal clearance to the provided between the live parts and steel work of super-structure shall be as per relevant standards.

NOTE:
i) Bidder shall adopt same cross arm design where jumper is projecting outside of cross-arm for `D' type tower to be used as dead end and angle tower.

ii) The design of the tower shall be such that it will satisfy all the conditions when clearances are measured from any live point of the strings.

E) Angle of Shielding

The angle of shielding is defined as the angle formed by the line joining the center lines of the earthwire and outer power conductor, in still air, at tower supports, to the vertical line through the center line of the earthwire. Bidders shall design the tower in such a way that the angle of shielding does not exceed 30 deg for double circuit tower.The drop of the earthwire clamp, which is in the scope of contractor supplied items, should be considered while calculating the minimum angle of protection. For estimating the minimum angle of protection the drop of earth wire suspension clamp alongwith shackle shall be taken as 150mm.

F) Mid Span Clearance

The minimum vertical mid span clearance between the earthwire and the nearest power conductor shall be as per IE/relevant rules, which shall mean the vertical clearance between earthwire and the nearest conductor under all temperatures and still air condition in the normal ruling span. Further, the tensions of the earthwires and power conductors, shall be so co-ordinated that the sag of earthwires shall be at least 10% less than that of power conductors under all temperature loading conditions.

12.03.00 **LOADING CONDITIONS**

12.03.01 **Loads at Conductor And Earthwire Points**

Contractor shall consider the ultimate external loadings at conductor and earthwire points base on IS 802-1, 1995. The Contractor shall develop the tower designs considering these loadings. The towers are to be designed to cater for the following loads:

a) Reliability Loads (Normal condition)
b) Security Loads (Broken wire condition)
c) Safety Loads (Construction & Maintenance loads)

12.03.02 **Suspension towers shall be designed for full wind load under security condition**

Wind Loads on Tower Body

The wind load on tower body shall be calculated by the Contractor as per IS:802, Part-I, 1995.

12.03.03 **Maximum Tension**

Maximum tension shall be based on either of the following (whichever is more stringent):

a) at 0 deg C with 36% full wind pressure., or
b) at 32 deg C with full wind pressure

The value of drag co-efficient (Cd) shall be 1.2 for conductor/earthwire if the diameter of the conductor/earth is 15mm or less.

12.03.04 Sag tension calculation for design purpose shall be calculated considering normal ruling span.

12.03.05 The initial conductor and earthwire tension at 32 degree C and without wind shall be 22% of the ultimate tensile strength of the conductor and 20% of the ultimate tensile strength of the Earthwire.

12.03.06 Limiting Tensions of conductor & Earthwire

The ultimate tension of conductor and ground wire shall not exceed 70 per cent of the ultimate tensile strengths.

12.03.07 **Broken Wire Condition**

The loads for broken wire conditions shall be considered as per clause 16 of IS 802 (Part I/ Sec 1): 1995. The tower type B & C shall be considered as small and medium angle towers whereas tower type D shall be considered as large angle tension tower/ dead end tower.

12.03.08 **Design Loads**

Owner's requirement for most stringent design longitudinal and transverse loads is summarized in Table T1-2.

12.04.00 **DESIGN OF TOWERS**

12.04.01 **Design Criteria**

Towers shall be designed based on spans and clearances, and loading conditions as detailed above.

12.04.02 **Design Temperatures**

The following temperature range for the conductors and ground wires shall be adopted for line design:

a)	Minimum temperature	:	0 deg.C
b)	Everyday temperature of conductor	:	32 deg.C
c)	Max. temperature of Conductor	:	75 deg.C
d)	Max. temperature of Earthwire exposed to sun	:	53 deg.C

12.04.03 **Redundant Design**

All redundants in the towers are to be triangulated. Redundants, having an angle of 15 deg or less with horizontal are to be designed for a concentric vertical ultimate load of 1.5 KN acting at center of the unsupported length. The Contractor has to furnish the calculation for the same. The redundants shall also be designed for 2.5% of max. axial load of connecting members (i.e. leg members, bracing members etc.).

12.04.04 **Steel Sections**

For designing of towers, preferably rationalised steel sections shall be used. During execution of the project, if any particular section is not available same shall be substituted by higher section at no extra cost to Owner and the same shall be borne by the Contractor. However, design approval for such substitution shall be obtained from the Owner before any substitution.

12.04.05 **Thickness of Members**

The minimum thickness of angle sections used in the design of tower, unless otherwise specified elsewhere in this Specification, shall be kept not less than the following values:

a) Main corner leg members including the groundwire peak and main cross arm : 5 mm
b) For all other members : 4 mm

12.04.06 **Bolts & Nuts**

A) The minimum bolt spacing and rolled edge distance and sheared edge distance from the centers of the bolt holes to be maintained are given below:

a)	Diameter of bolts	16 mm
b)	Hole diameter	17.5 mm
c)	Min. bolt spacing	40 mm
d)	Min. rolled distance	20 mm
e)	Min. sheared edge distance	23 mm

B) Bolts sizes mentioned above shall only be used. The minimum width of the flanges without bolt holes shall be 30mm.

C) For the purpose of calculating shearing stress and bearing stress for bolts, IS:802-Part-II-1993 may be referred.

12.04.07 **Slenderness Ratio**

A) Slenderness ratio for members shall be computed in accordance with IS:802, Part-II, 1993. Slenderness ratio for compression and tension members shall not exceed the values specified therein.

B) The following maximum limit of the slenderness ratio i.e. the ratio of unsupported length of the section in any plane to the appropriate radius of gyration will be adopted:

a)	For main corner leg members including the corner members of earthwire peak and the lower corner members of the cross-arms	120
b)	For other members having calculated stresses	200
c)	For redundant members	250
d)	For members having tensile stress only	400

C) The bracing pattern, including that of secondary bracings (redundants) shall be identical on transverse and longitudinal faces of the tower, i.e. staggering of primary and secondary bracings are not permitted. Primary bracings and redundants shall be properly triangulated, i.e. the overall pattern of bracing on tower body and cross arms shall be triangular only.

12.04.08 **Erection Stress**

Where erection stress combined with other permissible co-existent stresses could produce a working stress in any member appreciably above the specified working stress, such other provisions are to be made as may be necessary to bring the working stress within the specified limit.

12.05.00 **TOWER MATERIALS**

12.05.01 **Tower Steel Sections**

IS steel sections of tested quality in conformity with IS: 2062 are to be used in towers, extensions and stub setting templates. No individual member shall be longer than 6000mm. The Bidder can also use most efficient grades of structural steel angle sections and plates conforming to latest international standards. However, the Bidders are permitted to opt for not more than two (2) grades of steel for any particular package.

12.05.02	**Fasteners: Bolts, Nuts and Washers**
A)	All bolts and nuts shall conform to IS: 6639. All bolts and nuts shall be galvanised and shall have hexagonal head and nuts, the heads being forged out of the solid, truly concentric, and square with the shank, which must be perfectly straight.
B)	The bolt shall be of 16 mm dia and of property class 5.6 as specified in IS:1367 (Part-III) 1979 and matching nut of property class as specified in IS:1367 (Part-VI).
C)	Bolts upto M16 and having length upto 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolts for 5.6 grade should be 310 MP a minimum as per IS:12427. Bolts should be provided with washer face in accordance with IS:1363 Part-I to ensure proper bearing.
D)	To ensure uniformity of galvanizing, bolts and nuts should be galvanised by high temperature hot-dip galvanizing.
E)	Nuts should be double chamfered as per the requirement of IS:1363 Part-III. It should be ensured by the manufacturer that nuts should not be overtapped beyond 0.4 MM oversize on effective diameter for size upto M16.
F)	Fully threaded bolts shall not be used. The length of bolts shall be such that the threaded portion will not extend into the place of contact of the members.
G)	All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit firm gripping of the members, but not further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3 mm and not more than 8mm when fully tightened. All nuts shall fit and tight to the point where the shank of the bolt connects to the head.
H)	Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be of steel electro-galvanised, positive lock type and 3.5mm in thickness for 16mm dia.
I)	The Bidder shall furnish bolt schedules giving thickness of members connected, the nut and the washer and the length of shank and the threaded portion bolts and sizes of holes and any other special details of this nature.
J)	To obviate bending stress in bolts or to reduce to minimum, no bolt shall connect aggregate thickness of more than three (3) times its diameter.
K)	The bolt positions is assembled towers shall be as per IS:5613 (Part-II/Section-2).
L)	Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
12.06.00	**Tower Accessories**
12.06.01	**Step Bolts & ladders**

Each tower shall be provided with step bolts of not less than 16mm diameter and 175 mm long, spaced not more than 450mm apart and extending from about 3.5 meters above the ground level to the top of the tower. Step bolt shall be provided with two nuts on one end to fasten the bolt securely to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN. For special structures, where the height of the super structure exceeds 50 meters, ladders along with protection rings shall be provided in continuation of the step bolts on one face of the tower from 30 meters above ground level to the top of the special structure. From 3.5 m to 30 m height of super structure step bolts shall be provided. Suitable railing for access from step bolts to the ladder and from the ladder to each cross arm tip and the groundwire support shall be fixed on tower by using countersunk bolts.

12.06.02 **Insulator Strings and Earthwire Clamps Attachments**

a) For the attachment of suspension insulator string a suitable dimensioned swinging hanger on the tower shall be provided so as to obtain requisite clearance under extreme swinging conditions and free from swinging of the string. The hanger shall be designed to withstand an UTS equivalent to that of insulators. The supply of design & supply of hanger is in the scope of the Contractor.

b) At tension towers strain plates of suitable dimensions on the underside of each cross-arm tip and at the top of earthwire peak, suitable plate should be provided for taking the hooks or D-Shackle of the tension insulator strings or earthwire tension clamps, as the case may be. Full details of the attachments shall be submitted by the bidder for Owner's approval before starting the mass fabrication.

12.06.03 Earthwire peaks/crossarms are to be suitably designed to accommodate the shackle of the suspension clamp/tension clamps.

12.06.04 **Anti-climbing Device**

Barbed wire type anti-climbing device shall be provided and installed by the Contractor for all towers. The height of the anti-climbing device should be provided approximately 3m above ground level. The barbed wire shall conform to IS-278-1978. The barbed wires shall be given chromating dip as per procedure laid down in IS:1340-1959.

12.06.05 Danger plate, Number plates, Circuit Plate, Phase plate & Bird Guards.

Danger, Number Plates, Phase Plates & Bird Guards shall be provided and installed by the Contractor:

a) Each tower shall be fitted with a number plate, and danger plate. Each tension tower shall be provided with a set of phase plates also. The arrangement for fixing these accessories shall not be more than 4.5m above the ground level.
b) The letters, figures and the conventional skull and bones of data plates shall conform to IS:2551-1963 and shall be in a single red on the front of the plate.
c) The corners of the number and danger plate shall be rounded off to remove sharp edges.
d) To prevent birds from perching immediately above the suspension insulator strings and thus fouling it with droppings suitable birdguards shall be provided at cross arm tips of all suspension towers. The arrangement shall conform to IS:5613 part-2/Sec.I.

12.07.00 **TOWER FABRICATION**

12.07.01	Except where hereinafter modified, details of fabrication shall conform to IS:802 (Part-II) or the relevant international standards.
12.07.02	Butt splices shall be used and the inside Angle and outside plate shall be designed to transmit the load and inside cleat angle, shall not be less than half the thickness of the heavier member connected plus 2mm. Lap splice may be used for connecting members of unequal size and the inside angle of lap splice shall be rounded at the heel to fit the fillet of the outside angle. All splices shall develop full stress in the member connected through bolts. Butt as well as lap splice shall be made as above and as close to the main panel point as possible.
12.07.03	Joints shall be so designed as to avoid eccentricity as far as possible. The use of gusset plates for joining tower members shall be avoided as far as possible. However, where the connections are such that the elimination of the gusset plates would result in eccentric joints, gussets plates and spacer plates may be used in conformity with modern practices. The thickness of the gusset plates required to transmit stress shall not be less than that of members connected.
12.07.04	The use of filler in connection shall be avoided as far as possible. The diagonal web members in tension may be connected entirely to the gusset plate wherever necessary to avoid the use of filler and it shall be connected at the point of intersection by one or more bolts.
12.07.05	The tower structures shall be accurately fabricated to connect together easily at site without any undue strain on the bolts.
12.07.06	No angle member shall have the two leg flanges brought together by closing angle.
12.07.07	The diameter of the hole shall be equal to the diameter of bolt plus 1.5mm.
12.07.08	The structure shall be designed so that all parts shall be accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets depression are likely to hold water.
12.07.09	All similar parts shall be made strictly inter-changeable. All steel sections before any work is done on them, shall be carefully leveled, straightened and made true to detailed drawings by methods which will not injure the materials so that when assembled, the adjacent matching surfaces are in close contact through out. No rough edges shall be permitted in the entire structure.
12.07.10	**Drilling and Punching**
A)	Before any cutting work is started all steel sections shall be carefully straightened and trued by pressure and not by hammering. They shall again be trued after being punched and drilled.
B)	Holes for bolts shall be drilled on punched with a jig but drilled holes shall be preferred. The following maximum tolerance of accuracy of punched holes is permissible.
a)	Holes must be perfectly circular and no tolerance in this respect permissible.
b)	The max. allowable difference in diameter of the holes on the two sides of plates or angle is 0.8mm. i.e. the allowable taper in a punched holes should not exceed 0.8mm on diameter.
c)	Holes must be square with the plates or angles and have their walls parallel.

C) All burrs left by drills or punch shall be removed completely. When the tower members are in position the holes shall be truly opposite to each other. Drilling or reaming to enlarge holes shall not be permitted.

12.07.11 **Erection mark**

A) Each individual member shall have erection mark conforming to the component number given to it in the fabrication drawings. This mark shall be marked with marking dies of 16mm size before galvanising and shall be legible after galvanising.

B) Erection Mark shall be "A - BB- CC – DDD", where

A = Owner's code assigned to the Contractor Alphabet.
BB = Contractor's Mark-Numerical
CC = Tower Type-Alphabet
DDD = Number mark to be assigned by Contractor.

12.07.12 **Quantities and Weights**

A) The unit weight of each type of tower, stubs and extensions shall be furnished by the bidder. The weight of tower shall mean the weight of tower calculated by using the black sectional (i.e. un-galvanised) weight of steel members of the size indicated in the approved fabrication drawings and bills of materials, without taking into consideration the reduction in weights, holes, notches and bevel cuts etc, but taking into consideration the weight of the fasteners, anti-climbing devices etc.

12.07.13 **Galvanising**

Fully galvanised towers and stub shall be used for the line. Galvanisation of the member of the towers shall conform to IS:2629 and IS:4759. The minimum weight of galvanisation shall be 610 gms/sqm. The galvanisation shall be done after all fabrication work is completed, except that the nuts may be tapped or re-run after galvanising. Threads of bolts and nuts shall have a neat fit and shall be such that they can be turned with finger throughout the length of the threads of bolts and they shall be capable of developing full strength of the bolts. Spring washers shall be electro-galvanised as per Grade 4 of IS:1573.

12.07.14 **TOWER EARTHING**

The footing resistance of all towers shall be measured by the Contractor in dry weather after tower erection but before the stringing of earthwire. All the tower are to be earthed. In no case tower footing resistance shall exceed 10 ohms. Pipe type earthing and counterpoise type earthing wherever required shall be provided in accordance with the stipulations made in IS:3043-1987 and IS:5613 (part-II/Section-2) 1985. The details for pipe and counterpoise type earthing are given in drawing enclosed with the specification.

12.08.00 **INSPECTION AND TESTS**

12.08.01 All standard tests, including quality control tests, in accordance with appropriate Indian/International standard, shall be carried out unless otherwise specified herein.

12.08.02 **Inspection**

In addition to the provisions as specified elsewhere in this specification, the following shall also apply:

A) The Contractor shall keep the Owner informed in advance about the time of starting and the progress of manufacture and fabrication of various tower parts at various stages, so that arrangements could be made for inspection.

B) The acceptance of any part of items shall in no way relieve the Contractor of any part of his responsibility for meeting all the requirements of the Specification.

C) The Owner or his representative shall have free access at all reasonable times to those parts of the Contractor's works which are concerned with the fabrication of the Owner's material for satisfying himself that the fabrication is being done in accordance with the provisions of the specifications.

D) Unless specified otherwise inspection shall be made at the place of manufacture prior to dispatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

E) Should any member of the structure be found not to comply with the approved design, it shall be liable to rejection. No member once rejected shall be resubmitted for inspection, except in cases where the Owner or his authorised representative considers that the defects can be rectified.

F) Defect which may appear during fabrication shall be made good with the consent of, and according to the procedure proposed by the Contractor and approved by the Owner.

G) All gauges and templates necessary to satisfy the Owner shall be supplied by the manufacturer.

H) The correct grade and quality of steel shall be used by the Contractor. To ascertain the quality of steel used the inspector may at his discretion get the material tested at an approved laboratory.

12.08.03 **Tower Load Tests**

A) The Contractor shall submit one set of shop drawings alongwith the bill of materials. Further, Contractor shall submit one copy of test reports and final tracings of shop drawings and Bill of materials for Owner's reference and record.

B) The Contractor shall ensure that the specification of materials and workmanship of all towers actually supplied conform strictly to the towers which have successfully under gone the tests. In case any deviation is detected, the Contractor shall replace such defective towers free of cost to the Owner. All expenditure incurred in erection, to and fro transportation and any other expenditure or losses incurred by the Owner on this account shall be fully borne by the Contractor. No extension in delivery time shall be allowed on this account.

12.08.04 **Tower Testing Procedure**

The testing of towers shall be as per the procedure described below:

A) **Bolt Slip Test**

In the bolt slip test, the test loads shall be gradually applied up to the 50% of design loads under normal condition and held for two (2) minutes at that loads and then released gradually.

The initial and final readings on the scales (for measurement of defection) before application and after the release of Loads respectively shall be taken with the help of theodolite. The difference between these readings gives the values of the bolt slip.

B) **Normal/Broken Wire Load Tests**

All the loads, for a particular load-combination test shall be applied gradually upto the full design loads in the following steps and shall also be released in the similar manner:

50 percent
75 percent
90 percent
95 percent
100 percent

C) **Observation Periods**

a) Under normal and broken wire load tests, the tower shall be kept under observation for sign of any failure for two minutes (excluding the time for adjustment of loads) for all intermediate steps of loading upto and including 95 per cent of full design loads.

b) For normal, as well as broken wire tests, the tower shall be kept under observation for five (5) minutes (excluding the time for adjustment of loads) after it is loaded upto 100 percent of full design loads.

c) While the loading operation are in progress, the tower shall be constantly watched, and if it shows any tendency of failure anywhere, the loading shall be immediately stopped, released and then entire tower shall be inspected. The reloading shall be started only after the corrective measures are taken.

d) The structure shall be considered to be satisfactory, if it is able to support the specified full design loads for five (5) minutes, with no visible local deformation after unloading (such as bowing, buckling etc.) and no breakage of elements or constituent parts.

e) Ovalization of holes and permanent deformation of bolts shall not be considered as failure.

D) **Recording**

The deflection of the tower shall be recorded at each intermediate and final stage of normal load and broken wire load tests by means of a theodolite and graduated scale. The scale shall be of about one meter long with marking upto 5 mm accuracy.

E) **Destruction Test**

a) The destruction test shall be carried out under normal condition or broken wire condition. The Owner at the time of approval of rigging chart/test data sheet shall intimate the contractor. Under which load condition the destruction test is to be carried out.

b) The procedure for application of load for normal/broken wire test shall also be applicable for destruction test. However, the load shall be increased in steps of five (5) percent after the full design loads have been reached.

12.09.00 **PACKING**

12.09.01 The packings shall be properly done to avoid losses/damages during transit. Each bundle or package shall be appropriately marked.

12.10.00 DESIGN CALCULATION AND DRAWINGS

12.10.01 The following design calculation and drawings are required to be furnished during detailed engineering.

a) Computation of wind load
b) Sag-tension calculation
c) Tower loading
d) Single line diagram of towers slowing electrical clearances and steel sections.

12.10.02 The Contractor shall also furnish following to the owner:

a) Detailed design calculation and drawing for towers and foundations.
b) Detailed structural drawings indicating section size, length of members sizes of plate along with hole to hole distance, joint details etc.
c) Bill of materials, indicating cutting and bending details against each member.
d) Shop drawings showing all details relevant to fabrication.
e) All the drawings for the tower accessories.

TABLE-T1-2
DESIGN LOADS

S.No	400 kV	Longitudinal Loads		Transverse Loads	
		Reliability Condition	Security Condition	Reliability Condition	Security Condition
1	2	3	4	5	6
a.	A	0.0	0.5 x MT For Conductor). 1.0 x MT (For Earth Wire)	WC + WI + DY	0.6 WC + WI +0.25 DY (For Conductor) 0.6 WC + 0.5 DY (For Earth Wire)
b.	B (Section Tower- 0° Deviation)	0.0	1.0 x MT	WC + WI + DY	0.6 WC + WI +0.5 DY
c.	B (15° Deviation)	0.0	1.0 x MT x Cos Φ/2	WC + WI + DY	0.6 WC + WI +0.5 DY
d.	C (Section Tower- 0° Deviation)	0.0	1.0 x MT	WC + WI + DY	0.6 WC + WI +0.5 DY
e.	C (30° Deviation)	0.0	1.0 x MT x Cos Φ/2	WC + WI + DY	0.6 WC + WI +0.5 DY
f.	D (60° Deviation)	0.0	1.0 x MT x Cos Φ/2	WC + WI + DY	0.6 WC + WI +0.5 DY
g.	D (90° Deviation)	0.0	1.0 x MT x Cos Φ/2	WC + WI + DY	0.6 WC + WI +0.5 DY
h.	D Complete Dead End	MT	1.0 x MT	WC + WI	0.1 WC + WI

DESCRIPTION	SYMBOL	REMARKS
Maximum Tension Of Conductor/ Earth Wire under everyday temperature & full wind condition or minimum temperature & 36% 0f max. wind which ever is more stringent	MT	
Wind On Conductor	WC	Wind Span shall be the normal ruling span.
Wind On Insulator	WI	In case of Double String Insulators, both their strings shall be considered
Angle Of Deviation (Degrees)	Φ	
Load Due To Deviation Of Tower	DY= 2 x MT x Sin Φ/2	

Note:
1. Vertical loads shall conform to IS 802 – Part I, 1995. Weight spans as furnished under Clause 2.03.00 shall be considered for computation of vertical loads.

2. Safety loads and Anti-cascade loads as specified in IS 802- Part I, 1995 shall also be considered for design of Towers.

3. Wind loads on the towers shall be considered in transverse loads as per clause 11, 12 and 13 of IS: 802 (Part-I/ Sec. I)- 1995.

4. Any additional loads apart from the loads mentioned above, as required as per IS: 802-1995 shall be considered for design purpose.

13.00.00 TOWER FOUNDATIONS

13.01.00 **TYPES OF FOUNDATION**

13.01.01 General

A) Reinforced concrete footing shall be used for all type of normal tower in conformity with the present day practice followed in the country and the specifications laid herein. All the four footings of the tower and their extension shall be similar, irrespective of down thrust and uplift.

B) Foundation includes supply of materials such as cement, sand, coarse aggregates, reinforcement steel etc., and all work related to construction of foundations including excavation and backfilling, form work, stub setting, placing of reinforcement, concreting etc.

13.01.02 Design criteria for Foundations

The foundation shall be designed for the actual soil parameters based on the soil investigation carried out by the bidder and approved by the owner. For design purposes:

(a) The angle of repose shall be considered as two-third (2/3) of the value as obtained from the soil investigation

(b) Water table shall be considered up to the ground level.

(c) The weight of soil shall be considered as 1440 Kg/m^3 under dry condition and 940 Kg/m^3 under wet condition.

Well foundation or pile foundation shall be provided by the bidder wherever necessitated.

13.02.00 **SOIL INVESTIGATION**

13.02.01 The Contractor is required to carry out detailed soil investigation at various tower locations along the corridor, one borehole at centre of the tower, angle points, crossings, etc. and also where soil strata is different from the other locations

investigated. In addition the soil investigation may be required to be carried at other locations at the discretion of the Engineer.

The investigation comprises of field and laboratory testing. Field investigation includes boreholes, Standard Penetration Test (SPT), Static Cone Penetration Test (SCPT), Dynamic Cone Penetration Test (DCPT), collection of disturbed samples (DS) and undisturbed soil samples (UDS), Trial Pits (TP), Plate Load Tests (PLT), Electrical Resistivity Test (ERT), collection of water samples, etc. Laboratory tests shall include, Physical, chemical and engineering properties of soil/rock.

13.02.02 This specification covers technical requirements for geotechnical investigation and preparation of a detailed geotechnical report. It shall include mobilization of necessary equipment, providing necessary engineering supervision and technical personnel, carrying out field investigation and tests, laboratory tests, analysis and interpretation of data and results, collecting data regarding change of course of rivers from local sources, velocity, scour, etc., giving flood details of the area (past history), safe bearing capacity for different sizes of foundations, different founding strata for the various locations along the transmission lines and preparation of geotechnical report.

13.02.03 The diameter of borehole shall be minimum 150 mm in soil and 76 mm in rock. Depth of bore holes at river/bridge crossings shall be 40m, at angle points depth shall be 15.0m and at the centre of tower along the corridor depth of BH shall be 10.0m. Boring shall be terminated at the above specified depth or 3.0m continuous in rock with RQD>25% for river crossings and for balance areas 3.0m in refusal whichever is earlier. Refusal means SPT 'N' value greater than 100.

SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery up to 20%, met within a borehole. This test shall be conducted at every 3.0 m interval or at change of strata, up to the final depth. At refusal penetration shall be measured and the same shall be reported in Borelog. UDS shall be collected at every 3.0 m interval or at change of strata up to depth of borehole. UDS may be replaced by additional SPT, if SPT'N' value in the strata is above 50. The diameter of UDS sampler shall be 100 mm minimum.

13.02.04 Laboratory tests shall be done as per relevant IS codes. The laboratory tests, not be limited to the following shall be conducted on disturbed and undisturbed soil samples, rock samples & water samples collected during field investigations in sufficient numbers.

a) Laboratory Tests on Soil Samples

Laboratory tests shall be carried out on disturbed and undisturbed soil samples for Grain Size Analysis, Hydrometer Analysis, Atterberg Limits, Triaxial Shear Tests (UU), Natural Moisture Content, Specific Gravity and Bulk Unit Weight, Consolidation Tests, Unconfined Compression Test, Free swell Index, Shrinkage Limit, Swell Pressure Test, Chemical Analysis test on soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, organic matter and any other chemicals harmful to concrete and reinforcement/ steel.

b) Laboratory Tests on Rock Samples

Moisture content, porosity & density, Specific Gravity, Hardness, Soundness, Slake durability index, Unconfined compression test (Both at saturated and in-situ water content), Point load strength index and deformability test (Both at saturated and in-situ water content) shall be carried out on rock samples.

13.02.05 The laboratory tests shall be carried out progressively during the field work after sufficient numbers of samples have reached the laboratory in order that the test results of the initial boreholes can be made use of in planning the later stages of the field investigation and quantum of laboratory tests. All samples brought from field, whether disturbed or undisturbed shall be extracted/prepared and examined by competent technical personnel and the tests shall be carried out as per the procedures laid out in the latest editions of the relevant IS codes. Soil shall be classified as per the provisions of Indian standards.

13.02.06 On completion of all field & laboratory work, geotechnical investigation report shall be submitted for Owner's review/approval. The Geotechnical investigation report shall contain geological information of the region, procedure adopted for investigation, field & laboratory observations/ data/ records, analysis of results & recommendations on type of foundation envisaged for all areas of work with supporting calculations. Recommendations on treatment for soil, foundation, based on subsoil characteristics, soft soils, aggressive chemicals, expansive soils, etc.

13.02.07 The Geotechnical report shall include, but not limited to the following:

a) Borelogs: A true cross section of all individual boreholes with reduced levels and coordinates, showing the classification and thickness of individual stratum, position of ground water table, details of various in-situ tests conducted and samples collected at different depths and the rock stratum, wherever met with.

b) Results of all laboratory tests summarized for each Borehole along with a consolidated table giving the layer wise soil and rock properties. All the relevant charts, tables, graphs, figures, supporting calculations, conditions and photographs of representative rock cores shall be furnished.

c) Recommendations : The report should contain specific recommendations on type of foundations to be adopted for various structures, duly considering the sub soil characteristics, water table, total/ differential settlement permissible for structures and equipments, minimum depth and width of foundation. The observation/recommendations shall include but not limited to the following:

i) Geological information of the area, past observations or historical data, if available, for the area and for the structures in the nearby area, fluctuations of water table etc.

ii) Net safe allowable bearing pressure on the soil at various depths for different sizes of the foundations based on shear strength and settlements characteristics of soil with supporting calculations for the recommendations.

iii) Based on the chemical nature of soil and ground water and exposure condition, recommendations for protective measures on concrete and steel shall be mentioned.

iv) If expansive soil is met with, recommendation and removal or retainment of the same under structures/ roads etc. shall be given. In the later case detailed specification of any special treatment required including specifications for materials to be used, construction method, equipments to be deployed, etc. shall be furnished.

iv) Additional investigation other then specified above, if any, the same shall be carried out by the bidder at no extra cost to owner.

13.02.08 Indian Standard References

IS:1498 Classification and Identification of Soils for general Engineering Purposes.

IS:1892 Code of practice for Subsurface Investigation for Foundation.

IS:1904 Code of practice for design and construction of foundations in Soils: General Requirements.

IS:2131 Method of Standard Penetration Test for Soils.

IS:2132 Code of practice for Thin walled Tube Sampling of Soils.

IS:2470 Code of practice for design and construction of SepticTanks.

(Part-I)

IS:2720 Method of Test for Soils (Relevant Parts).

IS:5313 Guide for Core Drilling Observations.

IS:4968 Method for subsurface Sounding for Soils - Dynamic

(Part-II) method using Cone and Bentonite slurry.

IS:4968 Method for subsurface Sounding for Soils- Static Cone Penetration

(Part-III) Test

13.04.00 **LOADS ON FOUNDATIONS**

13.04.01 The foundations shall be designed to withstand the specific loads of the superstructure and for the full footings reactions obtained from the structural stress analysis in conformity with the relevant over load factors. The over load factor for foundation design shall be 1.10 for all loads except dead loads.

13.04.02 The reactions on the footings shall be composed of the following type of loads for which these shall be required to be checked :

i) Max. tension or uplift along the leg slope.
ii) Max. compression or down-thrust along the leg slope.
iii) Max. horizontal shear or side thrust.

13.04.03 The base slab of the foundation shall be designed for additional moments developing due to eccentricity of the loads.

13.04.04 The additional weight of concrete in the footing below ground level over the earth weight and the full weight of concrete above the ground level in the footing and embedded steel parts will also be taken into account adding to the down thrust.

13.05.00 **STABILITY ANALYSIS**

13.05.01 In addition to the strength design, stability analysis of the foundation shall be done to check the possibility of failure by over-turning, uprooting, sliding and tilting of the foundation.

13.05.02 The following primary type of soil resistance shall be assumed to act in resisting the loads imposed on the footing in earth:

A) Resistance against uplift

The uplift loads will be assumed to be resisted by the weight of earth in an inverted frustum of a conical pyramid of earth as per relevant formula on the footing pad whose sides make an angle equal to the angle of repose of the earth with the vertical, in average soil. The weight of concrete embedded in earth and that above the ground will also be considered for resisting the uplift. In case where the frustum of earth pyramids of two adjoining legs super-impose each other, the earth frustum will be assumed truncated by a vertical plane passing through the center line of the tower base.

B) Resistance against down thrust

The down-thrust load combined with the additional weight of concrete above earth will be resisted by bearing strength of the soil assumed to be acting on the total area of the bottom of the footings.

C) Resistance against side-thrust

The chimney portion of the foundation shall be designed as per limit load method described at clause 38.6 of IS-456-1978, or as per any other international standard, considering the chimney as a column subjected to axial loads (down thrust loads) and biaxial bending moments resulting from side thrust forces. The passive earth pressure (as per Rankine's formula) shall be considered for the design of chimney against side thrust. If uplift and down thrust are computed in vertical direction for the foundation design, full resultant horizontal shear shall be taken at footing tip for design of the footing to resist side thrust.

13.06.00 **PROPERTIES OF CONCRETE**

13.06.01 The cement concrete used for the foundations shall be of grade M-20 corresponding to 1:1½:3 nominal mix ratio with 20mm coarse aggregate.

13.06.02 All the properties of concrete regarding its strength under compression tension, shear, punching and bend etc. as well as workmanship will conform to IS:456-1978.

13.06.03 The material properties for cement, aggregate and reinforcement steel shall be as specified elsewhere in the specification

13.06.04	The water used for mixing concrete shall be fresh, clean and free from oil, acids and alkalies, organic materials or other deleterious substances. Portable water is generally preferred.
13.07.00	**DESIGN OF FOUNDATIONS**
134.07.01	Structural design of the foundations shall be done by limit State method conforming to IS 456.
13.07.02	The chimney should have all around clearance of 150mm from any part of stub angle limiting to 450mm sq. minimum.
13.07.03	The chimney top or muffing must be at least 225 mm above ground level and also the coping shall be extended upto lower most joint level between the bottom lattices and the main corner legs of the tower.
13.07.04	Minimum thickness of foundation shall be 300 mm.
13.07.05	The minimum distance between the lowest edge of the stub angle and the bottom surface of concrete footing shall not be less than 150 mm or more than 200mm.
13.07. 06	The total depth of foundations below the ground level shall not be less than 1.5 meters. To maintain the interchangeability of stubs for all types of foundations, for each type of tower, the same depths of foundations shall be used for different types of foundations.
13.07.07	The portion of the stub in the pyramid (or slab) shall be designed to take full down-thrust or uplift loads by the cleats combined with the bond between stub angles and pyramid concrete. The Contractor shall furnish the calculation for uprooting of stub along with the foundation design.
13.07.08	Minimum 50mm thick pad of lean concrete corresponding to 1:3:6 nominal mix shall be provided to avoid the possibility of reinforcement rod being exposed due to unevenness of the bottom of the excavated pit.
13.07.09	Over Load Factor The overload factor for foundations shall be considered as 1.1 i.e. the reaction except due to dead loads on foundations shall be increased by 10 per cent.
13.08.00	**CONSTRUCTION OF TOWER FOUNDATION**
13.08.01	**Excavation** Excavation work must not be started until the tower schedule & profile and foundation drawing are approved by the Owner. Except specified otherwise, all excavation for footing shall be made to the lines and grades of the foundation. All excavation shall be protected so as to maintain a clean subgrade, until the footing is placed, using timbering/shuttering, shoring etc., if necessary. Any sand, mud, silt or other undesirable materials which may accumulate in the excavated pit shall be removed by the Contractor before placing concrete.

13.08.02 **Rock excavation requiring Blasting**

Wherever blasting is required for excavation in rock, the same shall be done after obtaining license from the competent authority. Following shall be adhered to:

i) All provisions of explosive acts shall be adhered to.

ii) The magazine for the storage of explosive shall be to suit as per the requirements of explosive department.

iii) Where blasting is required, same shall be controlled blasting.

iv) Contractor shall prepare the detailed blasting scheme and get the same approved from Engineer-in-charge before carrying out the blasting operation. All blasting shall be done as per the approved blasting scheme.

v) The Contractor shall obtain Licenses from Competent Authorities for undertaking blasting work as well as for procuring, transporting to site and storing the explosives as per explosives act. The Contractor shall be responsible for the safe transport, use, custody and proper accounting of the explosive Materials.

vi) The Contractor shall also observe any specific instructions given by the Engineer-in-charge. The Contractor shall be responsible and liable for any accident and injury / damage which may occur to any person or property of the project or public on account of any operations connected with the storage, transportation, handling or use of explosives and the blasting operations. The Engineer-in-charge or his authorised representative shall frequently check the Contractor's compliance with these precautions and the manner of storing and accounting of explosives. The Contractor shall provide necessary facilities for this the above.

vii) Controlled blasting shall be done by a specialised agency duly approved by Engineer-in-charge. All controlled blasting shall be done by using time delay detonators (i.e. excel type).

viii) All rules under the Explosives Act and other local rules in force shall be fully observed. All blasting works shall be done in accordance with the stipulations contained in IS: 4081.

13.08.03 Setting of Stubs

A) The stubs shall be set correctly in accordance with approved method at the exact location and alignment and precisely at correct levels with the help of stub setting templates and leveling instrument. Stubs shall be set in the presence of Owner's representative available at site where required and for which adequate advance intimation shall be given to the Owner by the Contractor.

B) Setting of stub at each location shall be approved by the Owner's representative.

C) Stub setting templates shall be designed and arranged by the Contractor at his own cost for all types of towers with or without extension and also for leg extension. Stub templates for standard towers and towers with extension upto 6M shall be of adjustable type. The stub templates shall be painted. Generally for each

transmission line tower package, following numbers of stub setting templates shall be deployed by the Contractor:

For each A type tower : 3 Nos.
For each of B and C type : 2 Nos.

However, if Owner feels that more number of templates are required for timely completion of a particular line the Contractor shall have to deploy the same without any extra cost to Owner.

D) One set of each type of stub setting template as applicable, shall be supplied to the Owner, on completion of the project at no extra cost to Owner.

13.08.04 Mixing, Placing and Compacting of Concrete

A) The concrete shall be mixed in a mechanical mixer. However, in case of difficult terrain hand mixing may be permitted at the discretion of Owner. The water for mixing concrete shall be fresh, clean and free from oil, acids and alkalies. Saltish or blackish water shall not be used.

B) Mixing shall be continued until there is uniform distribution of material and the mix is uniform in colour and consistency, but in no case the mixing be done for less than two minutes. Normally mixing shall be done close to the foundation, but in case it is not possible the concrete may be mixed at the nearest convenient place. The concrete shall be transported from the place of mixing to the place of final deposit as rapidly as practicable by methods which shall prevent the segregation or loss of any ingredient. The concrete shall be placed and compacted before setting commences.

C) Form boxes shall be used for casting all type of foundations. The concrete shall be laid down in 150mm layers and consolidated well, so that the cement cream works up to the top and no honey-combing is left in the concrete. The mechanical vibrator shall be employed for compaction of the concrete. However, in case of difficult terrain, manual compaction may be permitted at the discretion of Owner. After concreting the chimney portion to the required height, the top surface should be finished smooth with a slight slope towards the outer edge, to drain off any rain water falling on the coping.

D) In wet locations, the site must be kept complete de-watered, both during the placing of the concrete and for 24 hours thereafter. There should be no disturbance of concrete by water during this period.

E) After the form-work has been removed if the concrete surface is found to be defective, the damage shall be repaired with rich cement and sand mortar to the satisfaction of the Owner's representative before the foundation pits are backfilled.

13.08.05 Back-Filling and Removal of Stub Template

A) After opening of form-work and removal of shoring and timbering, if any, backfilling shall be started, after repairs, if any, to the foundation concrete. Backfilling shall normally be done with excavated soil, unless it consists of large boulders/stones, in which case the boulders shall be broken to a maximum size of 80 mm. At such locations where borrowed earth is required for backfilling, shall be done by the Contractor at his own cost, irrespective of lead.

B) The backfilling materials should be clean and free from organic or other foreign materials. The earth shall be deposited in maximum 200 mm layers, leveled and wetted and tempered properly before another layer is deposited. Care shall be taken that the backfilling is started from the foundation ends of the pits, towards the outer ends. After the pits have been backfilled to full depth, the stub template may be removed.

C) The backfilling and grading shall be carried to an elevation of about 75 mm above the finished ground level to drain out water. After backfilling 50 mm high earthen embankment (bandh) will be made along the sides of excavation pits and sufficient water will be poured in the backfilled earth for atleast 24 hours.

13.08.06 Curing

The concrete after setting for 24 hours shall be cured by keeping the concrete wet continuously for a period of 10 days after laying. The pit may be back filled with selected earth sprinkled with necessary amount of water and well consolidated in layers not exceeding 200 mm of consolidated thickness after a minimum period of 24 hours and thereafter both the backfilled earth and exposed chimney top shall be kept wet for the remainder of the prescribed time of 10 days. The uncovered concrete chimney above the backfilled earth shall be kept wet by providing empty cement bags dipped in water fully wrapped around the concrete chimney for curing and ensuring that the bags are kept wet by the frequent pouring of water on them.

13.08.07 Benching

When the line passes through hilly/undulated terrain, for a few tower locations it may be required to level the ground for casting of tower footings on same elevation. All the activities related to make the required area of ground in same elevation for casting of foundation, shall be termed as benching work. Benching work shall include cutting of excess earth and removing the same to a suitable point of disposal as required by the Owner. Benching shall be resorted to only after getting specific approval from the Owner. Volume of the earth to be cut shall be measured before cutting and got approved from the Owner. This volume of earth shall be considered for the purpose of payment against the head of benching work. The earth removed for setting of stub template or for casting of foundation with difference of elevations of 1M between the tower legs shall not be entitled for payment.

13.08.08 Protection of Tower Footing

A) The work shall include all necessary stone revetments, concreting and earth filling above ground level and the clearance from stacking on the site of all surplus excavated soil, special measures for protection of foundation close to or in nallahas, river bed hilly/undulated terrain etc, by providing suitable revetments or galvanised wire netting and meshing packed with boulders. The top seal cover of the stone revetments shall be done with M-15 concrete (1:2:4:mix). The Contractor shall furnish recommendations for providing protection at these locations wherever required.

B) The quantity of excavated earth obtained from a particular location shall generally be utilised in back-filling work in protection of tower footing of same locations, unless it is unsuitable for such purpose. In the latter case, the back-filling shall be done with

borrowed earth of suitable quality irrespectively of lead as per the rate provided in the letter of award. The consolidation of earth shall however be done after backfilling free of cost.

14.00.00 TOWER LINE ERECTION AND STRINGING

14.01.00 GENERAL REQUIREMENTS

14.01.01 The details of the scope of erection work shall include the cost of labour, all tools and plants like tension stringing equipment and all other incidental expenses in connection with erection and stringing work.

14.01.02 The Contractor shall be responsible for transportation of all the materials to be provided by the Contractor as per the scope of work to site, proper storage and preservation at their own cost till such time the erected line is taken over by the Owner.

14.02.00 TREATMENT OF MINOR GALVANISING DAMAGE

In case any minor damage to galvanising is noticed, the same shall be treated with zinc rich paint (having at least 90% zinc content) before erection.

14.03.00 ASSEMBLY

14.03.01 The method followed for the erection of towers, shall ensure the points mentioned below :

a) Straining of the members shall not be permitted for bringing them into position. It may, however, be necessary to match hole positions at joints and to facilitate this, tommy bars not more than 450 mm long may be used.

b) Before starting erection of an upper section, the lower section shall be completely braced and all bolts provided and tightened adequately in accordance with approved drawings to prevent any mishap during tower erection.

c) All plan diagonals relevant to a section of tower shall be placed in position before assembly of upper section is taken up.

d) The bolt position in assembled towers shall be as per IS:5613 (Part-II/Section 2)-1976.

e) Tower shall be fitted with number plate, danger plate, phase plate and anti-climbing device as described.

f) All bank holes, if any left, after complete erection of the tower, are to be filled up by bolts and nuts of correct size.

14.03.02 Tightening and Punching of Bolts and Nuts

A) All nuts shall be tightened properly using correct size spanner/torque wrench. Before tightening, it shall be ensured that filler washers and plates are placed in gaps

between members wherever applicable, bolts of proper size and length are inserted, and one spring washer is inserted under each nut. In case of step bolts, spring washers shall be placed under the outer nut. The tightening shall progressively be carried out from the top downwards, care being taken that all bolts at every level are tightened simultaneously. The threads of bolts projecting outside the nuts shall be punched at their position on the diameter to ensure that the nuts are not loosened in course of time. If during tightening a nut is found to be slipping or running over the bolt threads, the bolt together with the nut shall be replaced.

B) The threads of all the bolts projected outside the nuts shall be welded at two diametrically opposite places. The welding shall be provided from ground level to waist level for single circuit towers and to bottom cross arm level for double circuit towers. After welding, cold galvanised paint having at least 90% Zinc content shall be applied to the welded portion. At least two coats of the paint shall be applied. The cost of welding and paint including application of paint shall be deemed to be included in the erection price.

C) In addition to the tack welding of nuts with bolts, as described above, the Contractor can also propose some alternative arrangements, like use of epoxy resin adhesive which can serve the purpose of locking the nut permanently with the bolt and thus preventing pilferage of the tower members.

14.04.00 **INSULATOR HOISTING**

Suspension insulator strings shall be used on suspension towers and tension insulator strings on angle and dead end towers. These shall be fixed on all the towers just prior to the stringing. Damaged insulators and fittings, if any, shall not be employed in the assemblies. Before hoisting, all insulators shall be cleaned in a manner that will not spoil, injure or scratch the surface of the insulator, but in no case shall any oil be used for the purpose. Corona control rings/arching horn shall be fitted in an approved manner. The yoke arrangements be horizontal for tensions strings. Torque wrench shall be used for fixing different line materials and their components, like suspension clamp for conductor and earthwire, etc., whenever recommended by the manufacturer of the same of river crossing towers.

14.05.00 **HANDLING OF CONDUCTOR AND EARTHWIRE**

14.05.01 The Contractor shall be entirely responsible for any damage to the towers or conductors during stringing. While running out the conductors, care shall be taken that the conductors do not touch or rub against the ground or objects which could cause scratches or damages to the strands. The conductors shall be run out of the drums from the top in order to avoid damage due to chafing. Immediately after running out, the conductor shall be raised at the supports to the levels of the clamps and placed into the running blocks. The groove of the running blocks shall be of such a design that the seat is semi-circular and larger than the diameter of the conductor earthwire and it does not slip over or rub against the sides. The grooves shall be lined with hard rubber or neoprene to avoid damage to conductor and shall be mounted on properly lubricated bearings.

14.05.02 The running blocks shall be suspended in a manner to suit the design of the crossarm. All running blocks, especially those at the tension end, will be fitted on the cross-arm with jute cloth wrapped over the steel work and under the slings to avoid

damage to the slings as well as to the protective surface finish of the steel work. In case suspension, or section towers are used even for temporary terminations, if this be unavoidable, they shall be well guyed and steps shall be taken by the Contractor to avoid damage. Guying proposal alongwith necessary calculations shall be submitted by the Contractor to Owner by the Contractor for checking the tensions in the guy made available to the Owner by the Contractor for checking the tensions in the guy wires. The drums shall be provided with a suitable braking device to avoid damages, loose running out and kinking of the conductor. The conductor shall be continuously observed for loose or broken strands or any other damage. When approaching end of a drum length, at least three coils shall be left when the stringing operations are to be stopped. These coils are to be removed carefully, and if another length is required to be run out, a joint shall be made as per the recommendations of the manufacturers.

14.05.03 Repairs to conductors, if necessary, shall be carried out during the running out operations, with repair sleeves. Repairing of conductor surface shall be done only in case of minor damage, scuff marks etc. keeping in view both electrical and mechanical safe requirements. The final conductor surface shall be clean smooth and without any projections, sharp points, cuts, abrasions etc.

14.05.04 Conductor splices shall be so made that they do not crack or get damaged in the stringing operation. The contractor shall use only such equipment/methods during conductor stringing which ensures complete compliance in this regard.

14.05.05 Derricks shall be used where roads, rivers, channels, telecommunication or overhead power lines, railway lines, fences or walls have to be crossed during stringing operations. It shall be seen that normal services are not interrupted or damage caused to property. Shut down shall be obtained when working at crossing of overhead power lines. The Contractor shall be entirely responsible for the proper handling of the conductor, earth-wire and accessories in the field.

14.05.06 The sequence of running out shall be from top to downwards i.e. the earthwire shall be run out first, followed by the conductors in succession. Unbalances of loads on towers shall be avoided as far as possible.

14.05.07 The proposed 66 kV transmission line may run parallel for certain distance with the existing Transmission lines which may remain energised during the stringing period. As a result there is a possibility of dangerous voltage build up due to electromagnetic and electrostatic coupling in the pulling wire, conductors and earthwires, which although comparatively small during normal operations can be severe during switching. It shall be the Contractor's responsibility to take adequate safety precautions to protect his employees and others from this potential danger.

14.05.08 B and C type of towers are not designed for one side stringing. Therefore proper guying arrangement shall be made for B and C type of towers during stringing on one section while the other section is not strung. The Contractor has to submit the detailed proposal along with the calculation for guying which shall be approved by the Owner. Proper T&P shall be made available to the Owner by the Contractor for checking the tensions in the guy wires. All the expenditure on account of the above work is deemed to be included in the bid price and no extra payment shall be made for the same.

14.06.00 **STRINGING OF CONDUCTOR AND EARTHWIRE**

14.06.01 The stringing of the conductor shall be done by standard stringing method.

14.06.02 After being pulled the conductor/earthwire shall not be allowed to hang in the stringing blocks for more than 96 hours before being pulled to the specified sag.

14.06.03 Conductor creep are to be compensated by over tensioning the conductor at appropriate temperature for which calculations are to be submitted by the contractor for Owner's approval.

14.06.04 The Bidder shall give complete details of the stringing methods which be proposes to follow. Before the commencement of stringing the Contractor shall submit the stringing charts for the conductor and earthwire for various temperatures and span alongwith equivalent spans for the approval of the Owner.

14.06.05 Jointing

A) All the joints on the conductor and earthwire shall be of compression type, in accordance with the recommendations of the manufacturer for which all necessary tools and equipment like compressors, dies, processes etc. shall have to be arranged by the Contractor. Each part of the joint shall be cleaned by wire brush to make it free of rust or dirt etc. and properly greased with anti- corrosive compound if required, and as recommended by the contractor before the final compression is done with the compressors.

B) All joints or splices shall be made at least 30 meters away from the structures. No joints or splices shall be made in spans crossing over main road, railways, small rivers with tension spans. During compression or splicing operation the conductor shall be handled in such a manner as to prevent lateral or vertical bearing against the dies. After pressing the joint the aluminium sleeve shall have all corners rounded, burrs and sharp edges removed and smoothened.

C) During stringing of conductor to avoid any damage to the joint, the Contractor shall use a suitable protector with mid span compression joints in case joints are to be passed over pulley blocks/aerial rollers. The size of the groove of the pulley shall be such that the joint along with protection can be passed over it smoothly.

14.07.00 Sagging-in-Operation

14.07.01 The conductor shall be pulled upto the desired sag and left in running blocks for atleast one hour after which the sag shall be re-checked and adjusted, if necessary before transferring the conductor from the running blocks to the suspension clamps. The conductors shall be clamped within 36 hours of sagging in.

14.07.02 The sag will be checked in the first and the last span of the section in case of sections upto eight spans and in one intermediate span also for sections with more than eight spans. The sag shall also be checked when the conductors have been drawn up and transferred from running blocks to the insulator clamps.

14.07.03 The running blocks, when suspended from the transmission structure for sagging shall be so adjusted that the conductors on running blocks will be at the same height as the suspension clamp to which it is to be secured,

14.07.04 At sharp vertical angles, the sags and tensions shall be checked on both sides of the angle, he conductor and earthwire shall be checked on the running blocks for equality of tension on both sides. The suspension insulator assemblies will normally assume vertical positions when the conductor is clamped.

14.07.05 Tensioning and sagging operations shall be carried out in clam weather when rapid changes in temperatures are not likely to occur.

14.07.06 Tensioning and Sagging of Conductors and Earthwire

The tensioning and sagging shall be done in accordance with the approved stringing charts before the conductors and earthwire are finally attached to the tower through the earthwire clamps for the earthwire and insulator strings for the conductor. The `Initial' stinging chart shall be used for the conductor and `final' stringing chart for earth-wire should be employed for this purpose. Dynamometers shall be employed for measuring tension in the conductor and earthwire. The dynamometers employed shall be periodically checked and calibrated with the standard dynamometer.

14.07.07 Clipping In

A) Clipping of the conductors in positions hall be done in accordance with the recommendations of the manufacturer. Conductor shall be fitted with armour rods where it is made to pass through suspension clamps.

B) The jumpers at the section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements and shall match the jumper drops shown in the tower drawings.

C) Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

14.07.08 Fixing of Conductor and Earthwire Accessories

Vibration dampers for conductor and earthwire and other conductor and earthwire accessories shall be installed by the Contractor as per the design requirement and respective manufacturer's instructions within 24 hours of the conductor/earthwire clamping. While installing the conductor and earthwire accessories, proper care shall be taken to ensure that the surfaces are clean and smooth and no damage shall occur to any part of the accessories.

14.08.00 **REPLACEMENT**

14.08.01 If any replacements are to be effected after stringing and tensioning or during maintenance, leg members and bracings shall not be removed without reducing the tension on the tower with proper guying or releasing the conductor. If the replacement of cross arms becomes necessary after stringing, the conductor shall be suitably tied to the tower at tension points or transferred to suitable roller pulleys as suspension points.

14.08.02 The Contractor shall not be required to return to the Owner, empty conductor and earthwire drums and shall dispose off the same at his cost except for steel drums which shall be returned to Owner.

14.09.00 **FINAL CHECKING TESTING AND COMMISSIONING**

14.09.01 After completion of the works, final checking of the line shall be done by the Contractor to ensure that all the foundation works, tower erection, and stringing have been done strictly according to the specifications and as approved by the Owner. All the works shall be thoroughly inspected keeping in view of the following main points:

a) Sufficient backfilled earth is lying over each foundation pit and it is adequately compacted.

b) Concrete chimneys and their copings are is good finally shaped conditions.

c) All the tower members are correctly used, strictly according to final approved drawing and are free of any defect or damage, whatsoever.

d) All bolts are properly tightened and punched/tack welded.

e) The stringing of the conductors and earthwire has been done as per the approved sag and tension charts and desired clearances are clearly available.

f) All conductor and earthwire accessories are properly installed.

g) All other requirements to complete the work like fixing of danger plate, phase plate, number plate, anti climbing device etc., are properly installed.

h) Wherever required it should be ensured that revetment is provided.

i) The original tracings of profile route alignment and tower, design, structural drawings, bill of material, shop drawings of all towers are submitted to the Owner for reference and record.

j) The insulation of line as a whole is tested by the Contractor by providing his own equipment, labour etc. to the satisfaction of the Owner.

k) All towers are properly grounded.

l) The line is tested satisfactorily for commissioning purpose.

15.00.00 TRANSMISSION LINE MATERIAL

15.01.00 **GENERAL**

15.01.01 All the equipment shall be of the latest design and conform to the best modern practice adopted in the extra high voltage field. The Bidder shall offer only such equipment as guaranteed by him to be satisfactory and suitable for 400 kV AC Double circuit transmission with quad moose conductor and will give continued good performance.

15.01.02 The design, manufacturing process and quality control of all the materials shall be such as to give maximum factor of safety, maximum possible working load, highest mobility, elimination of sharp edges and a good finish.

15.01.03 All ferrous parts shall be hot dip galvanised, after all machining has been completed, nuts may, however, be tapped (threaded) after galvanising and the threads oiled. Spring washers shall be electrogalvanised. The bolt threads shall be under cut to take care of increase in diameter due to galvanising . Galvanising shall be done in accordance with IS:2629-1972. Fasteners shall withstand four dips while spring washers shall withstand three dips. Other galvanised materials shall be guaranteed to withstand at least six dips each lasting one minute under the standard preece tests for galvanising.

15.01.04 The zinc coating shall be perfectly adherent, of uniform thickness, smooth, reasonably bright, continues and free from imperfection such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanising shall be of grade Zn. 99.95 as per IS:209-1966.

15.02.00 **EARTHWIRE**

15.02.01 The galvanised steel earthwire shall generally conform to the specification of ACSR core wire as mentioned in IS 398 (Part-II)-1976 except where otherwise specified herein.

15.02.02 Parameters of the earthwire

(a) Size (strands & wire diameter)	7/3.15 mm
(b) Overall diameter	9.45 mm
(c) Stranded weight	428 Kg/km
(d) Minimum ultimate tensile strength	56 kN

15.02.03 The earthwire shall be pre-formed and post-formed to avoid opening of strands at the time of cutting or joining. The finished material shall have minimum brittleness, as it will be subject to appreciable vibration while in use. It shall withstand 3 and ½ number of one minute dips in the standard preece test.

15.02.04 There shall be no joint of any kind in the finished steel wire strand entering into the manufacture of the earthwire. There shall be no strand joints or strand splicer in any length of the completed stranded earthwire.

15.03.00 **CONDUCTOR**

15.03.01 The conductor shall be Aluminium Core Steel Reinforced (ACSR) type. The conductor shall confirm to IS:398 (Part-II) except where otherwise specified herein.

15.03.02 Parameters of the conductor

a)	Code and standard	IS 398
b)	Name	MOOSE ACSR
c)	Overall diameter	31.77 mm
d)	Weight	2.004 kg/m
e)	Ultimate tensile strength	161.2 kN minimum
f)	Strands and wire diameter of	
	- Aluminium	54 / 3.53 mm
	- Steel	7 / 3.53 mm

15.03.03 The steel strands shall generally comply with the requirements stipulated for earthwire at clause 16.02.00 above.

15.03.04 Joints shall be permitted in the individual Aluminium wires in all layers except the outer most layer of the finished conductor. These joints shall be made by cold pressure butt-welding and shall be such that no two such joints are within 15 metres of each other in the complete stranded conductor.

15.03.05 The standard length of the conductor shall be 1600 meters for conductor and 2x2000 metres for earth wire. A tolerance of ± 5% on the standard length offered by the bidder shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths. Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of random lengths shall not be more than 10% of the total quantity ordered.

15.04.00 **CONDUCTOR ACCESSORIES**

15.04.01 **Mid Span Compression Joint for Conductor**

As per details given in IS:2121 Part-2..

15.04.02 **Repair Sleeve**

Repair Sleeve of compression type shall be used to repair conductor with not more than two strands broken in the outer layer. The sleeve shall be manufactured from 99.5% pure aluminium and shall have a smooth surface. The repair sleeve shall comprise of two pieces with a provision of seat for sliding of the keeper piece. The edges of the seat as well as the keeper piece shall be of rounded that the conductor strands are not damaged during installation.

15.04.03 The Bidder shall clearly specify the before and after compression dimensions of the mid span compression joint and repair sleeve for owner's review. The compression pressure shall also be indicated by the Bidder.

15.04.04 **Vibration Damper for conductor and Earthwire**

A) Vibration dampers of 4 R-Stock bridge type with four (4) different resonance spread within the specified aeolian frequency bandwidth shall be used at all suspension and tension points on each span to damp out the Aeolean vibrations of the conductors to the specified level as mentioned hereinafter. Two dampers minimum on each side per conductor/earthwire shall be used at tension points and one damper minimum on each side per conductor at suspension points for ruling design span.

B) The clamp of the vibration damper shall be made of high strength aluminium alloy of type LM-6 or equivalent.

C) The messenger cable shall be made of high strength galvanised steel/stainless steel with a minimum strength of 135 kg/mm^2. It shall be of pre-formed and post-formed quality in order to prevent subsequent droop of weight and to maintain consistent flexural stiffness of the cable in service. The number of strands in messenger cable shall be 19. The messenger cable other than stainless steel shall be hot dip galvanised in accordance with the recommendations of IS:4826-1979 for heavily coated wires.

D) The manufacturer must indicate the clamp bolt tightening torque to ensure that the slip strength of the clamp is maintained between 2.5 KN and 5KN. The clamp when

installed on the conductor shall not cause excessive stress concentration on the conductor leading to permanent deformation of the conductor strands and premature fatigue failure in operation.

E) The vibration damper for conductor shall not have magnetic power loss more than 0.5 watt at 350 amps at 50 Hz alternating current.

F) The vibration analysis of the system, with and without damper and dynamic characteristics of the damper shall have to be submitted by the Bidder .

G) The damper placement chart shall be submitted by the Bidder. All the placement charts should be duly supported by relevant technical documents and sample calculations.

H) The damper placement charts shall include the following:

i) Location of the dampers for various combinations of spans and line tensions clearly indicating the number of dampers to be installed per conductor/earthwire per span.

ii) Placement distances clearly identifying the extremities between which the distances are to be measured.

iii) Placement recommendation depending upon type of suspension clamp (viz Free centre type, Armour grip type, etc.)

iv) The influence of mid span compression joints, repair sleeves and armour rods (standard and AGS) in the placement of dampers.

15.05.00 **EARTHWIRE ACCESSORIES**

15.05.01 Mid Span Compression Joint for Earthwire

It shall be used for joining two lengths of earthwire. The joint shall be made of mild steel. The steel sleeve should not crack of fail during compression in it or service period. The Brinnel Hardness of steel should not exceed 200. The steel sleeve shall be hot dip galvanised. The joints shall not permit slipping off, damage to , of failure of the complete earthwire or any part thereof at a load not less than 95% of the ultimate tensile strength of the earthwire. The joint shall have resistivity less than 75% of resistivity of equivalent length of earthwire. The details of the joint shall be submitted for owners approval.

15.05.02 **Vibration Damper For Earthwire**

Refer Clause 16.04.04 detailed above.

15.05.03 **Flexible Copper Bond**: As detailed in is:2121 part3.

15.05.04 Suspension Clamp for Earthwire : As Detailed in IS:2121 Part3

15.05.05 **Tension Clamp for Earthwire**

The details shall be as per IS:2121 part-3. Only Compression type tension clamp shall be used to hold galvanised steel earthwire. Anchor shackle shall be supplied which shall be suitable for attaching the tension clamp to strain plates. The strain plates supplied with the towers will have a minimum thickness of 8 mm with a hole

of 17.5 mm diameter. Suitable lugs for jumper connection shall also be supplied alongwith necessary bolts and nuts.

15.06.00 **HARDWARE FITTINGS**

15.06.01 The hardware fittings shall be as per the specification and IS/IES standards

15.06.02 Each hardware fittings shall be supplied complete in all respects and include the following hardware parts:

a) Ball hook for suspension hardware fittings suitable for attaching to V-hanger of the tower. Anchor shackle shall be supplied, which shall be suitable for attaching the tension hardware fittings to strain plate, of the tower.

b) Suitable yoke plates

c) Suspension and dead end assembly to suit conductor size.

d) Other necessary fittings such as eye links, ball clevis, socket clevis, clevis eye, U-clevis, ball link, arcing horn etc. to make the hardware fittings complete.

e) 2.5% extra fasteners shall be supplied along with the hardware fittings.

f) Socket fittings shall be provided with only R-shaped security clip in accordance with IS-2486 (part-II).

15.07.00 **ANTI FOG DISC INSULATOR**

15.07.01 The size of disc insulator, the number to be used in different type of strings, their electromechanical strength and minimum creepage distance shall be as follows :

Type of String	Size of disc insulator (mm)	Min. creepage distance of each disc (mm)	No. of standard discs	Electro-mechanical strength of insulator string (kN)
Single Suspension	255/280 x 145	430	1x 23	120
Double Suspension	-do-	-do-	2x 24	2 x 120
Double tension	-do-	-do-	2x 24	2 x 120
Single tension	-do-	-do-	1x 24	120

Note: Single Suspension (Pilot) string will be used for jumpers of tension type towers. It will be similar to single suspension type except the clamp of the conductor.

A) Disc Insulator: The insulator shall be pin and cap ; ball and socket type. The disc insulator shall conform to IS:731.

B) Ball and Socket Designation

The dimensions of the balls and sockets shall be of 20 mm designation, for 90KN/120KN disc insulator in accordance with the standard dimensions stated in IS:2486-(Part-II)/IEC:120.

As alternate contractor may also offer long rod composite insulator for the above application.

15.07.02 **Materials**

A) Porcelain : The porcelain used in the manufacture of shells shall be sound, free from defects thoroughly vitrified and smoothly glazed.

B) Glaze: The finished porcelain shall be glazed in brown colour. The glaze shall cover all exposed parts of he insulator and shall have a good lustre, smooth, surface and good performance under the extreme weather conditions of a tropical climate. It shall not be cracked or chipped by ageing under the normal service conditions. The glaze shall have the same co-efficient of expansion as of the porcelain body throughout the working temperature range.

C) Toughened Glass: In case of glass insulator, the glass used for the shells shall be sound, free from defects such as flows, bubbles, inclusions etc. and be of uniform toughness over its entire surface. All exposed glass surfaces shall be smooth.

D) Cement: Cement used in the manufacture of the insulator shall not cause fracture by expansion or loosening by contraction. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as small and uniform as possible. Proper care shall be taken to correctly centre and locate individual parts during cementing.

E) Pins and Caps: Pins and Caps shall be made of drop forged steel and malleable cast iron/spheriodal graphite iron/drop forged steel respectively, duly hot dip galvanised and shall not be made by jointing, welding, shrink fitting or any other process from more than one piece of material.

F) Security Clips: Security clips shall be made of good quality stainless steel or phosphor bronze as per IS:1385-1968 2.5% extra Security clip shall be provided.

15.07.03 OPTICAL GROUND WIRE AND ACCESSORIES

General

This specification covers the provision of one peak of 400kV tower with Optical Fiber (OPGW). This optical fiber cable will be connected to suitable optical line terminal and multiplex equipment to form part of the Plant's overall communications transmission system. Any expected variation shall be clearly identified in the Bidder's Proposal. Bidder to ensure that optical fiber characteristic of the OPGW cable to be supplied shall be compatible with the existing OPGW cable if any.

Physical Characteristic

Dual-Window Single mode (DWSM), G.652D optical fibres (minimum 24 fibres) shall be provided in the fibre optic cables. DWSM optical fibres shall meet the requirements defined in Table 1-1(a).

Attenuation

The attenuation coefficient for wavelengths between 1525 nm and 1575 nm shall not exceed the attenuation coefficient at 1550 nm by more than 0.05 dB/km. The attenuation coefficient between 1285 nm and 1330 nm shall not exceed the attenuation coefficient at 1310 nm by more than 0.05 dB/km. The attenuation of the fibre shall be distributed uniformly throughout its length such that there are no point discontinuities in excess of 0.10 dB. The fibre attenuation characteristics specified in table 1-1 (a) shall be "guaranteed" fibre attenuation of any & every fibre reel. The overall optical fibre path attenuation shall not be more than calculated below:

- Maximum attenuation @ 1550nm: 0.21 dB/km x total km + 0.05 dB/splice x no. of splices + 0.5 dB/connector x no. of connectors
- Maximum attenuation @ 1310nm: 0.35dB/km x total km + 0.05 dB/splice x no. of splices + 0.5 dB/connector x no. of connectors

Construction

The OPGW (Optical Ground Wire) cable is proposed to be installed on the EHV transmission lines. The design of cable shall account for the varying operating and environmental conditions that the cable shall experience while in service. The OPGW cable to be supplied shall be designed to meet the overall requirements of all the transmission lines. The Bidder shall design the OPGW requirements to suit each span in the system, based on the applicable drawings and field surveys. The Bidder's proposal shall stipulate the characteristics of the OPGW required for each span in the system.

Optical Fibre Identification

Individual optical fibres within a fibre unit and fibre units shall be identifiable in accordance with EIA/TIA 598 or IEC 60304 or Bellcore GR-20 colour-coding scheme.

Colouring utilized for colour coding optical fibres shall be integrated into the fibre coating and shall be homogenous. The colour shall not bleed from one fibre to another and shall not fade during fibre preparation for termination or splicing.

Each cable shall have traceability of each fibre back to the original fibre manufacturer's fibre number and parameters of the fibre. If more than the specified number of fibres is included in any cable, the spare fibres shall be tested by the cable manufacturer and any defective fibres shall be suitably bundled, tagged and identified at the factory by the vendor.

Table1-1(a)
DWSM Optical Fibre Characteristics

Fibre Description:	Dual-Window Single-Mode
Mode Field Diameter:	8.6 to 9.5 µm (± 0.6µm)
Cladding Diameter:	125.0 µm ± 1 µm
Mode field concentricity error	≤ 0.6µm
Cladding non-circularity	≤ 1%
Cable Cut-off Wavelength λ_{cc}	≤ 1260 nm
1550 nm loss performance	As per ITU-T G.652 D
Proof Test Level	≥ 0.69 Gpa
Attenuation Coefficient:	@ 1310 nm ≤ 0.35 dB/km @ 1550 nm ≤ 0.21 dB/km
Chromatic Dispersion; Maximum: Zero Dispersion Wavelength: Zero Dispersion Slope:	18 ps/(nm x km) @ 1550 nm 3.5 ps/(nm x km) 1288-1339nm 5.3 ps/(nm x km) 1271-1360nm 1300 to 1324nm 0.092 ps/(nm2xkm) maximum
Polarization mode dispersion coefficient	≤ 0.2 ps/km^½
Temperature Dependence:	Induced attenuation ≤ 0.05 dB (-60°C - +85°C)
Bend Performance:	@ 1310 nm (75±2 mm dia Mandrel), 100 turns; Attenuation Rise ≤ 0.05 dB @ 1550 nm (30±1 mm radius Mandrel), 100 turns; Attenuation Rise ≤ 0.05 dB @ 1550 nm (32±0.5 mm dia Mandrel, 1 turn; Attenuation Rise ≤ 0.50 dB

Buffer Tube Loose tube construction shall be implemented. The individually coated optical fibre(s) shall be surrounded by a buffer for protection from physical damage during fabrication, installation and operation of the cable. The fibre coating and buffer shall be strippable for splicing and termination. Each fibre unit shall be individually identifiable utilizing colour coding. Buffer tubes shall be filled with a water-blocking gel.

Optical Fibre Strain & Sag-Tension chart

The OPGW cable shall be designed and installed such that the optical fibres experience no strain under all loading conditions defined in IS 802. Zero fibre strain condition shall apply even after a 25 year cable creep.

While preparing the Sag-tension charts for the OPGW cable the following conditions shall be met:

- The Max Allowable Tension (MAT) / max strain shall be less than or equal to the MWT/ Strain margin of the cable.
- The sag shall not exceed the earth wire sag in all conditions.
- The Max Allowable Tension shall also be less than or equal to 0.4 times the UTS.
- The 25 year creep at 25% of UTS (creep test as per IEEE 1138) shall be such that the 25 year creep plus the cable strain at Max Allowable Tension (MAT) is less than or equal to the cable strain margin.
- The everyday tension (EDT) shall not exceed 20% of the UTS for the OPGW cable.

2.13.01
The Sag-tension chart of OPGW cable indicating the maximum tension, cable strain and sag shall be calculated and submitted for owners review.

Cable Materials

The materials used for optical fibre cable construction, shall meet the following requirements:

Filling Materials

The interstices of the fibre optic unit and cable shall be filled with a suitable compound to prohibit any moisture ingress or any water longitudinal migration within the fibre optic unit or along the fibre optic cable. The water tightness of the cable shall meet or exceed the test performance criteria as per IEC 60794-1-F-5.

The filling compound used shall be a non-toxic homogenous waterproofing compound that is free of dirt and foreign matter, nonhygroscopic, electrically nonconductive and non-nutritive to fungus. The compound shall also be fully compatible with all cable components it may come in contact with and shall inhibit the generation of hydrogen within the cable.

The waterproofing filling materials shall not affect fibre coating, colour coding, or encapsulant commonly used in splice enclosures, shall be dermatologically safe, non-staining and easily removable with a non-toxic cleaning solvent.

Metallic Members

When the fibre optic cable design incorporates metallic elements in its construction, all metallic elements shall be electrically continuous.

Optical Ground Wire (OPGW)

OPGW cable construction shall comply with IEEE-1138, 2009. The cable provided shall meet both the construction and performance requirements such that the ground wire function, the optical fibre integrity and optical transmission characteristics are suitable for the intended purpose. The cable shall consist of optical fibre units as defined in this specification. There shall be no factory splices

within the cable structure of a continuous cable length.

The composite fibre optic overhead ground wire shall be made up of multiple buffer tubes embedded in a water tight aluminium/aluminium alloy/stainless steel with aluminium coating protective central fibre optic unit surrounded by concentric-lay stranded metallic wires in single or multiple layers. Each buffer tube shall have maximum 12 no. of fibres. All fibres in single buffer tube or directly in central fibre optic unit is not acceptable. The dual purpose of the composite cable is to provide the electrical and physical characteristics of conventional overhead ground wire while providing the optical transmission properties of optical fibre.

Central Fibre Optic Unit

The central fibre optic unit shall be designed to house and protect multiple buffered optical fibre units from damage due to forces such as crushing, bending, twisting, tensile stress and moisture. The central fibre optic unit and the outer stranded metallic conductors shall serve together as an integral unit to protect the optical fibres from degradation due to vibration and galloping, wind and ice loadings, wide temperature variations, lightning and fault current, as well as environmental effects which may produce hydrogen.

The OPGW design of dissimilar materials such as stainless steel tube with aluminium or aluminium –clad-steel wire strands are not allowed. Central fibre optic unit may be of aluminium or stainless steel tube with aluminium protective coating. In case of aluminium protective coating, the coating must completely cover the tubes leaving no exposed areas of tubing that can make electrical contact either directly or indirectly through moisture, contamination, protrusions, etc with the surrounding stranded wires. The tube may be fabricated as a seamless tube, seam welded, or a tube without a welded seam.

Basic Construction

The OPGW cable construction shall conform to the applicable requirements of this specification, applicable clauses of IEC 61089 related to stranded conductors and Table given below for OPGW Mechanical and Electrical Characteristics. In addition, the basic construction shall include bare concentric-laystranded metallic wires with the outer layer having left hand lay. The wires may be of multiple layers with a combination of various metallic wires within each layer. The direction of lay for each successive layer shall be reversed. The finished wires shall contain no joints or splices unless otherwise agreed to by the Employer and shall conform to all applicable clauses of IEC 61089 as they pertain to stranded conductors.

The wires shall be so stranded that when the complete OPGW is cut, the individual wires can be readily regrouped and then held in place by one hand.

Breaking Strength

The rated breaking strength of the completed OPGW shall be taken as no more than 90 percent of the sum of the rated breaking strengths of the individual wires,

calculated from their nominal diameter and the specified minimum tensile strength.

The rated breaking strength shall not include the strength of the optical unit. The fibre optic unit shall not be considered a load bearing tension member when determining the total rated breaking strength of the composite conductor.

Electrical and Mechanical Requirements

Below table provides OPGW Electrical and Mechanical Requirements for the minimum performance characteristics.For the purposes of determining the appropriate Max Working Tension limit for the OPGW cable IS 802:1995 and IS 875: 1987 shall be applied.

OPGW Electrical and Mechanical Requirements

Everyday Tension	≤ 20% of UTS of OPGW
D.C. Resistance at 20ºC:	< 1.0 ohm/Km
Short Circuit Current	≥ 6.32 kA for 1.0 second

Since OPGW shall be located at the top of the transmission line support structure, it will be subjected to Aeolian vibration, Galloping and Lightning strikes. It will also carry ground fault currents. Therefore, its electrical and mechanical properties shall be same or similar as those required of conventional ground conductors.

Assemblies and Line Accessories

a. General

The OPGW assemblies and line accessories shall consist of the hardware indicted herein. All hardware and accessories shall be made of aluminum, aluminum alloy, malleable iron, steel (metal mold of drop forging process), stainless steel, or non-ferrous metal, unless otherwise specified. In addition, all hardware and accessories shall have an ultimate tensile strength equal to or exceeding the rated ultimate tensile strength of the overhead ground wire. All metal shall be free from burrs, sharp edges, lumps and dross and shall be smooth so that interconnecting parts will fit properly, and so that the parts maybe assembled and readily.

All bolts and other fasteners shall be installed according to manufacturer's recommendations. Materials no specifically covered herein by detailed specifications shall be of standard commercial quality suitable for the intended use. The Contractor shall determine the most suitable type of clamp to be used at each and every transmission tower location.

b. Suspension Clamps

The suspension clamps for the OPGW shall be of bolt or performed type. The bolt type suspension clamps shall be complete with bolts, keeper pieces, and other

required parts. Each clamp shall be capable of holding the OPGW without slipping under an unbalanced tension of 25% of the ultimate tensile strength of the OPGW.

c. Tension Clamps

The tension clamps shall be of bolt or performed type, and cable of holding the OPGW without slipping or damaging the OPGW under a tension of 75% of the OPGW ultimate tensile strength. A suitable piece shall be of same material as the clamp body. Bolts, nuts and washers shall be hot-dipped galvanized malleable iron or steel.

d. Grounding clamps and Parallel Groove Clamp

Each clamp shall be capable holding the OPGW using bolts and nuts.

e. Vibration dampers

Stock bridge type vibration dampers, suitable for use on the OPGW shall be supplied. The dampers shall have an aluminum, clamping bolts, or other suitable device, on the galvanized wire between the weights, and be suitable for attachment to the OPGW. The damper clamp shall be designed to permit installation and removal using hot line tools. Each damper weight, subject to the accumulation of moisture, shall be provided with one drain hold positioned at the bottom of the weight when the damper is installed in the vertical plane. Damper weights shall be made of hot dip galvanized case iron or zinc.

f. Armor rods

The armor rods for the OPGW shall be of the preformed type. They shall be smooth and fee from corrosion, splitting, cracking, or any other defects. They shall be designed to effectively protect the OPGW from fatigue caused by vibration.

Armor rods may or may not be employed, as per OPGW manufacturer recommendations, however the use of armor rods is preferred by the Employer.

g. The joint box shall be air-tight, water-proof. The cover shall be securely fastened to the case by non-loosening fasteners. Both the case and the cover shall be made of non-corrosive aluminum alloy or hot dip galvanized steel or approved materials. The joint box shall be sufficiently rugged and sturdy to withstand outdoor climatic and environmental conditions. The joint box shall accommodate sheath protected arc-fusion splices and up to 1.5 m of additional fiber on each side of the splice; guides shall be provided to keep the extra fiber well above the allowable bending radius of the fiber. The spliced parts of the optical fiber within the joint box shall be reinforced and free from tension after completion of the splicing.

The contractor shall provide one set of terminating materials with every joint box for optical fiber connection.

All splices shall be encased in Fibre Optic Splice Enclosures. Suitable splice enclosures shall be provided to encase the optical cable splices in protective, moisture and dust free environment. Splice enclosures shall comply with ingress protection class IP 66 or better. The splice enclosures shall be designed for the storage and protection of required number of optical fibre splices and equipped with

sufficient number of splice trays for splicing all fibres in the cable. No more than 12 fibres shall be terminated in a single splice tray. They shall be filled with suitable encapsulate that is easily removable should re-entry be required into the enclosures.

Splice enclosures shall be suitable for outdoor use with each of the cable types provided under this contract. Splice enclosures shall be appropriate for mounting on transmission line towers above anti-climb guard levels at about 10 metres from top of the tower and shall accommodate pass-through splicing. Contractor shall be responsible for splicing of fibres and installation of splice enclosures.

15.07.04 **Hot Line Maintenance**

The insulators offered shall be suitable for employment of hot line maintenance technique so that the usual hot line operations can be carried out with ease, speed and safety.

Bidders shall indicate the methods generally used in the routine hot and dead line maintenance of HV lines for which similar insulator have been supplied by them. Bidders shall also indicate the recommended periodicity of such maintenance.

16.00.00 TESTS FOR TRANSMISSION LINE MATERIAL

16.01.00 GENERAL REQUIREMENTS

16.01.01 The materials shall conform to all the type tests as per relevant standards. The acceptance, routine tests and tests during manufacturer shall be carried out on the line material as per relevant standards.

SECTION- 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections of tender documents and are not exclusive. However, in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

3.1 PROJECT DETAILS

	Particular	Details
a)	Customer	NTPC Ltd.
b)	Engineer/Consultant/ Inspector	NTPC Ltd.
c)	Project Title	LARA SUPER THERMAL POWER PROJECT (2x800 MW) : 400kV Switchyard at NTPC LARA STAGE-II
d)	Project Location	Place: Village Lara, bounded by villages Lara, Chhapora & Lohakhan on the western side of Odisha State boundary District: Raigarh State: Chhattisgarh
e)	Latitude & Longitude	**400kV S/s at LARA STAGE-II:** North: 21°45'25" East: 83°27'26"
f)	Nearest Railway Station	Raigarh Railway Station (on South East Central Railway, Howrah-Bilaspur Broad Gauge)
g)	Distance of project location from the Railway station	30 Km (approx.)
h)	Nearest Major Town	Raigarh city
i)	Distance of the town from the project site	30 Km.
j)	Nearest commercial airport	Raipur
k)	Distance of airport from the project site	50 Km
	SITE CONDITIONS (for design purposes)	
a)	Design ambient temperature	50°C
b)	Maximum Relative humidity	95 %
c)	Height above mean sea level	Less than 1000 meters

d)	Pollution Severity	Heavily polluted
e)	Criteria for Wind Resistant design of structures and equipment	Standard Applicable - IS 875 (Part 3) 1987
f)	Basic Wind speed "Vb" at ten meters above the mean ground level.	44 m/ sec
g)	Category of terrain	Cat –2
h)	Risk Coefficient "K1"	1.07

3.1.1 **SYSTEM PARAMETERS:**

Sl.No.	Parameters	400 kV
1	i) Highest system voltage	420 kV rms
	ii) Rated / Nominal system voltage	400kV rns
2	Lightning Impulse voltage (ph to earth & between phases)	±1425kVp
	Across Isolating distance	1425(+240) KVp
3	Switching impulse voltage (ph to earth)	±1050kVp
	Across Isolating distance	900(+345) KVp
4	Power frequency withstand for 1 min (rms) to earth & between phases	520 & 610kV rms as per IEC
5	Max. fault level (1 sec.)	63 kA
6	Rated dynamic with stand current	157.5 kAP
7	PD Level	<5 pico-coulomb
8	Rated frequency	50Hz
9	Rated Ambient Temperature	50.deg.Cen
10	System earthing	Effectively earthed
11	Min.creepage (25mm/kV)	10500mm
12	Seismic acceleration	0.3g
13	Max. radio interference for freq. between 0.5 MHz and 2.0 MHz at 266 kV rms	1000 microvolt
14	Corona extinction voltage	Not less 320kV rms

3.1.2 **AUXILIARY POWER:**

Sl. No.	**Nominal Connection Voltage**	**Variations in Voltage**	**Frequency**	**Phase**	**Neutral**
1	415V,	±10%	50 (+3% -5%)	3Phase , 4 Wire	Solidly Earthed
2	240V	±10%	50 (+3% -5%)	1 phase	Solidly Earthed
3	220V	(+) 10% to (-) 15%.	-	DC	-

Combined variation of voltage and frequency shall be + 10%. Design fault level of 415V system shall be restricted to 50kA rms for 1 second.

The operational limits for variation of DC voltage are (+) 10% to (-) 15%.

3.1.3 The various minimum heights of the switchyard shall be as given below from plinth level:

Voltage	Equipment /1st Level	2nd Level	3rd Level	Peak
400kV	8000mm	16000mm	23000mm	8500mm

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550mm.

The minimum height of 400kV gantry for AIS shall be 16m+8.5 (peak). However intermediate gantry height for O/H connection to GT side shall be min 22m+8.5m (peak).

3.1.4 The minimum clearances for 400kV & 220 kV switchyards shall be as given below:

	400kV
Phase to earth clearance	3500 mm
Phase to phase clearance	4000 mm
Section clearance	6500 mm

3.2 INSTRUCTION TO BIDDERS:

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

It is recognized that the bidders may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the schedule, will not be considered as valid deviation.

Except for lighting fixtures, wherever a material or article is specified or defined by the name of a particular brand, Manufacturer or Vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition. For lighting fixtures, makes shall be as defined in Section-Lighting System.

Equipment furnished shall be complete in every respect with all mountings, fittings, erection hardware (on plinth/equipment structure) fixtures and standard accessories normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes, though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the switchyard unless specifically excluded shall

be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment under supply shall be inter-changeable with one another.

The bidder shall supply type tested (including special tests as per tech. specification) equipment and materials. The test reports shall be furnished by the bidder along with equipment/ material drawings. In the event of any discrepancy in the test reports, (i.e., if any test report is not acceptable due to any design/ manufacturing changes or due to non-compliance with the Technical Specification and/ or applicable standard), the tests shall be carried out without any additional cost implication to the BHEL. BHEL reserves the right to get any or all type/tests conducted/repeated.

3.3 CODES AND STANDARDS

The supplier is required to follow local statutory regulations stipulated in the latest amended Electricity Supply Act 1948 and Indian Electricity Rules 1956 (latest), NTPC safety codes, and other local rules and regulations.

In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following:

a) Indian Electricity Act
b) Indian Electricity Rules
c) Indian Explosives Act
d) Indian Factories Act and State Factories Act
e) Indian Boiler Regulations (IBR)
f) Regulations of the Central Pollution Control Board, India
g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India
h) Pollution Control Regulations of Department of Environment, Government of India
i) State Pollution Control Board.
(j) Rules for Electrical installation by Tariff Advisory Committee (TAC).
(k) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996
(l) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998
(m) Explosive Rules, 1983
(n) Petroleum Act, 1984
(o) Petroleum Rules, 1976,
(p) Gas Cylinder Rules, 1981
(q) Static and Mobile Pressure Vessels (Unified) Rules, 1981
(r) Workmen's Compensation Act, 1923
(s) Workmen's Compensation Rules, 1924
(t) NTPC Safety Rules for Construction and Erection
(u) NTPC Safety Policy
(v) Any other statutory codes / standards / regulations, as may be applicable.

Unless covered otherwise in the specifications, the latest editions (as applicable as on the date of bid opening 03.03.2023), of the codes and standards given below shall also apply:

a) Bureau of Indian standards (BIS)
b) Japanese Industrial Standards (JIS)
c) American National Standards Institute (ANSI)
d) American Society of Testing and Materials (ASTM)
e) American Society of Mechanical Engineers (ASME)
f) American Petroleum Institute (API)
g) Standards of the Hydraulic Institute, U.S.A.
h) International Organization for Standardization (ISO)
i) Tubular Exchanger Manufacturer's Association (TEMA)
j) American Welding Society (AWS)
k) National Electrical Manufacturers Association (NEMA)
l) National Fire Protection Association (NFPA)
m) International Electro-Technical Commission (IEC)/ European Norm (EN)
n) Expansion Joint Manufacturers Association (EJMA)
o) Heat Exchange Institute (HEI)
p) IEEE standard
q) JEC standard

Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and
deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.

As regards highly standardized equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.

In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.

In case of any change in codes, standards & regulations between the date of bid opening (03.03.2023) and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.

3.4 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

The 400 kV system is being designed to limit the power frequency over voltage of 1.5 p.u. and the switching surge over voltage to 2.5 p.u. In 400 kV system the initial value of temporary over voltage could be 2.0 p.u. for 1-2 cycles. All the equipment/materials covered in this specification shall perform all its function satisfactorily without undue strain, restrike etc. under such over voltage conditions.

All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (not applicable for this project) short circuit etc for the equipment.

The equipment shall also comply with the following:

a) All equipments shall be suitable for hot line washing.
b) To facilitate erection of equipment, all items to be assembled at site shall be "match marked".
c) Piping, if any, between equipment control cabinet or operating mechanism to marshalling box of the equipment shall bear proper identification to facilitate the connection at site.
d) All equipment shall be supplied with necessary inter-pole cabling, and its cost shall be included in the cost of equipment.

3.5 ENGINEERING DATA

3.5.1 Drawings

All drawings submitted by the supplier including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required. The dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

After the approval of the drawings, further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

The review of these data by the purchaser will cover only general conformance of the data to the specification and documents, interfaces with the equipment provided under specification, external connections and of the dimensions which might affect plan layout. This review by the purchaser may not indicate a thorough review of the dimensions, quantities and details of the equipment, material, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the purchaser shall not be considered by the contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent

of the Contract and such changes will again be subject to approval by the Purchaser. Approval of Contractor's drawing or work by the Purchaser shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

All engineering data submitted by the contractor after final process including review and approval by the purchaser shall form part of the contract document and the entire work performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the purchaser in writing.

3.5.2 Approval Procedure

The following procedure for submission and review/approval of the drawings, data-reports, information, etc. shall be followed by Contractor:

a. All data/information furnished by Vendor in the form of drawings, documents, Catalogues or in any other form for NTPC's information/interface and/or review and approval are referred by the general term "drawings".

b. The 'Master drawings list' indicating titles, Drawing Number, Date of submission and approval etc. shall be finalised mutually between Contractor and Employer before the award of contract. This list shall be updated if required at suitable interval during detailed engineering.

c. All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his subvendor along with his purchase order for subvendor's compliance.

d. Contractor shall submit all the drawings in five (5) copies for review of Employer. Employer shall forward their comments within four (4) weeks of receipt of drawings.

e. Upon review of each drawings, depending on the correctness and completeness of the drawings, the same will be categorised and approval accorded in one of the following categories:

CATEGORY I	Approved
CATEGORY II	Approved subject to incorporation of comments/modification as noted. Resubmit revised drawing incorporating the comments
CATEGORY III	Not approved. Resubmit revised drawings for Approval after incorporating comments/modifications as noted
CATEGORY IV	For information and records

f. Contractor shall resubmit the drawings approved under Category II, III within one (1) week of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of description or marked up in the drawing identifying the same with relevant revision number enclosed in a triangle (e.g 1.2.3. etc.).

g. In case Contractor does not agree with any specific comment, he shall furnish the explanation for the same to Employer consideration. In all such cases Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.

h. It is the responsibility of the Contractor to get all the drawings approved in the Category I or IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.

i. Contractor shall not make any changes in the portion of the drawing other than those commented. If changes are required to be made in the portions already approved, the Contractor shall resubmit the drawings identifying the changes (along with reasons for changes) for Employer's review and approval. **Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.**

j. Approval of drawings will not in any way relieve the Contractor of his obligations of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if such equipment is later found to be defective.

3.5.3 Erection Drawings.

a. Contractor shall furnish erection drawings for the guidance or commencement of erection or the first shipment, whichever is earlier. These shall generally comprise of fabrication/assembly drawings, various component/part details drawing, assembly, clearance data requirements, etc. The drawings shall contain details of components/ equipment with identification number, match marks, bill of materials, assembly procedures etc.

b. For all major equipment apart from above details, assembly sequence and instructions with check-lists shall be furnished in the form of erection manuals.

3.5.4 Instruction Manual

a. The Contractor shall submit to the Employer preliminary instruction manuals for all the equipments for review. The final instructions manuals incorporating Employer's comments and complete in all respect shall be submitted at least sixty (60) days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipments, the transportation, storage, installation, testing, operation and maintenance procedures, etc. separately for each component/equipment along with log record format. These instruction manuals shall be submitted in five (5) copies for approval.

b. If after commissioning and initial operation of the plant, the instruction manuals require any modifications/additions/changes, the same shall being corporate and the updated final instruction manuals shall be submitted.

c. The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall have sufficient details to enable the Employer to maintain, dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant/equipment, including erection, testing, commissioning, operation, maintenance dismantling and repair. Each manual shall also include a complete set of approved drawings together with performance/rating curves of the equipment and test certificates, wherever applicable. The contract shall not be considered completed for

purpose of taking over until such instructions and drawings have been supplied to the Employer.

d. A separate section of the manual shall be for each size/type of equipment and shall contain a detailed description of construction and operation, together will all relevant pamphlets.

e. The manuals shall include the following
a) List of spare parts along with their drawing and catalogues and procedure for ordering spares.
b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation.

f. Where applicable, fault location charts shall be included to facilitate finding the cause of mal-operation or break down.

g. A collection of the manufacturer's standard leaflets will not accepted to be taken as a compliance of this clause. The manual shall be specifically compiled for the concerned project.

3.5.5 ERECTION MANUALS

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of a particular equipment/system. The erection manual should contain the following as a minimum:

a) Erection strategy.
b) Sequence of erection.
c) Erection instructions.
d) Critical checks and permissible deviation/tolerances.
e) List of tools, tackles, heavy equipments like cranes, dozers, etc.
f) Bill of Materials
g) Procedure for erection and General Safety procedures to followed during erection/installation.
h) Procedure for initial checking after erection.
i) Procedure for testing and acceptance norms.
j) Procedure / Check list for pre-commissioning activities.
k) Procedure / Check list for commissioning of the system.
l) Safety precautions to be followed in electrical supply distribution during erection

3.5.6 OPERATION & MAINTENANCE MANUALS

a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.

b) The arrangement and contents of O & M manuals shall be as follows:

1) Chapter 1 - Plant Description: To contain the following sections specific to the equipment/system supplied

(a) Description of operating principle of equipment / system with schematic drawing / layouts.

(b) Functional description of associated accessories / controls. Control interlock protection write up.

(c) Integrated operation of the equipment alongwith the intended system. (This to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers).

(d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries.

(e) Design data against which the plant performance will be compared.

(f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets.

(g) Identification system adopted for the various components, (it will be of a simple process linked tagging system).

(h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume).

2) Chapter 2.0 - Plant Operation: To contain the following sections specific to the equipment supplied

(a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc.

(b) Limiting values of all protection settings.

(c) Various settings of annunciation/interlocks provided.

(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode.

(e) Do's and Don'ts related to operation of the equipment.

(f) Safety precautions to be taken during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions.

(g) Parameters to be monitored with normal value and limiting values.

(h) Equipment isolating procedures.

(i) Trouble shooting with causes and remedial measures.

(j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing.

(k) Routine Operational Checks, Recommended Logs and Records

(l) Change over schedule if more than one auxiliary for the same purpose is given.

(m) Preservation procedure on long shut down.

(n) System/plant commissioning procedure.

3) Chapter 3.0 - Plant Maintenance- To contain the following sections specific to the equipment supplied.

(a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population.

(b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment.

(c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc.
(d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.
(e) Preventive Maintenance schedules linked with running hours/calendar period along with checks to be carried out.
(f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done.
(g) Long term maintenance schedules
(h) Consumables list along with the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling.
(i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement.
(j) Tolerance for fitment of various components.
(k) Details of sub vendors with their part no. in case of bought out items.
(l) List of spare parts with their Part No, total population, life expediency & their interchangeability with already supplied spares to NTPC.
(m) List of mandatory and recommended spare list along with manufacturing drawings material specification & quality plan for fast moving consumable spares.
(n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares.
(o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied.

After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in table below. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer. If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Employer for records and number of copies shall be as mentioned in table below:

S. No.	Description of Drgs/Docs	No. of Prints	No. of CD ROMs/DVDs/Portable Hard Disk
1	Erection Manual	4 Sets	2
2	Operation & Maintenance manual i) First Submission	1 Sets	1
	ii) Final Submission	4 Sets	2

3.5.7 Final Submission of drawings and documents:

The Contractor shall furnish the following after approval of all drawings /documents and test reports:

a. List of drawings bearing the Employer's and Contractor's drawing number.

b. Three (3) bound sets along with 2 portable hard disk of all drawing.
c. All documents/designs in two (3) copies as noted above.
d. Contractor shall also furnish three (3) bound sets of all as-built drawings including the list of all as-built drawings bearing drawing numbers. The Contractor shall also furnish two (2) sets of CD-ROMs/ DVD/Portable hard disk of all as-built drawings as decided by the Employer.
e. The Contractor shall also furnish four (4) copies of instruction/ operations & maintenance manuals (after approval) for all the equipments.

3.5.8 TEST REPORTS

Two (2) copies of all test reports shall be supplied for approval before shipment of Equipment. The report shall indicate clearly the standard value specified for each test to facilitate checking of the reports. After final approval six (6) bound copies & 2 set of soft copies in portable hard disk of all type and routine test reports shall be submitted to Employer.

3.6 MATERIAL /WORKMANSHIP

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended and shall ensure satisfactory performance throughout the service life.

In case where the equipment, materials or components are indicated in the specification as “similar” to any special standard the purchaser shall decide upon the question of similarity. When required by the specification or when required by the purchaser the contractor shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Contractor.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the equipment supplied under the specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.
The equipment offered in the bid only shall be accepted for supply, with the minimum modifications as agreed/accepted.

3.7 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity' heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipment located in non-air-conditioned areas shall also be of same type.

SPACE HEATERS

The heaters shall be suitable for continuous operation at 230 V as supply voltage. On –off switch and fuse shall be provided.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centered in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conducting and electrical insulation properties or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in vitreous glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the compartments.

FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistance varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

Ventilation opening

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds.

Degree of Protection

The enclosure of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc. to be installed shall provide degree of protection as detailed here under:

a. Installed outdoor: IP- 55
b. Installed indoor in air conditioned area: IP-31
c. Installed in covered area: IP-52
d. Installed indoor in non-air-conditioned area where possibility of entry of water is limited: IP-41.
e. For LT Switchgear (AC & DC distribution Boards): IP-52 (Indoor), IP-54 (outdoor)

The degree of protection shall be in accordance with IS: 13947 (Part –I) / IEC-947 (Part-I) / IS 12063/IEC 529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

PRESERVATIVE SHOP COATING

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirements covered in the relevant part of the Technical Specification.

Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

3.8 RATING PLATES, NAME PLATES AND LABELS

3.8.1 Each equipment shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer’s name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.

3.8.2 Such nameplates or labels shall be of white non-hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.

3.8.3 The rated current, extended current rating and rated thermal current shall be clearly indicated in the name plate in case of current transformer.

3.8.4 Rated voltage, voltage factor and intermediate voltage shall be clearly indicated on the nameplate in case of capacitor voltage transformer.

3.8.5 Each switch shall a clear inscription identifying its function. Switches shall also have a clear inscription of each position indication.

3.8.6 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.

3.8.7 All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.

3.9 GALVANISING:

3.9.1 The galvanised surface shall consist of a continuous film adhering to the steel. The finished surface shall be clean and smooth, and shall be free from defects like dissolved patches, base, spot, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off, etc. The presence of any of these defects shall render the material liable to rejection.

3.9.2 All exposed ferrous parts shall be hot dip galvanised as per IS:2629 & IS:2633, Galvanising shall be uniform, smooth continuous and free from acid spots. Should the galvanising of the sample be found defective, the entire batch of steel shall have to be re-galvanised at Contractor's cost. The amount of zinc deposit shall be not less than 610 gms. per sq.m. of surface area and in addition, the thickness of zinc at any spot shall not be less than 85 microns. The Employer reserves the right to measure the thickness of zinc deposit by Elkometer or any other instrument acceptable to Employer and reject any component which shows thickness of zinc at any location less than 85 microns. The testing on the galvanised materials shall be carried out as per IS:2633.

3.9.3 The amount of zinc deposit over threaded portion of the bolts, nuts and screws shall not be less than 300 gms. per sq. meter of surface area. The amount of zinc deposit on washers shall not be less than 340 gms. per sq. meter of surface area. The threads having extra deposit of zinc shall be removed by die cutting after the completion of galvanising. The removal of extra zinc shall be carefully done so that threads shall have minimum deposits of zinc on them as specified.

3.10 PAINTING

Unless explicitly stated in relevant chapters of the specification, the painting of all electrical
equipment shall be as follows:
Epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be acceptable for finish coat. Paint shade shall be as per technical specification.

3.11 QUALITY ASSURANCE PROGRAMME

3.11.1 The Contractor shall adopt suitable quality assurance programme to ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his subcontractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001/IS- 14001.

A quality assurance programme of the contractor shall generally cover the following:

i. His organisation structure for the management and implementation of the proposed quality assurance programme
ii. Quality System Manual
iii. Design Control System
iv. Documentation Data Control System

v. Qualification data for Bidder's key Personnel.
vi. The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
vii. System for shop manufacturing and site erection controls including process, fabrication and assembly.
viii. Control of non-conforming items and system for corrective actions and resolution of deviations.
ix. Inspection and test procedure both for manufacture and field activities.
x. Control of calibration and testing of measuring testing equipments.
xi. System for Quality Audits.
xii. System for identification and appraisal of inspection status.
xiii. System for authorising release of manufactured product to the Employer.
xiv. System for handling storage and delivery.
xv. System for maintenance of records, and
xvi. Furnishing quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed as Annexure-I.

3.12 GENERAL REQUIREMENTS - QUALITY ASSURANCE

3.12.1 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award.

3.12.2 Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media e.g. floppy or E-mail in addition to hard copy, for review. Once the same is finalised, hard copies shall be submitted for approval. After approval the same shall be submitted in compiled form on CD ROM.

3.12.3 Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control Organisation, during various stages of site activities starting from receipt of materials/equipment at site.

3.12.4 The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference

documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed.

3.12.5 These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.

3.12.6 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of MDCC.

3.12.7 All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.

3.12.8 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer.

3.12.9 All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing.

3.12.10 All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.

3.12.11 Test results or qualification tests and specimen testing shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative.

3.12.12 For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipments/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding.

3.12.13 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.

3.12.14 No welding shall be carried out on cast iron components for repair.

3.12.15 Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.

3.12.16 All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.

In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 50mm shall be ultrasonically tested.

The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI). All the subcontractor proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval. The contractor’s proposal shall include vendor’s facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified subcontractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre-awards discussion and identified in "DR" category prior to any procurement. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.

3.12.17 For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor’s purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the subcontractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor’s quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc.

3.12.18 Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor’s or their sub vendor’s quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.

3.12.19 The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractors and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipments conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.

3.12.20 Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.

3.12.21 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.

3.12.22 Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.

3.13 Environmental Stress Screening

All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub – contractor should meet the following.

1. The Contractor / Sub – contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub – contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization.

Or

In case the Contractor / Sub – contractor do not have any established procedure to eliminate infant mortile components then two or 10% whichever is less, most densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.

Elevated Temperature Test Cycle

During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50° C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.

In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.

Burn In Test Cycle

The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.

The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems, the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.

The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.

3.14 QUALITY ASSURANCE DOCUMENTS

The Contractor shall be required to submit two hard copies and two sets on CDROM of the following Quality Assurance Documents as identified in respective quality plan with tick (√) mark.

Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before dispatch. However, CD-ROM may be issued not later than three weeks.

3.14.1 Typical contents of Quality Assurance Document are as below: -

i) Quality Plan,
ii) Material mill test reports on components as specified by the specification and approved Quality Plans.
iii) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.

iv) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
v) Heat Treatment Certificate/Record (Time- temperature Chart)
vi) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).
vii) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.
viii) Certificate of Conformance (COC) whoever applicable.
ix) MDCC

3.14.2 Similarly, the contractor shall be required to submit two hard copies and two sets on CD ROM of Quality Assurance Documents (in line with above) pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

3.14.3 Before dispatch/ commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

i) If the result of the review carried out by the Inspector of the Quality document (or applicable section) is satisfactory. The Inspector shall stamp the quality document (or applicable section) for release.
ii) If the quality document is unsatisfactory, the Supplier shall endeavour to correct the incompleteness, thus allowing finalizing the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.
i) If a decision is made for dispatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the dispatch of equipment.

3.15 TRANSMISSION OF QUALITY DOCUMENTS

As a general rule, two hard copies of the quality document and Two CD ROMs shall be issued to the Employer after the delivery date for the corresponding equipment. One set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Site.
For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than 3 weeks after the date of the last delivery similarly as stated above.

3.16 INSPECTION, TESTING & INSPECTION CERTIFICATE

3.16.1 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.

3.16.2 The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.

3.16.3 The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.

3.16.4 The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.

3.16.5 When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.

3.16.6 In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.

3.16.7 The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.

3.16.8 To facilitate advance planning of inspection in addition to giving inspection notice, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.

3.16.9 All inspection, measuring and test equipments used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipments in the presence of Project Manager / Inspector.

3.17 PACKAGING & TRANSPORTATION

Items shall be packed & dispatched separately to site i.e. to 400kV S/s at LARA SUPER THERMAL POWER PROJECT STAGE-II.

3.17.1 Packing, Marking and shipping

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Bidder shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.

Bidder shall ensure to affix RFID tags/Trackers on the item & punch the same before dispatch with RFID reader/BLE beacon & enter details of item associating with RFID tag no./Tracker no. For low value items QR code-based solution shall also be acceptable. Exact selection of type of tagging based on type & size of equipment/consignment/package will be decided during detail engineering.

Bidder to provide RFID tags/Trackers/QR code for all items being supplied to the Contractor under the contract of this project.

a) Each item identifiable with KKS / PGMA-DU / other identification scheme of the bidder/OEM/OES shall have a RFID/QR.
b) Even if the BOQ is identified in tonnage/ cumulative of multiple items, unique identification shall be provided for each item as mentioned above (Eg – GIS Duct, Gis bay module, Panels etc., however each sub item shall have its own RFID/equivalent). c) For items which are

interchangeable and dispatched together (eg Foundation bolts in a box / Identical beams in a single consignment), the entire consignment can be tagged with a single RFID if the software system has the capability to track partial
consumption (eg 100 bolts consumed from a package of 1000 bolts) from a consignment.

3.17.2 Insurance

a) The Contractor shall insure all shipments and works at his own expense for not less than the full replacement cost plus any additional cost for accelerated manufacturing of the replacement parts.

b) Loss or the damage to equipment during shipping or transportation to the site(s) or otherwise shall not constitute groups for claims for extension in time or for extra payment.

3.18 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

3.18.1 The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of IS:617 for connecting to equipment terminals and conductors of aluminium. In case the terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetallic liner.

3.18.2 The material of clamps and connectors shall be Galvanised mild steel for connecting to shield wire.

3.18.3 Bolts, nuts and plain washers shall be hot dip galvanised mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanised mild steel. The spring washers shall be electro-galvanised mild steel.

3.18.4 All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be rounded off to meet specified corona and radio interference requirements.

3.18.5 They shall have same current rating as that of the connected equipment. All current carrying parts shall be at least 10 mm thick. The connectors shall be manufactured to have minimum contact resistance.

3.18.6 Flexible connectors, braids or laminated strips shall be made up of copper/aluminium.

3.18.7 Current rating and size of terminal/conductor for which connector is suitable shall be put on a suitable sticker on each component which should last at least till erection time.

3.19 SPACERS

3.19.1 Spacers shall conform to IS: 10162. They shall be of non-magnetic material except nuts and bolts, which shall be of hot dip galvanised mild steel.

3.19.2 Spacers shall generally meet the requirements of clamps and connectors as specified above. Its design shall take care of fixing and removing during installation and maintenance.

3.19.3 In addition to the type tests as per IS: 10162, clamp slip test should have been conducted. In this test the sample shall be installed on test span of twin/quad bundle string at a tension of 44.2kN (4500 kg). One of the clamps when subjected to a longitudinal pull of 2.5kN (250 kg) parallel to the axis of conductor shall not slip, i.e. permanent displacement between conductor and clamp after test shall not exceed 1.0 mm. This test should have been performed on all other clamps of the sample.

3.20 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS, AND DISC INSULATORS

3.20.1 Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC: 137 while hollow column insulators shall be manufactured and tested in accordance with IEC 233/IS 5284. The support insulators shall be manufactured and tested as per IS: / IEC 168/IEC 273. The insulators shall also conform to IEC 815 as applicable.
Support insulators/ bushings/ hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

3.20.2 Porcelain used shall be homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Hollow porcelain should be in one integral piece in green & fired stage.

3.20.3 Glazing of the porcelain shall be uniform brown in colour, free form blisters, burns and other similar defects.

3.20.4 When operating at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or when operating at normal rated voltage.

3.20.5 The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall be lead to deterioration. All ferrous parts shall be hot dip galvanised.

3.20.6 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps, the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.

3.20.7 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued, porcelain parts by grinding and metal parts by machining. Insulator/ bushing design shall be such as to ensure a uniform compressive pressure on the joints.

3.20.8 In accordance with the requirement stipulated elsewhere, bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests and acceptance test/sample test in accordance with relevant standards.

3.21 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT.

3.21.1 All types of control cabinets, junction boxes, marshalling boxes, lighting panels, terminal boxes, operating mechanism boxes, Kiosks etc. shall generally conform to IS:5039, IS:8623 and IEC:439 as applicable.

3.21.2 **Mechanism Box/ Control Cabinet/ Kiosks:** A sheet steel (at least 2.5 mm thick), dust and vermin proof M.Box/CCC/CMB shall be provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP 55. One dummy terminal block in between each trip wire terminal shall be provided. At least 20% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber.

Painting of boxes shall be as follows,

- External surface : Chemical resistant epoxy zinc phosphate primer, MIO (Micaceious iron oxide) as intermediate paint followed by polyurethane finish paint **(RAL 5012 Blue)**
- Internal surface : Chemical resistant epoxy zinc phosphate primer followed by chemical & heat resistant **epoxy enamel white paint**.

3.21.3 **Junction Boxes:** The junction boxes shall be made of minimum 2 mm thick sheet steel. Gland plates shall be removable type and made of 3 mm thick sheet steel. The boxes shall be provided with detachable cover or hinged door with captive screws. Top of the box shall be arranged to slope towards the rear of the box. The box shall be **hot dip galvanised** and shall be provided with suitable neoprene gaskets to achieve requisite degree of protection. Adequate spacing shall be provided to terminate the external cables. The boxes shall be suitable for mounting on various types of steel structures. The terminal blocks provided shall be of 650 V grade, rated for 10 A for control cables. Suitable numbering for terminal blocks shall be done. In case of junction box for power cable, the box shall be rated for maximum current carrying capacity. Terminal blocks shall be of one piece, Klippon RSF-1 or ELMEX CSLT-1 type with insulating barriers.

3.21.4 The cabinets/boxes/kiosks/panels shall be free standing or wall mounting or pedestal mounting type. They shall have hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.

3.21.5 The degree of protection of of all the outdoor boxes shall not be less than IP 55 as per IS 2147.

3.21.6 The cable entry shall be from bottom, for which removable gasketed cable gland plates shall be provided.

3.21.7 Suitable 240V, single phase, 50Hz ac heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10deg. above the ambient.

3.21.8 The size of enclosure and the layout of equipment inside shall provide generous clearances. Each cabinet/box/kiosk/panel shall be provided with a 15A, 240V ac, 2 pole, 3 pin industrial grade receptacle with switch. For incoming supply, MCB of suitable rating shall be provided. Illumination of each compartment shall be with door operated incandescent lamp. All control switches shall be of rotary switch type.

3.21.9 Each cabinet/box/kiosk/panel shall be provided with two earthing pads to receive 75mmx12mm GS flat. The connection shall be bolted type with two bolts per pad. The hinged door shall be connected to body using flexible wire. The cabinets/boxes/kiosks/panels shall also be provided with danger plate, and internal wiring diagram pasted on inside of the door. The front label shall be on a 3mm thick plastic plate with white letters engraved on black background

3.22 TERMINAL BLOCKS

3.22.1 They shall be non-disconnecting stud type of extensible design equivalent to Elmex type CAT-M4.

3.22.2 The terminal blocks shall be of 850 V grade, and rated to continuously carry maximum expected current. The conducting part shall be tinned or silver plated.

3.22.3 They shall be of moulded, non-inflammable thermosetting plastic. The material shall not deteriorate with varied conditions of temperature and humidity. The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating plastic material. Insulating barriers shall be provided between the terminal blocks so that the barriers do not hinder the wiring operation without removing the barriers.

3.22.4 The terminals shall be provided with marking tags for wiring identification.

3.22.5 Unless otherwise required (expected current rating) or specified, terminal blocks shall be suitable for connecting the following conductors on each side:
All CT & VT circuits - Min. four 2.5 sq.mm. copper flexible conductor
AC & DC power supply -Two 16 sq.mm. Aluminium conductor
Other control circuits - Min. two 2.5 sq.mm. copper flexible conductor.

3.22.6 The terminal blocks for CT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary leads shall also be provided with short circuiting and earthing facilities.

3.23 Wiring

3.23.1 All wiring shall be carried out with 1100 V grade stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows:
a) All circuits except CT circuits 2.5 sq.mm
b) CT circuits 4 sq. mm (minimum number of strands shall be 3 per conductor).

3.23.2 All internal wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals and terminal blocks.

3.23.3 Wire terminations shall be made with solderless crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires shall not fall off when the wires and shall not fall off when the wire is disconnected from terminal blocks.

3.23.4 All wires directly connected to trip circuit breaker shall be distinguished by the addition of a red coloured unlettered ferrule. Number 6 & 9 shall not be included for ferrules purposes.

3.23.5 All terminals including spare terminals of auxiliary equipment shall be wired upto terminal blocks. Each equipment shall have its own central control cabinet in which all contacts including spare contacts from all poles shall be wired out. Interpole cabling for all equipment's shall be carried out by the Contractor.

3.24 CABLE GLANDS AND LUGS

3.24.1 Cable glands shall be Double compression type, tinned/Nicked plated (coating thickness not less than 20 microns in case of tin and 10 to 15 microns in case of nickel) brass cable glands for all power and control cables. They shall provide dust and weather proof terminations. They shall comprise of heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and off tested quality. Required number of packing glands to close unused openings in gland plates shall also be provided.

3.24.2 The cable glands shall be tested as per BS:6121. The cable glands shall also be duly tested for dust proof and weather proof termination.

3.24.3 Cables lugs for power cables shall be tinned copper solder less crimping type conforming to IS:8309 and 8394 suitable for aluminum or copper conductor (as applicable). Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. The cable lugs shall suit the type of terminals provided. The cable lugs shall be of Dowell make or equivalent.

3.25 CONDUITS, PIPES AND ACCESSORIES

3.25.1 The bidder shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes, etc. including all necessary sundry materials, such as tees, elbows, check nuts, bushing reduces, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes, etc.

3.25.2 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate conversion coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/ pipes shall be of a reputed make.

3.25.3 Flexible conduits shall be heat-resistant lead coated steel, water-leak, fire and rust proof, and be of PLICA make or equivalent.

3.26 MOTORS

3.26.1 The voltage level for motors shall be as follows:

a) Up to 0.2 KW:	Single phase 240V AC / 3 phase 415V AC
b) Above 0.2 KW and up to 200 KW:	3 phase, 415V AC
c) Above 200 KW and up to 1500 KW:	3 phase, 3.3 kV AC
d) Above 1500 KW:	11 kV Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall conform to type tests and shall be subjected to routine tests as per applicable standards.

The bidder may adopt 415V/3.3 KV for the drives rated in the range of 160-210 KW.

The voltage rating of the drives indicated above is for basic guideline.

3.26.2 All motors shall conform to IEC-60034-5 / IS Standard and with principal dimensions in accordance with IEC 60072-1 (1991), IEC 60072-2 (1990) and IEC 60072-3 (1994).

3.26.3 All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.

3.26.4 Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.

3.26.5 **Degree of Protection**

Degree of protection for various enclosures as per IEC60034-05 shall be as follows:

Indoor motors -	IP 55
Outdoor motors -	IP 55 (additional canopy to be provided)
Cable box-indoor area -	IP 55
Cable Box-Outdoor area -	IP 55

3.26.6 **Type:**

AC Motors:
a) Squirrel cage induction motor suitable for direct-on-line starting.
b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30.
c) Crane duty motors shall be squirrel cage Induction motor as per the requirement.
d) Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034- 18-41 and IEC: 60034-18-42 as applicable.

DC Motors Shunt wound

3.27 AUXILIARY SWITCH

The auxiliary switch shall conform of following type tests:

a) Electrical endurance test - A minimum of 1000 operations for 2A. D.C. with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/ visual defects/ temperature rise test.
b) Mechanical endurance test - A minimum of 5000 operations with a subsequent checking of contact pressure test/ visual examination
c) Heat run test on contacts
d) IR/HV test, etc.

3.28 LAMPS AND SOCKETS

3.28.1 Lamps:

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

3.28.2 Sockets

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

3.28.3 Hand Lamp:

A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON-OFF Switch for connection of hand lamps.

3.29 SWITCHES & FUSES:

Each control panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with switch-fuse units. Selection of the main and sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS 9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal Protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints of the fuse rating and voltage.

All control switches shall be of rotary type. Toggle/piano switches shall not be accepted.

3.30 TYPE, ROUTINE & ACCEPTANCE TESTS:

All equipments to be supplied shall be of type tested design. During contract stage, bidder shall submit for Owner's approval the reports of all the type tests listed in this specification and carried out within last ten years from the date of techno-commercial bid opening **03.03.2023**. These reports should be for the test conducted on the

equipment similar to those proposed to be supplied under this contract and the tests should have been either conducted at an independent laboratory or should have be witnessed by a client.

However, if contractor is not able to submit report of the type tests conducted within ten years from the date **03.03.2013** or in the case of type test reports are not found to be meeting the specification requirements, the bidder shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/ owners representative and submit the reports for approval.

All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

3.31 CORONA AND RIV TESTS AND SEISMIC WITHSTAND TEST:

a) The corona (for 400kV only) and RIV tests shall confirm to the requirements as per Annexure A.
b) The seismic withstand test for 400kV shall conform to requirements as per Annexure B.

3.32 Enclosures:

1. ANNEXURE- A - CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST
2. ANNEXURE- B - SEISMIC WITHSTAND TEST
3. ANNEXURE- I – MQP (NTPC format)
4. ANNEXURE- II – QUALITY ASSURANCE FOR SWITCHYARD

Annexure – A

CORONA AND RIV TESTS AND SEISMIC WITHSTAND TEST (for 400kV AIS only):

The corona and RIV tests shall confirm to the requirements as per Annexure- A to this chapter. The seismic withstand test shall conform to requirements as per Annexure -B to this section.

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST (For 400 kV AIS only)

1.0 General:

Unless otherwise stipulated, all equipment together with its associated connectors where applicable shall be tested for external corona both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and measurement of radio interference voltage (RIV).

2.0 Test Methods for RIV:

2.1 RIV tests shall be made according to measuring circuit as per International Special – committee on Radio Interference (CISPR) Publication 16 -1 (1993) Part – I. The measuring circuit shall preferably be tuned to frequency with 10 % of 0.5 MHz but other frequencies in the range of 0.5 MHZ to 2 MHz may be used, the measuring frequency being recorded. The result shall be in microvolts. Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107 – 1964 except otherwise noted herein. In measurement of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

2.2 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, 115% and 130% for the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 420 KV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.0 Test Methods for visible Corona:

The purpose of this test is to determine the corona extinction voltage of the apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 130 % of RIV test voltage and maintained there for five minutes. In case corona inception does not take place at 130 %, the voltage level shall be raised till inception of corona or rated voltage whichever is lower. The voltage will then be decreased slowly until all visible corona disappears. The test procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which the visible corona (negative or positive polarity) disappears.

Annexure – B

SEISMIC WITHSTAND TEST (for 400 kV AIS only)

a.) The seismic withstand test on the complete equipment (except BPI) shall be carried out along with supporting structure.

b.) The supplier shall arrange to transport the structure from his purchaser's premises / owner's sites for purpose of seismic withstand test only.

c.) The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the terminal pad of the equipment and at any other point as agreed by the owner. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the purchaser.

ANNEXURE-I

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	**MANUFACTURING QUALITY PLAN**		PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:
		ITEM : SUB-SYSTEM:	QP NO.: REV.NO.: DATE: PAGE: …. OF….	

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** **M:** MANUFACTURER/SUB-SUPPLIER C**:** MAIN SUPPLIER, **N**: NTPC **P:** PERFORM **W**: WITNESS AND **V:** VERIFICATION. AS APPROPRIATE, **CHP:** NTPC SHALL IDENTIFY IN COLUM "N" AS ' W"		DOC. NO.: REV…… CAT…..		
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER		FOR NTPC USE			
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

FORMAT NO.: QS-01-QAI-P-09/F1-R1 **1/1** **ENGG. DIV./QA&I**

EPC PACKAGE FOR TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW)			

ANNEXURE-II

ENDORSEMENT SHEET FOR QP

REFERENCE / *STANDARD* / FIELD QUALITY PLAN (RQP / SQP/*RFQP/SFQP*)

TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		To be filled in by NTPC
PROJECT NAME		*REVIEW & ENDORSEMENT BY NTPC* **PROJECT SPECIFIC QP NUMBER ALLOTTED**
CONTRACT NO.:		**QP NO.:**
MAIN SUPPLIER		
MANUFACTURER WORKS & ADDRESS	M/S	**REV. NO.: DATE:**
ITEM /EQUIPMENT / SYSTEM/ SUB-SYSTEM DETAILS i.e. MODEL TYPE / SIZE /RATING etc.		** The RQP/SQP/RFQP/SFQP once endorsed for a particular contract shall remain valid even though the original QP may have expired or revised, unless / otherwise mutually agreed with the supplier. ①
APPROVED QP NO.: RQP/SQP/RFQP/SFQP	0000-999-QV - - REV. NO.: DATED**: **	
Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)		*(TICK APPLICABLE)*
***I. That the item/ component is identical to that considered for QP approval.* OR.**		**The QP is endorsed for this project without any change**
***II. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same do not affect the contents of QP.* OR**		
III. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same affect the QP slightly, as indicated below / in attached sheet.		**The QP is endorsed for this project with changes as indicated.**
		DISTRIBUTION OF ENDORSEMENT OF **A) RQP/SQP:** *1. MAIN SUPPLIER (WITH A COPY OF QP)* *2. MANUFACTURER* *3. RIO* *4. CQA-SPL* *5. CQA-O/C* **B) RFQP/SFQP:** *1. MAIN SUPPLIER (with a copy of QP)* *2. MANUFACTURER* *3. NTPC FQA (with a copy of QP)* *4. NTPC Erection (with a copy of QP)* *5. CQA-SPL* *6. CQA-O/C*
SIGN.: (Main Supplier) DATE	***SIGN.: (Manufacturer) DATE:***	**NTPC (Reviewed /Approved by/ Date & Seal)**

Annexure-1

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 _____

_____ (hereinafter referred to as "Contract"). 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 panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

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

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

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

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

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

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

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during 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 shall 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 , terminate the contract, if already awarded, exclude from future business dealings and/ 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 (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above , the Bidder(s)/ Cotractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be-entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee , whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) 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 or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity 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 panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.

8.2 The IEMs are 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 IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.

8.4 The Principal will provide to the IEMs 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 IEMs the option to participate in such meetings.

8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a 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 or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, 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 the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.

8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.

8.9 IEMs 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 Prinicpal should be looked into by the CVO of the Principal.

8.10 If the IEMs have 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 IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

8.13 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact 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. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

9.2 If any claim is made/ lodged during currency of this Integrity Pact, 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 Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.

10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact 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 Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place _____
Date _____

Witness:_____
(Name & Address) _____
_____

Witness:_____
(Name & Address) _____
_____

FORMAT OF NO DEVIATION CERTIFICATE

(To be submitted in the bidder's letter head)

REF: …….. **Date**…….

BHARAT HEAVY ELECTRICALS LIMITED,
TRANSMISSION BUSINESS GROUP,
6th Floor, BHEL SADAN,
Plot No- 25, Sector- 16A, Noida,
Distt. Gautambudh Nagar, UP-201301

SUB: TENDER FOR "EXECUTION AND HANDING OVER OF SUPPLY, ETC & CIVIL WORKS FOR 400kV TRANSMISSION LINE AT 2 x 800 MW NTPC LARA STPP-II, CHATTISGARH".

Tender Ref.: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 DATE: 20.02.2025

Dear Sir,

With reference to above, this is to confirm that as per tender conditions, we have visited subject 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 and in case of 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 and we hereby convey our unqualified acceptance to all terms and conditions as stipulated in the tender and NIT. 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 offer strictly in accordance with tender instructions.

Thanking you,

Yours faithfully,

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

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)

Ref: **Date…….**

To,
Sr. DGM/TBSM
Transmission Business Group,
Bharat Heavy Electricals Limited,
6th Floor, BHEL SADAN,
Plot No. 25, Sector-16A, Noida,
Distt. – Gautam Buddh Nagar, UP-201301

Dear Sir,

Sub: Declaration for relation in BHEL

Ref: 1) NIT/Tender Specification No.: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 dtd. 20.02.2025

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:

a)

b)

Signature of the Authorized 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 against the Bidder/ Contractor.

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

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

To,

Sr. DGM/TBSM
Transmission Business Group,
Bharat Heavy Electricals Limited,
6th Floor, BHEL SADAN,
Plot No. 25, Sector-16A, Noida,
Distt. – Gautam Buddh Nagar, UP-201301

Dear Sir,

Sub: Declaration by Authorized Signatory regarding Authenticity of submitted documents.

Ref: 1**) NIT/Tender Specification No: TBSM/LARA/SUPPLY, ETC & CIVIL/TENDER/24-25 Date: 20.02.2025**

2) **All other pertinent issues till date**

I/We, hereby certify that all the documents submitted by us in support of possession of "Qualifying Requirements" are true copies of the original and are fully compliant required for qualifying / applying in the bid and shall produce the original of same as and when required by Bharat Heavy Electricals Limited.

I / We hereby further confirm that no tampering is done with documents submitted in support of our qualification as bidder. I / We understand that at any stage (during bidding process or while executing the awarded works) if it is found that fake / false / forged bid qualifying /supporting documents / certificates were submitted, it would lead to summarily rejection of our bid / termination of contract. BHEL shall be at liberty to initiate other appropriate actions as per the terms of the Bid / Contract and other extant policies of Bharat Heavy Electricals Limited.

Yours faithfully,

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

Date:

Place

FORMATS FOR EPAYMENTS

To,

Sr.DGM (Finance)
Transmission Business Group
BHEL, TBG Finance,
Plot no. - 25, Sector - 16A
Noida - 201301; U.P.

Subject: E-Payments vide RTGS/NEFT

I/We request and authorise you to effect Epayment vide any of the above two modes to my/our bank account as per the details given below:

Vendor Name	:
Title/Name of Account in the bank	:
Account Type(Saving /current)	:
Bank Account Number	☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Name & address of Bank	
Bank /Branch contact person's name	:
Bank /Branch Tele Numbers with STD code	:
Bank Branch MICR code	☐☐☐☐☐☐☐☐☐
	(please enclose a copy of a cheque. This cheque should not be a payable at par cheque)
Bank Branch RTGS IFSC code	☐☐☐☐☐☐☐☐☐☐☐
Bank Branch NEFT IFSC code	☐☐☐☐☐☐☐☐☐☐☐
	(you can obtain this from branch where you have your account)
Your Email address	: **(not more than 20 character)**
Name of the Authorised Signatory	: (Please mention here name of person from your organization signing this letter.)
Contact Person's name	: (please mention here the name of a person in your company/organization)

I/We confirm that information provided above is correct & any consequences due to any mistake in above will be borne by us.

Thanking you

For
(Autorised Signatory)

We confirm that we are enabled for receiving RTGS/NEFT credits and we further confirm that the account number of (Please mention here name of the account holder), the signature of the authorised signatory and the MICR and IFSC Codes of our branch mentioned above are correct.

Bank's Verification
(Manager's/Officers signature under
bank Stamp)

Note:- Please attach cancelled original Cheque leaf.