BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP
SUBCONTRACTS MANAGEMENT
6TH FLOOR, BHEL SADAN,
PLOT NO. 25, SECTOR 16A, NOIDA,
DISTT. – GAUTAM BUDDH NAGAR (U.P.) - 201301

TENDER DOCUMENTS

FOR

TENDER FOR PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT.

CUSTOMER

RAJASTHAN PART I POWER TRANSMISSION LIMITED

TENDER SPEC. NO.: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26

DATE: 08.07.2025

TRANSMISSION BUSINESS GROUP

SUBCONTRACTS MANAGEMENT

INDEX

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

SECTOR-16A, NOIDA -201301

e-mail: akmeena@bhel.in

NOTICE INVITING TENDER

REF.: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 **Date: 08.07.2025**

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT".

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
PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT	05.02.2027	NIL	On or before 22.07.2025 11.00 hrs.	22.07.2025 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 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) 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. **EMD is not applicable for this tender.**

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

9. 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.

10. Drawings & FQP enclosed with the NIT (if provided) are for tender purpose only. Drawings & FQP may get change during execution stage.

11. Construction/ RFC drawing/ Fronts/Inputs (if applicable) 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/inputs shall be entertained.

12. 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 terms and conditions of contract.

13. 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.

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

    14.1. 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.

    14.2. Commitment by Bidder/ Supplier/ Contractor:

14.2.1. 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.

14.2.2. 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.

14.2.3. 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".

15. 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.

16. 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."

17. 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.

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

19. 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.

20. 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.

21. 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.

22. Integrity Pact (IP) is not applicable for this tender.

23. Any materials (if required) for 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.

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

25. 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.

26. 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.

27. 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.

Thanking you,

Yours faithfully,
For and on behalf of BHEL,

(Ashok Kumar Meena)
AGM /TBSM

TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD

ANNEXURE - X

REF.: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 **Date: 08.07.2025**

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT".

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

ANNEXURE – Z

REF.: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 **DATE: 08.07.2025**

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT".

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/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 **DATE: 08.07.2025**

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT".

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 **₹ 45,21,108/- for last three fin. Years (2021-22, 2022-23 & 2023-24 or 2022-23, 2023-24 & 2024-25)** 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 **designed Steel structures and RCC structures including foundations for any industrial project/power sector project (refer Note-1) during last seven years ending on 30.06.2025** and should be either of the following: i. Three similar jobs costing (except service tax/GST) not less than **₹ 60,28,144/-** each. OR ii. Two similar jobs costing (except service tax/GST) not less than **₹ 75,35,180/-** each. OR iii. One similar job costing (except service tax/GST) not less than **₹ 1,20,56,288/-** In addition to the above,

		a) bidder should have an experience in design of lattice structures for switchyard/substation/transmission lines of 220kV and above rating. b) The bidder must have a team with: **One Lead Engineer**: Minimum **10 years** in Structure design. and **Four RCC/Steel Structure Specialists**: Certified engineers with minimum 2 years relevant experience.

Note:

1. Power Sector Projects shall include Substations/Switchyards/Power plants/Converter stations/Transmission lines (220kv or above) and Industrial Projects shall include - Oil & gas (refineries, pipelines)/Chemical & Process Industries/Metallurgical & mining/Cement plants/other Large industrial facilities
2. The bidder shall submit approved design document/Drawings of Switchyard tower/equipment structure and foundations in support of Switchyard rating.
3. The Bidder shall submit the Contract Agreement/Work Order/LOI along with BOQ and Performance/completion/execution certificate issued by customer in support of experience.
4. Cvs of Key Personnel for Sl. No. C (b), additional qualification.
5. The word 'executed' means the bidder should have achieved the criteria specified in the PQR even if the total contract has not been completed or closed.
6. In order to technically qualify in this tender, bidder should meet all criteria i.e. A, B & C mentioned above.
7. 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.
8. 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.
9. BHEL shall not be responsible for any delay, loss, damage for bids sent by post.
10. BHEL shall not be liable for any expenses incurred by bidder in preparation of bid irrespective of whether it is accepted or not.
11. Quotations received from bidders who do not fulfil the PQR shall be summarily rejected without any further evaluation and information to bidders.
12. 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.
13. 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.
14. 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 RAJASTHAN PART I POWER TRANSMISSION LIMITED

2.0 PROJECT LOCATION AND DETAILS:

TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000 MW BHADLA FATEHPUR PROJECT".

3.0 CONTACT PERSON: FOR CONTRACTUAL ISSUES

ASHOK KUMAR MEENA
AGM (TBSM)
SUB-CONTRACTS 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

4.0 **CONTACT PERSON: FOR ENGINEERING ISSUES**

ALI ABBAS
SR. MANAGER (TBEM)
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301
PHONE: 0120-674- 8546/ 8800449777
E-mail: aliabbas@bhel.in

TERMS AND CONDITIONS OF CONTRACT

The following terms and conditions shall form a part of the tender document.

A. Terms and Condition of Contract:

A.1. GENERAL INSTRUCTION

A.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.

A.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. PROCEDURE FOR SUBMISSION OF SEALED TENDERS

A.2.1. Bidders may please refer Cl no. 02 to Cl no. 03 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 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/office, 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. The 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. **ADJUSTMENT PRICE DISCREPANCY (IES): - Not Applicable being e procurement.**

A.4. **EVALUATION OF TECHNICAL BIDS**

A.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.

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.

A.4.2. 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.

A.4.3. 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.

A.4.4. 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.

A.4.5. 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.

A.4.6. 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. **EVALUATION OF PRICE BIDS**

A.5.1. Price Bids of unqualified bidders shall not be opened.

A.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.

A.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.

A.6. **DOCUMENTS TO BE ENCLOSED:**

Full information shall be given by the tenderer in respect of the following.

A.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.

A.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.

A.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).

A.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.

A.6.5. DOCUMENT RELATED TO INCORPORATION OF BUSINESS ENTITY:

A.6.5.1. IN CASE OF INDIVIDUALTENDERER:

His/her full name, address and place & nature of business.

A.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.

A.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.

A.6.6. Offer forwarding letter over the letterhead.

A.6.7. *Declaration sheets (As per Prescribed format) over the letter head*.

A.6.8. *No Deviation certificates (As per Prescribed format) over the letterhead.*

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

A.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.

A.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.

A.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.

A.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.

A.8.5. 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.

A.8.6. 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.8.7. 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.8.8. 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.

A.8.9. 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.

A.8.10. The successful tenderer should not sub-contract the part or complete work detailed in the tender specifications without written permission of BHEL.

A.8.11. Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-I party, then the awarded price i.e. contract value shall be worked out after considering the discount so offered.

A.8.12. BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

A.9. Consortium/ JV bidding is not allowed under this NIT.

B. EARNEST MONEY DEPOSIT (EMD)

EMD is not applicable for this Tender.

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.

C.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.**

C.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)

C.3. Submission of Security Deposit:

i) At least 50 % of the required Security Deposit 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.

C.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).

C.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.

C.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.

C.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.

C.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 Security Deposit through electronic fund transfer mode.

NAME OF THE COMPANY	**BHARAT HEAVY ELECTRICALS LTD**
ADDRESS OF THE COMPANY	**TRANSMISSION BUSINESS GROUP, 5TH FLOOR, BHEL TOWER, 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. Overall Quantity variation-

The quantities indicated in "Bill of Quantity" attached with the tender are indicative only and individual quantity may vary up to any extent. However, agreed unit rates shall remain firm up to a variation of + 30% of the total value of the rate contract irrespective of variations in the quantity of individual items.

F. INCOME TAX/SALES TAX/WORKS TAX

a. 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.

b. GST along with Cess (as applicable) legally leviable & payable by successful bidder as per GST Law shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.

c. 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.

d. Contractor shall furnish proof of GST registration with GSTN Portal covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by contractor on BHEL for this project / work. However, in case contractor submits GST Registration of a state other than the state wherein the site is located, then contractor has to submit an undertaking that contractor is not liable to take registration in the state wherein the site is located as per the provision of Place of Supply under CGST/SGST/IGST Act. BHEL will not be held responsible for any non-compliance of the Contractor in respect of GST laws as framed from time to time.

e. Contractor shall comply with all statutory amendment/notifications in this respect

f. Contractor shall submit the tax invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder). In case of raising any Supplementary Tax Invoice (Debit / Credit Note), contractor shall issue the same containing all the details as referred in Section 34 read with Section 31 of GST Act & Rules referred there under. Contractor shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising the Tax Invoice

g. 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 shall upload the invoices raised on BHEL in IFF/GSTR-1 within the prescribed time as given in the GST Act.
iv. Invoice raised and uploaded in IFF/GSTR-1 by the Contractor should be available to BHEL in FORM GSTR-2B electronically through the common portal.
v. Confirmation of payment of such GST to the Government through filing of GSTR-3B of corresponding month/quarter.

h. The GST amount should 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.

i. Statutory variation, if any, on account of GST will be payable by BHEL at actuals on submission of documentary evidence.

j. 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.

k. **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.

G. "Over run charges"

No overrun charges are payable under the contract.

H. "secured advance"

No advance on materials shall be payable under the contract.

I. "Price Variation"

Price Variation Clause in not Applicable for this tender.

J. <u>LIQUIDATED DAMAGES/PENALTY CLAUSE:</u>

If the contractor fails to complete the works within the specified time from inputs as mentioned in time schedule in Clause No. 7.0.0 of technical specification or within the amended time schedule/ time extension as granted by the BHEL, then 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 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 ORC, Supplementary/ Additional works) shall be considered for calculating LD/ penalty.

K. TERMS OF PAYMENT:

Sl.No.	Condition	Payment
Item Nos 1, 2, 3 & 4 of Sch./BOQ of Items		
(a)	On approval of design documents / drawings (at least Cat 2 i.e. approved with comments)	75% of quoted rate
(b)	Approval of design documents / drawings in Cat-I	20% of quoted rate.
(c)	Submission of as-built drawings	5% of quoted rate.
Item No 5		
(a)	On approval (at least Cat 2 i.e. approved with comments) of architectural drawings.	10% of quoted rate on pro-rata basis.
(b)	On approval (at least Cat 2 i.e. approved with comments) of design documents.	20% of quoted rate on pro-rata basis.
(c)	On approval (at least Cat 2 i.e. approved with comments) of construction/ structure / fabrication drawings.	45% of quoted rate on pro-rata basis.
(d)	On approval (at least Cat 2 i.e. approved with comments) of plumbing, sanitary & other miscellaneous drawings.	10% of quoted rate on pro-rata basis.
(e)	Approval of all documents in Cat-I	10 % of quoted rate.
(f)	Submission of as-built drawings	5% of quoted rate.
Item No 6 of Sch./BOQ of Items		
(a)	On submission of claim after completion of visit.	100 % of quoted rate.

L. PROGRESSIVE PAYMENT/ FINAL PAYMENT:

L.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) Payment of particular BOQ item 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 PVC 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

L.1.1. Documents required for RA Bill (in addition to documents required as per SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND SCHEDULE OF ITEMS)**:**

a) GST Complied Invoice of the work done as per approved BOQ.
b) Jointly signed Measurement sheet.
c) Validity of SD Bank Guarantees as applicable under the contract.
d) Power of Attorney for representative signing bill etc, if not submitted earlier.
e) Any other documents as per customer/statutory requirement

L.2. Final Bill:

L.2.1. Final Bill' is used for final payment on closing of Running Account for works or for single payment. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope, approval of final report by customer, removal of temporary structures from site. BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL.

L.2.2. Documents required for Final Bill (in addition to documents required as per SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND SCHEDULE OF ITEMS):

a. GST Complied Invoice of the work done as per approved BOQ.
b. Jointly signed Measurement sheet, WAM-10 (if applicable)
c. Valid Bank Guarantees as applicable under the contract.
d. 'No claim' certificate from the contractor.
e. Deviation statement showing the Executed quantities and quantities as per the contract.
f. Power of Attorney for representative signing bill etc, if not submitted earlier.
g. Final Delay Analysis, if applicable
h. Any other documents as per customer requirement/statutory requirement.

Annexure-A

1	**RIGHTS OF BHEL**
	BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any Compensation.
1.1.	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.
1.2	**BREACH OF CONTRACT, REMEDIES AND TERMINATION**
1.2.1	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.
	<u>LD against delay in executed work in case of Termination of Contract:</u>
	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. o 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 o Let the value of executed work till the time of termination of contract= X o 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 o Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1 o 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.
1.2.2	**REMEDIES IN CASE OF BREACH OF CONTRACT**
	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 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.
1.3	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.
1.4	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.
1.5	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.
1.6	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.
1.7	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.
1.8	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.
2	**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, <u>that puts them in a position to have access to information about or influence on the bid of another Bidder;</u> **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. <u>However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid;</u> **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:* i. *The principal manufacturer directly or through one Indian agent on his behalf; and* ii. *Indian/foreign agent on behalf of only one principal;* ***OR***

	iii. *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* iv. *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.* "
3	**BOCW (CESS):**
	Deleted.
4	**ROYALTY**
	Deleted.
5	**ISSUE OF MATERIAL BY BHEL (IF APPLICABLE AS PER BOQ AND SCOPE)**
	Not Applicable
6	**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.
7	**SUSPENSION OF BUSINESS DEALINGS**
	BHEL reserves the right to act 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

8	**SETTLEMENT OF DISPUTE**
	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.
8.1	**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.
8.2	**ARBITRATION:**
8.2.1	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.
8.2.2	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.
8.2.3	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.
8.2.4	The fee and expenses shall be borne by the parties as per the Arbitral Institutional rules.
8.2.5	The Arbitration proceedings shall be in English language and the seat and venue of Arbitration shall be **Delhi.**
8.2.6	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.**
8.2.7	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.
8.2.8	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.
8.2.9	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.
8.2.10	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 8.2.9. 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.
8.3	**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.

8.4	**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.
9	**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.
10	**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.**
11	**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.
12	**DELAY AND EXTENSION OF TIME**
12.1	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 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.
12.2	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.
13	**FORCE MAJEURE**
13.1	"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.

13.2	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.
13.3	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.
13.4	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.
13.5	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
13.6	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
14	**Special Condition -**
	If the bidder is already engaged with BHEL as design consultant for other project, then a separate design team is to be engaged for Bhadla Fatehpur HVDC project. An undertaking to this effect is to be submitted along with the bid by the bidder.

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.

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 : ±800kV, 6000MW BHADLA-FATEHPUR HVDC

Name of Work : PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT

Tender Ref. No.- TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025

Item No	Description	Unit	Qty			Rate	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
1	**Preparation, submission of design documents & line sketches of following switchyard structures as per Specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL.**						
A	***Lattice/Pipe Structures***						
(i)	765kV Gantry & Towers i/c foundation bolts	Types	0	4	**4**	₹ 1,23,350.00	₹ 4,93,400.00
(ii)	765kV Switchyard equipment support structures i/c foundation bolts	Types	0	6	**6**	₹ 27,333.00	₹ 1,63,998.00
(iii)	400kV Switchyard beams	Types	0	7	**7**	₹ 24,000.00	₹ 1,68,000.00
(iv)	400kV Switchyard towers i/c foundation bolts	Types	8	6	**14**	₹ 45,667.00	₹ 6,39,338.00
(v)	400kV Switchyard equipment support structures i/c foundation bolts	Types	12	1	**13**	₹ 20,667.00	₹ 2,68,671.00
(vi)	33kV Switchyard beams	Types	1	0	**1**	₹ 17,333.00	₹ 17,333.00
(vii)	33kV Switchyard towers i/c foundation bolts	Types	2	0	**2**	₹ 19,000.00	₹ 38,000.00
(viii)	PLC Filter Capacitor	Types	1	0	**1**	₹ 14,000.00	₹ 14,000.00
(ix)	PLC Filter Reactor	Types	1	0	**1**	₹ 14,000.00	₹ 14,000.00
(x)	33kV Switchyard equipment support structures i/c foundation bolts	Types	1	0	**1**	₹ 12,333.00	₹ 12,333.00
(xi)	Valve Hall equipment support structures i/c foundation bolts	Types	7	0	**7**	₹ 21,667.00	₹ 1,51,669.00
(xii)	AC Filter Yard equipment support structures i/c foundation bolts	Types	7	7	**14**	₹ 11,333.00	₹ 1,58,662.00
(xiii)	DC Yard equipment support structures i/c foundation bolts	Types	7	7	**14**	₹ 14,000.00	₹ 1,96,000.00
(xiv)	DC Hall equipment support structures i/c foundation bolts	Types	56	51	**107**	₹ 24,333.00	₹ 26,03,631.00
(xv)	DC Filter equipment support structures i/c foundation bolts	Types	21	21	**42**	₹ 17,333.00	₹ 7,27,986.00
(xvi)	LM Tower i/c foundation bolts	Types	2	1	**3**	₹ 62,000.00	₹ 1,86,000.00
2	**Preparation & submission of fabrication (structure assembly) drawings & BOMs including their approval from BHEL/Customer based on input from BHEL.**						
A	***Lattice type Structures***						
(i)	765kV Gantry & Towers	Types	0	4	**4**	₹ 53,667.00	₹ 2,14,668.00
(ii)	400kV Beams	Types	0	7	**7**	₹ 26,000.00	₹ 1,82,000.00
(iii)	400kV Towers	Types	8	6	**14**	₹ 40,000.00	₹ 5,60,000.00
(iv)	LM Tower	Types	2	1	**3**	₹ 52,000.00	₹ 1,56,000.00
(v)	33kV Beams	Types	1	0	**1**	₹ 12,333.00	₹ 12,333.00
(vi)	33kV Tower/LM	Types	2	0	**2**	₹ 19,000.00	₹ 38,000.00
(vii)	765kV Equipment Support Structure except Wave Trap & 3-Ph Isolators	Types	0	4	**4**	₹ 12,333.00	₹ 49,332.00
(viii)	765kV 3-Ph Isolators	Types	0	3	**3**	₹ 16,667.00	₹ 50,001.00
(ix)	765kV 1-Ph Isolators	Types	0	3	**3**	₹ 16,667.00	₹ 50,001.00
(x)	765kV 1-Ph Wave Trap	Types	0	1	**1**	₹ 16,667.00	₹ 16,667.00
(xi)	400kV Equipment Support Structure except 3-Ph Isolators	Types	4	4	**8**	₹ 9,667.00	₹ 77,336.00
(xii)	400kV 3-Ph Isolators	Types	1	1	**2**	₹ 12,333.00	₹ 24,666.00
(xiii)	PLC Filter Capacitor	Types	1	1	**2**	₹ 7,000.00	₹ 14,000.00
(xiv)	PLC Filter Reactor	Types	1	1	**2**	₹ 7,000.00	₹ 14,000.00
(xv)	33kV Switchyard equipment support structures	Types	7	0	**7**	₹ 7,000.00	₹ 49,000.00
(xvi)	Valve Hall equipment support structures	Types	3	3	**6**	₹ 11,333.00	₹ 67,998.00
(xvii)	AC Filter Yard equipment support structures	Types	4	4	**8**	₹ 7,667.00	₹ 61,336.00
(xviii)	DC Yard equipment support structures	Types	28	22	**50**	₹ 9,667.00	₹ 4,83,350.00
(xix)	DC Hall equipment support structures	Types	10	0	**10**	₹ 13,333.00	₹ 1,33,330.00
(xx)	DC Filter equipment support structures	Types	6	6	**12**	₹ 13,333.00	₹ 1,59,996.00
3	**Preparation, submission of design documents of following switchyard civil works as per Specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL.**						
(i)	765kV tower foundation	Types	0	4	**4**	₹ 18,000.00	₹ 72,000.00

BILL OF QUANTITY CUM PRICE SCHEDULE (ANNEXURE-I)

Name of Project : ±800kV, 6000MW BHADLA-FATEHPUR HVDC

Name of Work : PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT

Tender Ref. No.- TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025

Item No	Description	Unit	Qty			Rate	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
(ii)	400kV tower foundation	Types	8	6	**14**	₹ 12,333.00	₹ 1,72,662.00
(iii)	33kV tower foundation	Types	2	0	**2**	₹ 18,000.00	₹ 36,000.00
(iv)	765kV equipment support structure foundations	Types	0	7	**7**	₹ 16,333.00	₹ 1,14,331.00
(v)	400kV equipment support structure foundations	Types	8	8	**16**	₹ 16,333.00	₹ 2,61,328.00
(vi)	33kV equipment support structure foundations	Types	8	8	**16**	₹ 16,333.00	₹ 2,61,328.00
(vii)	AC Filter Yard equipment support structure foundations	Types	7	7	**14**	₹ 15,000.00	₹ 2,10,000.00
(viii)	PLC Filter Capacitor/Reactor Foundations	Types	2	1	**3**	₹ 18,000.00	₹ 54,000.00
(ix)	Cable trench	Types	6	0	**6**	₹ 27,667.00	₹ 1,66,002.00
(x)	Cable Trench Crossing	Types	6	0	**6**	₹ 20,667.00	₹ 1,24,002.00
(xi)	500MVA Transformer foundation with soakpit including Fire wall	Types	0	1	**1**	₹ 34,333.00	₹ 34,333.00
(xii)	110/80/50MVAR Reactor foundation with soakpit including Fire wall	Types	2	2	**4**	₹ 34,333.00	₹ 1,37,332.00
(xiii)	Auxiliary Transformer foundations	Types	1	1	**2**	₹ 13,667.00	₹ 27,334.00
(xiv)	Jacking pad for transformer/reactor	Types	2	2	**4**	₹ 21,000.00	₹ 84,000.00
(xv)	Rail cum road	Types	2	2	**4**	₹ 17,333.00	₹ 69,332.00
(xvi)	Road	Types	2	2	**4**	₹ 14,000.00	₹ 56,000.00
(xvii)	Storm water Drainage	Types	4	4	**8**	₹ 19,667.00	₹ 1,57,336.00
(xviii)	Sump pit for cable trench/drainage	Types	2	2	**4**	₹ 8,667.00	₹ 34,668.00
(xix)	Boundary wall	Types	1	1	**2**	₹ 12,333.00	₹ 24,666.00
(xx)	Oil recovery (including oil water separator) tank	Types	2	2	**4**	₹ 28,333.00	₹ 1,13,332.00
(xxi)	DG set foundation design	Types	1	2	**3**	₹ 17,667.00	₹ 53,001.00
(xxii)	30m DG support structure/Chimney foundation design	Types	1	2	**3**	₹ 24,000.00	₹ 72,000.00
(xxiii)	Underground diesel tank (15KL)(common underground foundation design for accommodating 2 nos. tanks)	Types	1	1	**2**	₹ 5,500.00	₹ 11,000.00
(xxiv)	DG SET Fuel transfer pump room/PUMP HOUSE	Types	1	1	**2**	₹ 11,000.00	₹ 22,000.00
4	**Preparation, submission of drawings of following switchyard civil works including their approval from BHEL/Customer based on input from BHEL**						
(i)	Details of Tower foundation bolts (All Ratings)	Set of Drawings	2	3	**5**	₹ 2,150.00	₹ 10,750.00
(ii)	Details of AIS equipment foundation bolts	Set of Drawings	1	2	**3**	₹ 2,150.00	₹ 6,450.00
(iii)	Details of DC Yard/DC Filter/Valve Hall/DC Hall/AC Filter Equipment foundation bolts	Set of Drawings	2	2	**4**	₹ 2,150.00	₹ 8,600.00
(iv)	Foundation Layouts of 765/400/33kV Switchyard	Set of Drawings	2	2	**4**	₹ 2,26,667.00	₹ 9,06,668.00
(iv)	Foundation Layout of AC Filter yard	Set of Drawings	1	1	**2**	₹ 1,23,333.00	₹ 2,46,666.00
(v)	Details of tower foundations	Drawing	18	22	**40**	₹ 10,667.00	₹ 4,26,680.00
(vi)	Details of equipment foundations	Set of Drawings	31	36	**67**	₹ 9,667.00	₹ 6,47,689.00
(vii)	Ground Improvement Layout	Set of Drawings	1	0	**1**	₹ 32,000.00	₹ 32,000.00
(viii)	Details of cable trenches	Set of Drawings	1	1	**2**	₹ 21,500.00	₹ 43,000.00
(ix)	Details of cable trench crossings	Set of Drawings	1	1	**2**	₹ 24,333.00	₹ 48,666.00
(x)	Details of 500MVA Transformer foundation with soakpit including combined Layout of all Transformers & Fire walls etc.	Set of Drawings	0	1	**1**	₹ 26,500.00	₹ 26,500.00
(xi)	Details of 110/80/50MVAR Reactor foundation with soakpit including combined Layout of all reactors & Firewalls etc.	Set of Drawings	2	2	**4**	₹ 32,667.00	₹ 1,30,668.00
(xii)	Auxiliary Transformer	Drawing	1	1	**2**	₹ 7,667.00	₹ 15,334.00
(xiii)	Details of Jacking pad for transformer/reactor	Drawing	2	2	**4**	₹ 21,667.00	₹ 86,668.00
(xiv)	Details of Rail cum road	Drawing	2	2	**4**	₹ 11,333.00	₹ 45,332.00

BILL OF QUANTITY CUM PRICE SCHEDULE (ANNEXURE-I)

Name of Project : ±800kV, 6000MW BHADLA-FATEHPUR HVDC

Name of Work : PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT

Tender Ref. No.- TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025

Item No	Description	Unit	Qty			Rate	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
(xv)	Layout of cable trenches	Drawing	1	1	**2**	₹ 53,500.00	₹ 1,07,000.00
(xvi)	Details of Road including Layout	Set of Drawings	1	1	**2**	₹ 32,000.00	₹ 64,000.00
(xvii)	Details of fencing	Set of Drawings	1	1	**2**	₹ 17,000.00	₹ 34,000.00
(xviii)	Details of boundary wall	Drawing	1	1	**2**	₹ 31,000.00	₹ 62,000.00
(xix)	Details of gates	Drawing	2	2	**4**	₹ 18,667.00	₹ 74,668.00
(xx)	Layout of drainage	Drawing	1	1	**2**	₹ 32,000.00	₹ 64,000.00
(xxi)	Details of drains/crossings	Set of Drawings	1	1	**2**	₹ 19,333.00	₹ 38,666.00
(xxii)	Details of sump pits	Drawing	1	1	**2**	₹ 10,333.00	₹ 20,666.00
(xxiii)	Details of Oil recovery tank including Layout	Set of Drawings	1	1	**2**	₹ 24,000.00	₹ 48,000.00
(xxiv)	Rain Water Harvesting	Drawing	1	1	**2**	₹ 21,000.00	₹ 42,000.00
5	**Preparation, submission of design documents & drawings of following RCC buildings as per specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL Single Storey: (For working out area, outer wall to outer wall dimensions shall be considered)**						
(i)	Auxiliary CRB- Greater than 100sqm but less than equal to 650sqm	LS	0	1	**1**	₹ 3,66,667.00	₹ 3,66,667.00
(ii)	SPR- less than equal to 100sqm	LS	2	2	**4**	₹ 53,000.00	₹ 2,12,000.00
6	**Visit to Site / Customer's / Consultant / verification agency**						
(i)	LS Allowance per day including boarding, lodging, local conveyance, etc., all inclusive. (BHEL shall pay to & fro Ist AC fare from Bidder's headquarters to BHEL office/Customer office/any other place within India for each visit separately.)	day	5	5	**10**	₹ 31,000.00	₹ 3,10,000.00
(ii)	LS Allowance per day including boarding, lodging, local conveyance, etc., all inclusive. (BHEL shall pay to & fro economy class Air fare from Bidder's headquarters to Site/Customer office for each visit separately.)	day	5	5	**10**	₹ 31,000.00	₹ 3,10,000.00
						Total Amount (Excluding GST)	**₹ 1,50,70,360.00**

Validate Print Help

Percentage BoQ

Tender Inviting Authority: BHEL, TBG- SubContracting Department, Sector 16A Noida, UP

Name of Work: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT"

Contract No: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE 08.07.2025

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 "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT."- Excluding GST	1.000	Nos	15070360.00	**15070360.00**	INR One Crore Fifty Lakh Seventy Thousand Three Hundred & Sixty Only
Total in Figures					**15070360.00**	INR One Crore Fifty Lakh Seventy Thousand Three Hundred & Sixty Only
Quoted Rate in Figures			**Select**		**0.000**	INR Zero Only
Quoted Rate in Words		**INR Zero Only**				

CUSTOMER	**RAJASTHAN PART I POWER TRANSMISSION LIMITED.**
PROJECT	**±800kV, 6000MW HVDC Terminals at Bhadla (HVDC) & Fatehpur (HVDC) along with associated AC substations and AC Substation extension at Bhadla-3 associated with "Transmission system for evacuation of Power from REZ in Rajasthan (20GW) under Phase-III, Part-I".**

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SECTION - 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENT &
QUANTITIES

SCOPE & SPECIFIC TECHNICAL REQUIREMENTS

Doc No: TB-DC-FB800-001 Rev 00

1.0.0 INTRODUCTION

1.1.0 Transmission Business Group (TBG) of Bharat Heavy Electricals Limited has been awarded the work of ±800kV, 6000MW HVDC Terminals at Bhadla (HVDC) & Fatehpur (HVDC) along with associated AC substations and AC Substation extension at Bhadla-3 associated with "Transmission system for evacuation of Power from REZ in Rajasthan (20GW) under Phase-III, Part-I". The customer is **RAJASTHAN PART I POWER TRANSMISSION LIMITED.**

1.2.0 For the purpose of designing, preparation of design, fabrication drawings and Construction drawings of civil works of Control Building, GI structures of Gantry towers, Gantry Beams, Equipment supporting structures for AC yard, DC yard, Valve Hall & DC Hall eqpt indoor Support structures, AC Filters, DC Filters, and other structures including design and drawings of civil foundations and other civil works of the Switchyard, BHEL intends to appoint a competent and experienced Design Agency.

1.2.1 It is expected of the Design Agency to quote their most competitive rates for the items indicated in Annexure - I of this specification.

2.0.0 SCOPE

2.1.0 The detailed Scope of work but not limited to is as given below.

2.2.0 Based on Inputs from BHEL/customer specification, Preparation of Layout drawing, Architectural drawings, Designing using latest software such as STAAD or similar approved software, preparing detailed fabrication & construction drawings, submission of softcopies / hard copies as required, obtaining approval from BHEL/Customer/ Consultant of Customer, incorporating correction, updating & resubmission (if required) till appropriate approval by customer of detailed design and drawings of any item or items indicated in Annexure-I. The detailed design & drawing work shall include, but not limited to:

2.2.1 Verification of all data, criteria and information contained in the contract documents.

2.2.2 Generation of all data, criteria and information required for the completion of work including liaison and interfaces with BHEL/Consultant/Customer.

2.2.3 The design of any item shall be most economical.

2.2.4 The Construction drawings prepared shall have sufficient detailing so that no difficulty is faced by site engineers during execution.

2.2.5 Providing quantities of major items like Excavation, PCC, Shuttering, RCC, and Reinforcement Steel (dia-wise), etc. for the purpose of estimates, indents, if required.

2.3.0 Visit to Site or Customer's/Consultant's office: The Design Agency will have to depute their Engineer(s) to BHEL office, Customer's/Consultant's office or Site for any clarification etc. as required by BHEL/Consultant/Customer.

3.0.0 SPECIFIC TECHNICAL REQUIREMENTS

3.1.0 The specific technical requirements shall be as per input provided by BHEL from time to time after award of work.

3.2.0 Customer technical specification are enclosed in **Section-3**.

3.3.0 The Design Agency shall interact closely with BHEL engineering group for any input/ clarification and finalize details across the table. There may be certain cases when on account of revision or change of inputs certain design/ drawing may be required to be redone. **No claim on account of this shall be entertained.** Only suitable time extension shall be granted on account of above.

4.0.0 SCHEDULE OF ITEMS

4.1.0 The Schedule/BOQ of Items shall be as per Annexure- I. The Design agency is required to quote their most competitive rates for these items. The quantities shown in annexure -I are tentative and may vary to any extent as per project specific BOQs.

5.0.0 DOCUMENTATION

5.1.0 All design documents including computer outputs shall be neatly typed, produced on A4 size paper and shall have a 'Cover Sheet' (To be provided later).

5.2.0 All drawings shall be prepared in AutoCAD as per standard sizes (viz. A0, A1, A2, A3 & A4) and shall have a 'Title Block' (To be provided by BHEL).

6.0.0 SPECIAL TERMS & CONDITIONS

6.1.0 The consultant/ Consulting Firm shall have dedicated technical staff who will be required to be committed for BHEL's consultancy work. Minimum number of dedicated staffs required and their qualification required are as follows-

6.1.1 03 Nos. Engineers with minimum 5 years Structural design experience

6.1.2 01 No. Architect having minimum 5 years' experience in building designing

6.1.3 06 Nos. Draftsmen with minimum 5 years' experience in preparation of building drawings

6.2.0 During an assignment where, key professionals are named in the contract, if substitution is necessary (for example, because of ill health or because a staff member proves to be unsuitable, or the member is no longer working with the consultant), the consultant shall propose the substitute staff of the same level with intimation to BHEL.

6.3.0 BHEL may visit consultant's registered office for inspection of the firm's technical and managerial strength, overall capacity to perform multiple projects and consultant's capabilities and eligibility to undertake the assignment during the bidding & execution times.

7.0.0 TIME SCHEDULE:

7.1.0 After receipt of LOI/Work Order, a detailed schedule giving list of design documents and drawings and their submission dates shall be prepared jointly by BHEL & Design Agency based on concurrent working meeting the construction schedule. This detailed schedule shall be the time schedule of the project. Any delays attributable to agency in any activity shall be counted by this schedule. As the design and drawings will be approved by Customer, therefore time taken by customer in approval is also important for early completion of work. The agency is required to interact with customer and ensure minimum approval time.

TIME SCHEDULE (FOR EACH BUILDING)					
INPUT BY BHEL			SUBMISSION BY AGENCY		
S. No.	**Description of Input**	**Date of Input**	**S. No.**	**Design /Drawings activity.**	**Submission within time (Days)**
TIME SCHEDULE (FOR EACH BUILDING)					
1	**1. Conceptual plan of building, technical specification and soil report etc.**		1	**Architectural drawings (Lot 1):** Architectural plans, elevations, sections and finishing schedules. Any other sketch, plan/details required for developing architectural drawings/plans.	
			1 (a)	**R0 Submission:** (Nos of days from receipt of input)	20
			1(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments	7

	2. Customer comments/BHEL instruction.			from Customer/BHEL. (Nos of days for each revision)	
			2	**Design document:** The agency is required to start the design immediately after getting Cat -2 approval of architectural drawings (Lot1) of building or earlier if instructed by BHEL/Customer.	
			2(a)	**R0 Submission:**(Nos of days from cat2 approval/instruction of BHEL)	15
			2(b)	**Resubmissions:** (Nos of days for each revision)	10
			3	**Civil drawings (Lot 1)**: All RCC drawings up to plinth beams i.e. foundations layout & details, column details, plinth beams, tie beams if any and staircase dowel bars details etc.	
			3(a)	**R0 Submission:** (Nos of days from Cat 2 approval of Design document).	15
			3(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
			4	**Architectural drawings (Lot 2)**: Door & windows, soak pit, septic tank, plumbing, water supply, sanitary, toilet/pantry details, false ceiling drawings and other miscellaneous drawings such as garland drain, plinth protection, ramp, railings, roof treatment etc. Any other drawing required for completion.	
			4(a)	**R0 Submission**: The agency is expected to put architectural & structural teams parallelly: Therefore, work on these drawings can be started based on Cat 2 approval of architectural drawings (Lot 1).	25
			4(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
2	**Cut out, panel placement plan, underhung cable racks and layout etc.**		5	**Civil drawings (Lot 2)**: All RCC drawings above plinth beams i.e. floor lintels, floor slabs, staircase and roof slabs.	
			5(a)	**R0 Submission:** (Nos of days from Cat 2 approval of Design document).	30
			5(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
3	**Internal cable trench layout**		6	**Civil drawings (Lot3)**: Grade slab, internal cable trenches, cable pull pit etc as per project requirement.	
			6(a)	**R0 Submission:** (Nos days from receipt of input)	10
			6(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
4	**Instructions to submit the As Built Drawings and intimation of changes to be**		7(a)	**R0 Submission:** (Nos days from receipt of input)	30
			7(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments	7

	incorporated in As Built Drawings			from Customer/BHEL. (Nos of days for each revision)	
TIME SCHEDULE (FOR CIVIL WORK SWITCHYARD)					
1	Structure loading diagram, electrical layout, Customer comments /BHEL instruction.		1	***Structure design Including line diagram and GA drawings (Lot-1)*** Switchyard Towers, Beams, trestle	
			1(a)	**R0 Submission:** (Nos days from receipt of input)	45
			1(b)	**Any structure due to hold/change of input**	7
			1(c)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	3
			2	***Foundation design & drawing (Lot-1)*** – Switchyard tower, trestle (after approval/comment of structure design/drawing)	
			2(a)	**R0 Submission:** (Nos days from receipt of input)	30
			2(b)	**Any foundation due to hold/change of input**	7
			2(c)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
			3	***Foundation layout***	
			3(a)	**R0 Submission:** (Nos days from receipt of input)	7
			3(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
2	Equipment GA and other details (to be provided in phase manner/progressively) Customer comments /BHEL instruction.		4	***Structure design including line diagram and GA drawings (Lot-2)*** Switchyard equipment support structures	
			4(a)	**R0 Submission:** (Nos days from receipt of input)	25
			4(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
			5	***Foundation design & drawing (Lot-2)*** – Switchyard equipment support str. (after approval/comments on structure design / drawings) (for each type of eqpt.)	
			5(a)	**R0 Submission:** (Nos days from receipt of input)	10
			5(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
			6	**Fabrication Drawings of Beams & Tower (Lot-1)** – Beam & Tower	

			6(a)	**R0 Submission:** (Nos days after CAT 1 approval of structure design)	15
			6(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
			7	**Fabrication Drawings of Equipment Support Structure (Lot-2)** – All types of Equipment Support Structures.	
			7(a)	**R0 Submission:** (Nos days after CAT 1 approval of structure design)	7
			7(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments	3
				from Customer/BHEL. (Nos of days for each revision)	
3	Transformer /Reactor GA and other details.		8	***Foundation design & drawing (Lot-3)*** – Transformer/Reactor foundation, rail cum road, fire wall etc (for each type)	
			8(a)	**R0 Submission:** (Nos days from receipt of input)	15
			8(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
4	Cable trench details and layout		9	***Foundation Design & drawing (Lot-4)*** – Switchyard trenches/crossing, sump pits etc.	
			9(a)	**R0 Submission:** (Nos days from receipt of input)	7
			9(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
5	Miscellaneous Inputs		10	***Design and drawing (Lot-5)*** – Switchyard roads, drain, fencing, gate, boundary wall, oil recovery tank and other civil works required for project.	
			10(a)	**R0 Submission:** (Nos days from receipt of input)	15
			10(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7
6	**Instructions to submit the As Built Drawings and intimation of changes to be incorporated in As Built Drawings**		11(a)	**R0 Submission:** (Nos days from receipt of input)	30
			11(b)	**Resubmissions:** Revised drawings shall be submitted by agency within receipt of comments from Customer/BHEL. (Nos of days for each revision)	7

Notes:

1 All inputs shall be provided by e-mails in soft copy. The date of e-mail sent by BHEL shall be considered as date of input.

2 The agency shall immediately acknowledge the receipt of input via return email.

8.0.0 PAYMENT SCHEDULE:

S.No.	Condition	Payment
Item Nos 1, 2, 3 & 4 of Sch./BOQ of Items		
(a)	On approval of design documents / drawings (at least Cat 2 i.e. approved with comments)	75% of quoted rate
(b)	Approval of design documents / drawings in Cat-I	20% of quoted rate.
(c)	Submission of as-built drawings	5% of quoted rate.
Item No 5		
(a)	On approval (at least Cat 2 i.e. approved with comments) of architectural drawings.	10% of quoted rate on pro-rata basis.
(b)	On approval (at least Cat 2 i.e. approved with comments) of design documents.	20% of quoted rate on pro-rata basis.
(c)	On approval (at least Cat 2 i.e. approved with comments) of construction/ structure / fabrication drawings.	45% of quoted rate on pro-rata basis.
(d)	On approval (at least Cat 2 i.e. approved with comments) of plumbing, sanitary & other miscellaneous drawings.	10% of quoted rate on pro-rata basis.
(e)	Approval of all documents in Cat-I	10 % of quoted rate.
(f)	Submission of as-built drawings	5% of quoted rate.
Item No 6 of Sch./BOQ of Items		
(a)	On submission of claim after completion of visit.	100 % of quoted rate.

BILL OF QUANTITY

Name of Project :	HVDC Fatehpur Bhadla Project
Name of Work :	Civil Design Consultancy for HVDC Switchyard

Item No	Description	Unit	Qty			Rate (Rs.)	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
1	**Preparation, submission of design documents & line sketches of following switchyard structures as per Specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL.**						
A	***Lattice/Pipe Structures***						
(i)	765kV Gantry & Towers i/c foundation bolts	Types	0	4	**4**	123350	493400
(ii)	765kV Switchyard equipment support structures i/c foundation bolts	Types	0	6	**6**	27333	163998
(iii)	400kV Switchyard beams	Types	0	7	**7**	24000	168000
(iv)	400kV Switchyard towers i/c foundation bolts	Types	8	6	**14**	45667	639338
(v)	400kV Switchyard equipment support structures i/c foundation bolts	Types	12	1	**13**	20667	268671
(vi)	33kV Switchyard beams	Types	1	0	**1**	17333	17333
(vii)	33kV Switchyard towers i/c foundation bolts	Types	2	0	**2**	19000	38000
(viii)	PLC Filter Capacitor	Types	1	0	**1**	14000	14000
(ix)	PLC Filter Reactor	Types	1	0	**1**	14000	14000
(x)	33kV Switchyard equipment support structures i/c foundation bolts	Types	1	0	**1**	12333	12333
(xi)	Valve Hall equipment support structures i/c foundation bolts	Types	7	0	**7**	21667	151669
(xii)	AC Filter Yard equipment support structures i/c foundation bolts	Types	7	7	**14**	11333	158662
(xiii)	DC Yard equipment support structures i/c foundation bolts	Types	7	7	**14**	14000	196000
(xiv)	DC Hall equipment support structures i/c foundation bolts	Types	56	51	**107**	24333	2603631
(xv)	DC Filter equipment support structures i/c foundation bolts	Types	21	21	**42**	17333	727986
(xvi)	LM Tower i/c foundation bolts	Types	2	1	**3**	62000	186000
			1	1			
2	**Preparation & submission of fabrication (structure assembly) drawings & BOMs including their approval from BHEL/Customer based on input from BHEL.**						
A	***Lattice type Structures***						
(i)	765kV Gantry & Towers	Types	0	4	**4**	53667	214668
(ii)	400kV Beams	Types	0	7	**7**	26000	182000
(iii)	400kV Towers	Types	8	6	**14**	40000	560000
(iv)	LM Tower	Types	2	1	**3**	52000	156000
(v)	33kV Beams	Types	1	0	**1**	12333	12333
(vi)	33kV Tower/LM	Types	2	0	**2**	19000	38000
(vii)	765kV Equipment Support Structure except Wave Trap & 3-Ph Isolators	Types	0	4	**4**	12333	49332
(viii)	765kV 3-Ph Isolators	Types	0	3	**3**	16667	50001
(ix)	765kV 1-Ph Isolators	Types	0	3	**3**	16667	50001
(x)	765kV 1-Ph Wave Trap	Types	0	1	**1**	16667	16667
(xi)	400kV Equipment Support Structure except 3-Ph Isolators	Types	4	4	**8**	9667	77336
(xii)	400kV 3-Ph Isolators	Types	1	1	**2**	12333	24666
(xiii)	PLC Filter Capacitor	Types	1	1	**2**	7000	14000
(xiv)	PLC Filter Reactor	Types	1	1	**2**	7000	14000
(xv)	33kV Switchyard equipment support structures	Types	7	0	**7**	7000	49000
(xvi)	Valve Hall equipment support structures	Types	3	3	**6**	11333	67998
(xvii)	AC Filter Yard equipment support structures	Types	4	4	**8**	7667	61336
(xviii)	DC Yard equipment support structures	Types	28	22	**50**	9667	483350
(xix)	DC Hall equipment support structures	Types	10	0	**10**	13333	133330
(xx)	DC Filter equipment support structures	Types	6	6	**12**	13333	159996
3	**Preparation, submission of design documents of following switchyard civil works as per Specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL.**						
(i)	765kV tower foundation	Types	0	4	**4**	**18000**	72000
(ii)	400kV tower foundation	Types	8	6	**14**	**12333**	172662
(iii)	33kV tower foundation	Types	2	0	**2**	**18000**	36000
(iv)	765kV equipment support structure foundations	Types	0	7	**7**	**16333**	114331
(v)	400kV equipment support structure foundations	Types	8	8	**16**	**16333**	261328
(vi)	33kV equipment support structure foundations	Types	8	8	**16**	**16333**	261328
(vii)	AC Filter Yard equipment support structure foundations	Types	7	7	**14**	**15000**	210000
(viii)	PLC Filter Capacitor/Reactor Foundations	Types	2	1	**3**	**18000**	54000
(ix)	Cable trench	Types	6	0	**6**	**27667**	166002
(x)	Cable Trench Crossing	Types	6	0	**6**	**20667**	124002
(xi)	500MVA Transformer foundation with soakpit including Fire wall	Types	0	1	**1**	**34333**	34333
(xii)	110/80/50MVAR Reactor foundation with soakpit including Fire wall	Types	2	2	**4**	**34333**	137332
(xiii)	Auxiliary Transformer foundations	Types	1	1	**2**	**13667**	27334
(xiv)	Jacking pad for transformer/reactor	Types	2	2	**4**	**21000**	84000
(xv)	Rail cum road	Types	2	2	**4**	**17333**	69332
(xvi)	Road	Types	2	2	**4**	**14000**	56000
(xvii)	Storm water Drainage	Types	4	4	**8**	**19667**	157336
(xviii)	Sump pit for cable trench/drainage	Types	2	2	**4**	**8667**	34668
(xix)	Boundary wall	Types	1	1	**2**	**12333**	24666
(xx)	Oil recovery (including oil water separator) tank	Types	2	2	**4**	**28333**	113332

BILL OF QUANTITY

Name of Project :	HVDC Fatehpur Bhadla Project
Name of Work :	Civil Design Consultancy for HVDC Switchyard

Item No	Description	Unit	Qty			Rate (Rs.)	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
(xxi)	DG set foundation design	Types	1	2	3	17667	53001
(xxii)	30m DG support structure/Chimney foundation design	Types	1	2	3	24000	72000
(xxiii)	Underground diesel tank (15KL)(common underground foundation design for accommodating 2 nos. tanks)	Types	1	1	2	5500	11000
(xxiv)	DG SET Fuel transfer pump room/PUMP HOUSE	Types	1	1	2	11000	22000
4	**Preparation, submission of drawings of following switchyard civil works including their approval from BHEL/Customer based on input from BHEL**						
(i)	Details of Tower foundation bolts (All Ratings)	Set of Drawings	2	3	5	2150	10750
(ii)	Details of AIS equipment foundation bolts	Set of Drawings	1	2	3	2150	6450
(iii)	Details of DC Yard/DC Filter/Valve Hall/DC Hall/AC Filter Equipment foundation bolts	Set of Drawings	2	2	4	2150	8600
(iv)	Foundation Layouts of 765/400/33kV Switchyard	Set of Drawings	2	2	4	226667	906668
(iv)	Foundation Layout of AC Filter yard	Set of Drawings	1	1	2	123333	246666
(v)	Details of tower foundations	Drawing	18	22	40	10667	426680
(vi)	Details of equipment foundations	Set of Drawings	31	36	67	9667	647689
(vii)	Ground Improvement Layout	Set of Drawings	1	0	1	32000	32000
(viii)	Details of cable trenches	Set of Drawings	1	1	2	21500	43000
(ix)	Details of cable trench crossings	Set of Drawings	1	1	2	24333	48666
(x)	Details of 500MVA Transformer foundation with soakpit including combined Layout of all Transformers & Fire walls etc.	Set of Drawings	0	1	1	26500	26500
(xi)	Details of 110/80/50MVAR Reactor foundation with soakpit including combined Layout of all reactors & Firewalls etc.	Set of Drawings	2	2	4	32667	130668
(xii)	Auxiliary Transformer	Drawing	1	1	2	7667	15334
(xiii)	Details of Jacking pad for transformer/reactor	Drawing	2	2	4	21667	86668
(xiv)	Details of Rail cum road	Drawing	2	2	4	11333	45332
(xv)	Layout of cable trenches	Drawing	1	1	2	53500	107000
(xvi)	Details of Road including Layout	Set of Drawings	1	1	2	32000	64000
(xvii)	Details of fencing	Set of Drawings	1	1	2	17000	34000
(xviii)	Details of boundary wall	Drawing	1	1	2	31000	62000
(xix)	Details of gates	Drawing	2	2	4	18667	74668
(xx)	Layout of drainage	Drawing	1	1	2	32000	64000
(xxi)	Details of drains/crossings	Set of Drawings	1	1	2	19333	38666
(xxii)	Details of sump pits	Drawing	1	1	2	10333	20666
(xxiii)	Details of Oil recovery tank including Layout	Set of Drawings	1	1	2	24000	48000
(xxiv)	Rain Water Harvesting	Drawing	1	1	2	21000	42000
5	**Preparation, submission of design documents & drawings of following RCC buildings as per specification/Latest IS codes including their approval from BHEL/Customer based on input from BHEL** **Single Storey: (For working out area, outer wall to outer wall dimensions shall be considered)**						
(i)	Auxiliary CRB- Greater than 100sqm but less than equal to 650sqm	LS	0	1	1	366667	366667
(ii)	SPR- less than equal to 100sqm	LS	2	2	4	53000	212000
6	**Visit to Site / Customer's / Consultant / verification agency**						

BILL OF QUANTITY

Name of Project :	HVDC Fatehpur Bhadla Project
Name of Work :	Civil Design Consultancy for HVDC Switchyard

Item No	Description	Unit	Qty			Rate (Rs.)	Amount
			Bhadla(B)/ Bhadla-III	Fatehpur (F)	Total (B+F)		
(i)	LS Allowance per day including boarding, lodging, local conveyance, etc., all inclusive. (BHEL shall pay to & fro Ist AC fare from Bidder's headquarters to BHEL office/Customer office/any other place within India for each visit separately.)	day	5	5	**10**	31000	310000
(ii)	LS Allowance per day including boarding, lodging, local conveyance, etc., all inclusive. (BHEL shall pay to & fro economy class Air fare from Bidder's headquarters to Site/Customer office for each visit separately.)	day	5	5	**10**	31000	310000
	Total Amount					TOTAL	**15070360**

SECTION - 2

STANDARD TECHNICAL SPECIFICATION
(N.A.)

SECTION - 3

ENCLOSURES TO THE SPECIFICATION

(a) Customer's specification

TECHNICAL SPECIFICATION FOR

CIVIL WORKS & STRUCTURE WORKS

FOR SANGOD SS

REV. NO.	DATE	DESCRIPTION	PREPARED BY	REVIEWED BY	APPROVED BY
03	21.07.2022	Issued for Tender	Nilesh C. Lal	Manoj Gohil	Sanjay Bhatt
02	24.01.2022	Issued for tender	Nilesh C. Lal		Ishwar K. Dubey
01	07.03.2019	Issued for tender			
00					

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SECTION: CIVIL WORKS

1. GENERAL

The intent of this technical specification covers the following:

The civil works to be provided by the Contractor, in accordance with the Specification, shall include the design & construction of all the items required for the Substation including site and general services; buildings; foundations; structures, cable trenches, Drains, Fencing fire and firewalls etc. The supply of steel and cement required for the civil works shall also be in the scope of the contractor. All testing required shall be arranged by the Contractor at his own cost (40% TP + 60% at site). The contractor shall execute the work as per the standard Field Quality Plan (SFQP) enclosed with the specifications in Third party lab.

All civil works shall satisfy the requirements specified in other Sections of this Specification and as detailed below. They shall be designed to the required service conditions/loads as specified elsewhere in this Specification and implied as per relevant national /international Standards. All civil works shall be carried out as per design/drawings approved by the Owner and the specification provided by the Owner. In case any item is not covered under specification then the same shall be carried out as per CPWD specification /applicable Standards / IRC guidelines etc. whichever is critical. Any item for which specification is not provided herein and is not covered under CPWD specification shall be executed as per manufacturer guidelines. All materials shall be of best quality conforming to relevant Indian Standards and Codes. In case of any conflict between Standards/ Code and Technical Specification, the most critical of the all the provisions shall prevail.

All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. The Contractor shall furnish all design, drawings, labor, tools, equipment, materials, temporary works, constructional plant, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications, and direction of the Employer.

All the Works shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Employer. For all buildings, structures, foundations etc. necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the plant and facilities and providing enough space and access for operation, use and maintenance. Certain minimum requirements are indicated in this Specification for guidance purpose only; however, the Contractor shall provide according to the complete requirements.

All quality standards, fabrication and erection check lists, welding standards and other technical requirements as covered in the Specification shall be strictly adhered to by the Contractor.

Construction of all civil works at substation is covered in the scope of contract which shall be as per drawings approved by Owner.

The bidder shall fully apprise himself of the prevailing conditions at the proposed site. Climatic conditions including monsoon patterns, local conditions and site-specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.

2. DRAWINGS

The contractor shall submit the drawings for the approval of the Employer in sets of four drawings /EDMS Portal/E -mail. The Contractor shall execute the work at Site as per approved drawings only. Photocopies shall not be used at Site.

2.1. Control room building

The control room cum office building shall have acquits size to ensure functional requirement / client's requirement. All the indoor equipment's such as ACDB, DCBD, battery charger, battery, MIDB etc. shall be installed at respective portion of the area. Balance area shall be used for Station in-charge room, Engineer's room, office, and test lab etc. with split type ACs in every room. All basic concept drawings will be submitted by bidders keeping in mind the present and future scope requirement of the building. The buildings shall be designed keeping in mind the functionality and the aesthetics also. (Architect to be used for the external architecture). 3D views shall be got approved by the Contractor during approval of Architectural drawings.

2.2. Firefighting pump house building and fire water tank

All construction drawings will be submitted by contractor after award for approval of Owner.

2.3. Bay Control Rooms:

These shall be buildings of suitable size to house the Control & Relay panels.

All Construction drawings will be submitted by Contractor after award for approval of owner

2.4. Tower & equipment foundations

All construction drawings for towers and equipment's foundations shall be developed by contractor as per IS: 802 & 456 during detailed engineering. Foundations for any miscellaneous requirements like electric poles, kiosks etc. shall also be engineered by the Contractor and the design and drawings shall be submitted for Owner's approval.

Drawings for transformer / reactor foundations and fire wall shall be made available by the contractor to the Owner during detailed engineering.

In case the site conditions warrant any special type of foundations to be used, the same shall be designed and issued by the contractor during detailed engineering.

2.5. Tower and equipment structures

All construction drawings shall be developed after award by the contractor.

The fabrication drawings (structure assembly drawings) and Bill of Materials based on the Design/ drawings of standard structure shall also be developed by contractor.

Suitable modification shall be carried out in the drawings of equipment support structures by the contractor to suit fixation of accessories such as marshalling boxes, MOM boxes, control cabinets, junction box, surge counter etc. in the structure fabrication drawings. Drawings of fixing of such accessories shall be submitted by the contractor for approval.

2.6. Roads and rail cum Road

All construction drawings for road as well as rail cum road shall be developed after award by the contractor.

2.7. Drains

The contractor shall develop an overall drainage layout for the entire switching station during detailed engineering. The type of drains used shall be of the sections standardized and indicated in the drawings to be developed by the contractor.

2.8. Boundary Wall with Main Gate

The contractor shall develop an overall Boundary wall layout enclosing the entire switching station (including the residential & the station area) during detailed engineering. The type of Sections to be used for the Boundary wall shall be of the sections standardized and indicated in the drawings to be developed by the contractor. The Contractor shall design the section as per site soil report and submit to the Employer for approval of the concept, design & detail drawings. (Refer Annexure-5 & 6)

2.9. Chain Link Fencing and Switchyard Gate

The chain link fencing drawings & switchyard gate as per annexure-4 & 6 respectively shall be submitted after award by contractor for Owner's approval. The contractor shall design the foundation of the fence as per the site soil report and submit to the employer for approval of the concept, design, and detail drawing.

2.10. Rainwater harvesting

All construction drawings shall be submitted after award by contractor for OWNER's approval.

2.11. External water supply from bore-well to fire water tank

The drawing for the water supply from bore -well to fire water tank shall be developed by the contractor and submitted to Owner for approval. Water supply shall be arranged by the Contractor at two locations within the substation. 80 mm dia. GI pipe shall be provided by the Contractor from the bore -well to the fire water tank. From this a 25 mm minimum dia. tap off shall be connected by the Contractor to the roof water tank provided for the control room building & security hut.

2.12. Septic tank and soak pit

All construction drawings shall be submitted afterward by contractor for OWNER's approval.

2.13. Stone spreading and antiweed treatment

The layout of the area where anti -weed treatment and stone spreading is to be provided shall be made available to the contractor during detailed engineering.

3. CIVIL WORKS DESIGN BASIS

3.1. GENERAL

The Contractor shall design and construct all civil works to meet the requirements of the Specification and to be suitable for the intended use at the specified locations. In particular, the Contractor shall be responsible for obtaining all data not specifically detailed herein which is required to ensure compliance with the Specification. In case of any dispute between the details as mentioned in the technical specification, IS codes and CPWD specifications, the critical of all shall prevail and the decision of the Owner shall be binding.

The foundations and structures shall be designed to ensure that relative movement over the specified life of the installation does not result in stresses in any part of the Works which exceed the maximum design levels.

A report to the effect shall be submitted by the Contractor for the Employer's specific approval giving details regarding his assumed data for civil design.

The Contractor must visit site during the bidding stage and acquaint himself with the local ground conditions and perform any investigations as required. Any variation in design data shall not constitute a valid reason for any additional cost & shall not affect the terms & condition of the Contract. No extra payment whatsoever, shall be paid to the Contractor on account of any variation in soil properties / conditions.

3.2. LAND DEVELOPMENT

As available site shall be handed over to the Contractor. The finished ground level shall be the finished formation level furnished/fixed by the Employer. The filling / cutting required to reach the FGL as furnished by the employer shall be deemed to be included in the scope of the contractor. In case borrowed earth the bidder has to ensure only moorum soil is used and no weak soil such as Black cotton or clayey soil shall be allowed. Bidder to ascertain availability of suitable quality of soil for filling during bidding itself. No additional cost implication shall be entertained after award on this account. The compaction of finish formation shall be approx. 95% on proctor scale. In case it is found to be lower, then the contractor might redo the job without any additional cost to the Employer.

For detailed technical specification for earth filling work refer **Annexure 1** of this document.

Bidder to evaluate the land development (cutting and filling) requirement for Substation as no cost and time implication shall be provided to the bidder due to any variation in the land development quantity. The land can be developed in single level or multi-level as per the requirement of the owner and layout. Switchyard FGL shall be +300 mm above HFL or nearest SH/NH whichever is higher.

Area flood drainage study shall be conducted by the bidder for the plot before finalization of the FGL.

3.2.1. SCOPE OF WORK (Geotechnical Investigation)

The Contractor shall perform a detailed soil investigation to arrive at sufficiently

accurate, general as well as specific information about the soil profile and the necessary soil parameters of the Site in order that the foundation of the various structures can be designed and constructed safely and rationally.

This specification covers all the work required for detailed soil investigation and preparation of a detailed report. The work shall include mobilization of necessary equipment, providing necessary engineering supervision and technical personnel, skilled and unskilled labor etc. as required to carry out field investigation as well as, laboratory investigation, analysis and interpretation of data and results, preparation of detailed Geo-technical report including specific recommendations for the type of foundations and the allowable safe bearing capacity for different sizes of foundations at different founding strata for the various structures of the substation.

The Contractor shall make his own arrangement for locating the co-ordinates and various test positions in field as per the information supplied to him and for determining the reduced level of these locations with respect to the benchmark indicated by the Employer.

A report to the effect shall be submitted by the Contractor for Employer's specific approval giving details regarding data proposed to be utilized for civil structures design.

All the work shall be carried out as per latest edition of the corresponding Indian Standard Codes.

The contractor shall submit the soil investigation layout for Employer's specific approval giving details regarding the soil test to be performed at site.

Soil Investigation must be carried out for bay extension substations.

3.2.2. BORE HOLES

Bore holes of 150 mm diameter in accordance with the provisions of IS: 1892 at the rate of minimum one number bore hole per hectare up to 10meter depth or to refusal which ever occur earlier shall be drilled. In any case number of boreholes shall not be less than five. By refusal it shall mean that a standard penetration blows count (N) of 100 is recorded for 30 cm penetration. Number of boreholes may be increased in case soil strata are varying from borehole to borehole to have fair idea of soil profile. In case of pile foundations soil investigation is to be carried out up to 25 m depth from ground level or refusal whichever is earlier. In case rock is encountered, coring in all the boreholes shall be carried out up to 3 meter in rock.

The contractor shall carry out Standard Penetration Tests at approximately 1.5 m interval in the borehole starting from 1.5 m below ground level onwards and at every change of stratum. The disturbed samples from the standard penetrometer shall also be collected for necessary tests.

The contractor shall collect undisturbed samples of 100/75 mm diameter 450 mm long from the bore holes at intervals of 2.5 m and every change of stratum starting from 1.0 m below ground level onwards in clayey strata.

The depth of Water Table, if encountered, shall be recorded in each borehole. In case the soil investigation is carried out in winter/summer, the water table for rainy season shall be collected from reliable sources and recorded in the report.

All samples, both disturbed and undisturbed, shall be identified properly with the

borehole number and depth from which they have been taken.

The sample shall be sealed at both ends of the sampling tubes with wax immediately after the sampling and shall be packed properly and transported to the Contractor's laboratory without any damage or loss.

The logging of the boreholes shall be compiled immediately after the boring is completed and a copy of the bore log shall be handed over to the Engineer-in- change.

3.2.3. TRIAL PITS

Trial pits shall be carried out at minimum one location per hectare as directed by the Employer. The trial pits shall be 2 m x 2 m in size extending to 4 m depths, or as specified by the Employer. Undisturbed samples shall be taken from the trial pits as per the direction of the Employer.

3.2.4. ELECTRICAL RESISTIVITY TEST

This test shall be conducted to determine the Electrical resistivity of soil required for designing safety-grounding system for the entire station area. The specifications for the equipment's and other accessories required for performing electrical resistivity test, the test procedure, and reporting of field observations shall confirm to IS:3043 (Latest). The test shall be conducted using Wagner's four electrode method as specified in IS: 1892, Appendix-B2 also polar curve to be shown in the report. Unless otherwise specified at each test location, the test shall be conducted along two perpendicular lines parallel to the coordinate axis. On each line a minimum of 8 to 10 readings shall be taken by changing the spacing of the electrodes from an initial small value of 0.2 m up to 50.0 m.

Thermal Resistivity Test shall be performed wherever underground cable is envisaged.

3.2.5. PLATE LOAD TEST

Plate load test shall be conducted to determine the bearing capacity, modulus of sub grade reaction and load/settlement characteristics of soil at shallow depths by loading a plane and level steel plate kept at the desired depth and measuring the settlement under different loads, until a desired settlement takes place or failure occurs. The specification for the equipment and accessories required for conducting the test, the test procedure, field observations and reporting of results shall conform
to IS: 1888. Modulus of sub grade reaction shall be conducted as per IS: 9214. The location and depth of the test shall be at the Control Room Building, Transformer Foundations, Reactor Foundations, & FF Reservoir locations at the proposed foundation depth below finished ground level for determining the bearing capacity.

Undisturbed tube samples shall be collected at 1.0 m and 2.5m depths from natural ground level for carrying out laboratory tests.

The size of the pit in plate load test shall not be less than five times the plate size and shall be taken up to the specified depth. All provisions regarding excavation and visual examination of pit shall apply here.

Unless otherwise specified the reaction method of loading shall be adopted. Settlement shall be recorded from dial gauges placed at four diametrically opposite ends of the test plate. Valid calibration certificates for all equipment to be used shall be submitted to employer before execution of tests.

The load shall be increased in stages. Under each loading stage, record of Time vs. Settlement shall be kept as specified in IS: 1888.

Backfilling of the pit shall be carried out as per the directions of the Employer. Unless otherwise specified the excavated soil shall be used for this purpose. In cases of gravel-boulder or rocky strata, respective relevant codes shall be followed for tests.

3.2.6. CALIFORNIA BEARING RATIO

Sufficient sample shall be taken as per road layout at interval of 50 m for complete road layout and CBR test shall be carried out as per standards.

3.2.7. WATER SAMPLE

Representative samples of ground water shall be taken when ground water is first encountered before the addition of water to aid drilling of boreholes. The samples shall be of sufficient quantity for chemical analysis to be carried out and shall be stored in air -tight containers.

3.2.8. BACK FILLING OF BORE HOLES

On completion of each hole, the Contractor shall backfill all bore holes as directed by the Employer. The backfill material can be the excavated material.

3.2.9. LABORATORY TEST

1. The laboratory tests shall be carried out progressively during the field work after enough samples has reached the laboratory in order that the test results of the initial bore holes can be made use of in planning the later stages of the field investigation and quantum of laboratory tests.

2. All samples brought from field, whether disturbed or undisturbed shall be extracted / prepared and examined by competent technical personnel, and the test shall be carried out as per the procedures laid out in the relevant I.S. Codes.

   The following laboratory tests shall be carried out

   a) Visual and Engineering Classification
   b) Liquid limit, plastic limit, and shrinkage limit for C -Ø soils.
   c) Natural moisture content, bulk density, and specific gravity.
   d) Grain size distribution.
   e) Swell pressure and free swell index determination.
   f) California bearing ratio.
   g) Consolidated drained test with pore pressure measurement.
   h) Chemical tests on soil and water to determine the carbonates, sulphates, nitrates, chlorides, Ph-value, and organic matter and any other chemical harmful to the concrete foundation.
   i) In case of rock samples following tests shall also be conducted:
      i) Rock quality designation (RQD), RMR.
      ii) UCC test.
      iii) Point Load Index test

3.2.10. TEST RESULTS AND REPORTS

The Contractor shall submit the detailed report in four (4) copies wherein information regarding the geological detail of the site, summarized observations, and test data,

bore logs, and conclusions and recommendations on the type of foundations with supporting calculations for the recommendations. Initially the contractor shall submit draft report and after the draft report is approved, the final report in four (4) copies shall be submitted. The test data shall bear the signatures of the Investigation Agency, Vendor and site representative of Employer.

The report shall include, but not limited to the following: -

a) A plan showing the locations of the exploration work i.e., bore holes, Dynamic cone penetration tests, trial pits, Plate load test etc.
b) Bore Logs: Bore logs of each bore holes clearly identifying the stratification and the type of soil stratum with depth. The values of Standard Penetration Test (SPT) at the depths where the tests were conducted on the samples collected at various depths shall be clearly shown against that stratum.

Test results of field and laboratory tests shall be summarized strata wise as well in combined tabular form. All relevant graphs, charts tables, diagrams, and photographs, if any, shall be submitted along with report. Sample illustrative reference calculations for settlement, bearing capacity, pile capacity shall be enclosed.

Recommendations: The report should contain specific recommendations for the type of foundation for the various structures envisaged at site. The Contractor shall acquaint himself about the type of structures and their functions from the Employer.
The observations and recommendations shall include but not limited to the following:

a) Geological formation 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.
b) Recommended type of foundations for various structures. If piles are recommended the type, size and capacity of pile and groups of piles shall be given after comparing different types and sizes of piles and pile groups.
c) Allowable bearing pressure on the soil at various depths for different sizes of the foundations based on shear strength and settlement characteristics of soil with supporting calculations. Minimum factor of safety for calculating net safe bearing capacity shall be taken as 3.0 (three). Recommendation of liquefaction characteristics of soil shall be provided.
d) Recommendations regarding slope of excavations and dewatering schemes, if required.
e) Comments on the Chemical nature of soil and ground water with due regard to deleterious effects of the same on concrete and steel and recommendations for protective measures.
f) If expansive soil is met with, recommendations on removal or detainment of the same under the structure, road, drains, etc. shall be given. In the latter case detailed specification of any special treatment required including specification or materials to be used, construction method, equipment's to be deployed etc. shall be furnished. Illustrative diagram of a symbolic foundation showing details shall be furnished.

Recommendations for additional investigations beyond the scope of the present work, if considered such investigation as necessary.
In case of foundation in rocky strata, type of foundation and recommendation regarding rock anchoring etc. should also be given.
No cost or time implication shall be provided to the bidder at later stage due to change

of soil parameters. Hence, bidder to evaluate the soil parameters judiciously for bidding and execution purpose.
All site investigation field data shall be duly verified and signed by authorized person from both employers and bidder at site. The same shall be attached in the annexure of the final report.

4. AREA DEVELOPMENT & SITE PREPARATION:

As available site shall be handed over to the contractor. The Access Road at site shall also be in scope of contractor. The further site development works like grubbing, cutting, or filling required, site grading etc. shall be in the scope of the contractor. The layout and levels of all structure etc. shall be made by the Contractor at his own cost from the general grids of the plot and benchmarks set by the Contractor and approved by the Owner. The Contractor shall provide all assistance in instruments, materials, and personnel to the Owner for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels.

4.1. SCOPE

This clause covers the execution of the work for site preparation, such as clearing of the site, the supply and compaction of fill material, excavation, and compaction of backfill for foundation, road construction, drainage, trenches and final topping by stone (broken hard stone). The accuracy of the levels shall be to the tune of +/ - 50mm.

4.2. GENERAL

a) Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the Owner.
b) Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. Excavated material not suitable or not required for backfill shall be disposed of in areas as directed by Owner up to a maximum lead of 5 km within or outside the boundaries.

4.3. EXCAVATION AND BACKFILL

a) Excavation and backfill for foundations shall be in accordance with the relevant code.
b) Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling. All necessary arrangements for dewatering, sludge removal etc. for the removal of water is included in contractor's scope, no additional claim in this regard shall be entertained on a later date.
c) When embankments are to be constructed on slopes of 15% or greater, benches or steps with horizontal and vertical faces shall be cut in the original slope prior to placement of embankment material. Vertical faces shall measure not more than 1 m in height.
d) Embankments adjacent to abutments, culverts, retaining walls and similar structures shall be constructed by compacting the material in successive uniform horizontal layers not exceeding 15 cm in thickness. (Of loose material before compaction). Each layer shall be compacted as required by means of mechanical tampers approved by the Owner. Rocks larger than 10 cm in any direction shall not be placed in embankment adjacent structures.
e) Earth embankments of roadways and site areas adjacent to buildings shall be placed in successive uniform horizontal layers not exceeding 20 cm in thickness in

loose stage measurement and compacted to the full width specified. The upper surface of the embankment shall be shaped to always provide complete drainage of surface water.

4.4. COMPACTION

a) The density to which fill materials shall be compacted shall be as per relevant IS and as per direction of Owner. All compacted sand filling shall be confined as far as practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor 's density at OMC. The sub grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material shall be compacted to 70% relative density (minimum)

b) At all times unfinished construction shall have adequate drainage. Upon completion of the road's surface course, adjacent shoulders shall be given a final shaping, true alignment, and grade.

c) Each layer of earth embankment when compacted shall be as close to optimum moisture content as practicable. Embankment material which does not contain sufficient moisture to obtain proper compaction shall be wetted. If the material contains any excess moisture, then it shall be allowed to dry before rolling. The rolling shall begin at the edges overlapping half the width of the roller each time and progress to the center of the road or towards the building as applicable. Rolling will also be required on rock fills. No compaction shall be carried out in rainy weather.

4.5. REQUIREMENT FOR FILL MATERIAL UNDER FOUNDATION

The thickness of fill material under the foundations shall be such that the maximum pressure from the footing, transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed soil. For expansive soils the fill materials and other protections etc. to be used under the foundation is to be got Approved by the Contractor from the Owner. However, no foundation shall rest over filled up soil.

5. ANTIWEED TREATMENT & STONE SPREADING

5.1. SCOPE OF WORK

The Contractor shall furnish all labor, equipment and materials required for complete performance of the work in accordance with the drawings, specification, and direction of the Owner.

Stone spreading along with antiweed treatment shall be done in the areas of the switchyard under present scope of work. However, the stone spreading along with antiweed Treatment in future areas within fenced area shall also be provided in case step potential without stone layer is not well within safe limits.

5.2. GENERAL REQUIREMENT

The material required for site surfacing / stone filling shall be free from all types of organic / inorganic materials and shall be of standard quality, and as approved by the Owner.

5.2.1. The material to be used for stone filling / site surfacing shall be uncrushed / crushed / broken stone of 40mm nominal size (upgraded single size)

conforming to Table 2 of IS:383 – 1970. Hardness and flakiness as required for wearing courses are given below:

a) Sieve Analysis limits (Gradation) (IS: 383 – Table – 2)

Sieve Size	% passing by weight
63mm	100
40mm	85 -100
20mm	0 -20
10mm	0 -5

"One Test" shall be conducted for every 500 cum.

b) Hardness
Abrasion value (IS:2386 Part -IV) – not more than 40%

Impact value (IS:2386 Part -IV) – not more than 30% and frequency shall be one test per 500 cum. with a minimum of one test per source.

c) Flakiness Index

One test shall be conducted per 500 cum. of aggregate as per IS:2386Part – I and maximum value is 25%.

5.2.2. After all the structures/ equipment's are erected, antiweed treatment shall be applied in the switchyard wherever stone spreading is to be done and the area shall be thoroughly de - weeded including removal of roots. The recommendation of local agriculture or horticulture department may be sought wherever feasible while choosing the type of chemical to be used. The antiweed chemical shall be procured from reputed manufacturers. The doses and application of chemical shall be strictly done as per manufacturer's recommendation. Nevertheless, the effectiveness of the chemical shall be demonstrated by the contractor in a test area of 10MX10M (appx) and shall be sprinkled with water at least once in the afternoon every day after forty-eight hours of application of chemical. The treated area shall be monitored over a period of two to three weeks for any growth of weeds by the Engineer-in-charge. The final approval shall be given by Engineer – in –charge based on the results.

5.2.3. Engineer-in-charge shall decide final formation level to ensure that the site appears uniform devoid of undulations. The final formation level shall however be very close to the formation level indicated in the approved drawing.

5.2.4. After antiweed treatment is complete, the surface of the switchyard area shall be maintained, rolled/compacted to the lines and grades as decided by Engineer -in charge. The sub grade shall be consolidated by using half ton roller with suitable water sprinkling arrangement to form a smooth and compact surface. The roller shall run over the sub grade till the soil is evenly and densely consolidated and behaves as an elastic mass.

5.2.5. In areas that are considered by the Engineer -in-Charge to be too congested with foundations and structures for proper rolling of the site surfacing material by normal rolling equipment's, the material shall be compacted by hand, if necessary. Due care shall be exercised so as not to damage any foundation structures or equipment during rolling comp action.

5.2.6. Over the prepared sub grade, a final layer of 100mm thickness of uncrushed/crushed/broken stone of 40mm nominal size (ungraded size) shall be spread uniformly.

6. SEWAGE SYSTEM

a) Sewage system (including collection, treatment, and disposal) shall be provided for all buildings.
b) For treating the effluents, the Contractor shall provide septic tank and soak pit system of suitable size within the stations.
c) The sewage system shall consist of all necessary piping, pumps (if required), fittings, manholes, clean outs, piping connections and all other materials required for a safe and efficient sewage system. Sewer pipes and fittings shall conform to the relevant Indian Standards.
d) Sewers shall be designed for a minimum self -cleansing velocity of 0.75 m/sec and the maximum velocity shall not exceed 2.4 m/sec.
e) Cement concrete pipes or Cast-Iron pipes shall be used below ground level. However, salt glazed stoneware pipes can be used in localized areas not subject to any traffic load.
f) Manholes shall be provided at every 30 m along the length, and at connection points, and at every change of alignment, gradient, or diameter of a sewer pipeline.

7. DRAINAGE

7.1. SITE DRAINAGE

The Contractor shall provide rainwater drainage system within the switchyard fencing including connection at one or more points to the outfall points located outside the substation boundary wall is in the scope of contractor. Invert level of drainage system at outfall points shall be decided in such a way that the water can easily be discharged outside the substation boundary wall. In case outfall point is away from boundary wall, only 100-meter drain outside the boundary wall is in the scope of contractor. Outfall points shall be approved from Engineer-in-charge before commencement of construction.

Area flood drainage study shall be conducted by bidder and shall be duly approved by the owner before planning of drainage system of the switchyard.

While designing the drainage system following points shall take care of:

- The surface of the switchyard shall be sloped towards the drain to prevent accumulation of water.
- Drain shall be constructed on both sides of roads.
- In the switchyard maximum spacing between two drains shall not be more than 100 meters.
- It shall be ensured that no area is left un-drained.
- Brick Drains / fly ash bricks with first class bricks / laterite bricks shall be provided & the design & layout shall be submitted to the owner for approval.
- The drains shall be rectangular in shape & shall be plastered 18mm thick with CM 1:6 with neat cement finish.
- The Floor of the drain shall be of brick work and shall be properly finished with CC 1:2:4 with proper gradient.
- Longitudinal slope shall not be less than 1 in 1000.

- The side wall of the drains shall be 25 mm above the gravel level to prevent falling of gravel into drain. Groove of 125 mm width shall be provided at 2000 mm spacing with suitable mild steel grating.

  The maximum velocity for pipe drains and open drains shall be limited to 2.4m/sec and 1.8m/sec respectively. However, minimum non-silting velocity of 0.6m/sec shall be ensured. Pipe drains shall be provided in areas of switchyard where movement of crane shall be necessary in operating phase of the substation.

  For pipe drains, concrete pipe of class NP2 shall be used. However, for road crossings etc. higher strength pipe of class NP3 shall be provided. For rail crossings, RCC pipes of class NP4 shall be provided. For design of RCC pipes for drains and culverts, IS:456 and IS:783 shall be followed.

  Three Nos. of portable pumps of 5 HP capacity shall be auto start ON/OFF along with all accessories including permanent power supply for drainage of water shall be provided by the Contractor. Pipe drains shall be connected through manholes at an interval of max. 30m.

  If the invert level of outfall point is above the last drain point in the substation boundary, sump of suitable size must be constructed with in the substation boundary. The cost shall be deemed to be included in the Drainage.

  The drainage scheme and associated drawings shall be got approved from the Employer before commencement of construction.

  Additional requirements regarding building drainage are detailed in following sections of the specifications.

  Drainage system shall be provided for bay extensions work in line with the existing facilities. Necessary due diligence shall be carried out by bidder.

8. RAINWATER HARVESTING:

In addition to drainage of rainwater, the contractor shall make arrangement for rainwater harvesting also.

Rainwater harvesting shall be done by providing two numbers of recharge Structures with bore wells. The recharge structures shall be suitably located within the substation. Branch drains from the main drain carrying rainwater from entire switchyard shall be connected to the recharge structures.

The internal diameter of recharge shafts shall be 4.5 meter with 230mm thick lining of brick /laterite masonry work up to a depth of 2.0 meter from ground level and 345mm thick brick / laterite masonry work below 2.0-meter depth. The brick / laterite masonry work shall be constructed with cement mortar 1:6 (1 cement: 6 coarse sand). The overall depth of shaft shall be 5.0 meter below invert level of drain. The shaft shall be covered with RCC slab for a live load of 300 kg. per sq. m. Two openings of size 0.7 x 0.7 meter shall be provided in the RCC cover slab as shown in the drawing. An iron cover made of 5mm thick chequered plate with hinges shall be provided on the openings. Galvanized

M.S. rungs of 20mm diameter at spacing of 300 mm shall be provided in the wall of shaft below the opening in the RCC slab to facilitate cleaning of shaft.

A 300 mm diameter bore well shall be drilled in the center of the shaft. The depth of bore well shall be 5.0 meter more than the depth of sub soil water.

A 100 mm dia. medium duty MS pipe conforming to IS 1161 shall be lowered in the bore well keeping bail plug towards bottom of bore well. The pipe shall have 1.58mm holes for 4.0-meter length starting from 1.0 meter from bottom of bore well. Holes of 3.0mm dia. shall be provided for a length of 2.0 meter starting from the bottom level of coarse sand and down

wards. The overall length of pipe shall be equal to total depth of bore well plus depth of shaft.
Gravel of size 3mm to 6mm shall be filled around 100 dia. MS pipe in the bore well. The shaft shall be filled with 500 mm thick layers each from the bottom of shaft with boulders of size 50mm to 150mm, gravel of size 5mm to 10mm, coarse sand having particle size 1.5mm to 2.0mm and boulders of size not less than 200mm respectively.

9. ROADS AND CULVERTS

All roads shall be rigid pavement as decided by the owner.

a) The roads shall be of two widths. The roads around the control Room Building / approach to the switchyard / approach to ICT and reactor shall be 3.75 m wide. The internal roads of the switchyard / circuit breaker / peripheral road shall be 2.75 m. Kerb Stones shall be provided on all Roads as per standards.
b) The roads outside the switchyard fenced area shall have shoulders of 1.2 m for the 3.75m & 1.0 m for the 2.75m wide roads with kerb stones at the two ends of the road. The Shoulders shall have interlocking tiles in the building areas and in approach road area. In the Switchyard areas shoulders shall be a finishing layer of CC 1:2:4 over well compacted soil of 600mm wide. The pattern of painting of Kerb Stones & interlocking tiles shall be approved/decided by the engineer in charge.
c) Adequate turning space for vehicles shall be provided and bend radii shall be set accordingly. Special care shall be taken for the main approach & the transformer areas. Road to the transformer / Reactor shall be as short and straight as possible.
d) CPWD / IRC / MOST (critical of all) specification shall be followed for construction of Roads.
e) The Roads shall be designed as per the CBR Value obtained from the soil investigation report and the design submitted for the approval. The Design shall be as per relevant IRC Standards.
f) All the culverts and allied structures (required for road/rail, drain, trench crossings etc.) shall be designed for class AA loading as per IRC standard / IS code and should be checked for transformer loading.

In case of flexible pavement, it shall include pavements with bituminous surfacing over granular base, subbase, and sub grade. Design and material specification shall be followed as per CPWD/IRC/MOST specifications and shall be confirmed during detail engineering.

In case of paver block switchyard road, it shall include M-40 interlocking paver block of 80mm thick surfacing over geogrid membrane as per MoRTH 700 and sand of approved quality. Design and material specification shall be followed as per IS: 15658 and shall be confirmed during detailed engineering.

In case of rigid pavements, RCC shall be laid and finished with screed board, vibration, vacuum dewatering process etc. PCC and WBM shall extend up to the shoulder width on both sides of the road outside switchyard area as per the drawing. In case of road within the switchyard PCC and WBM shall be placed only up to the width of the road. Polythene sheet of 125 microns shall be placed between the RCC and PCC slab. Expansion joint (12mm thick) shall be provided at every 8.0 m. In addition, in case of 5.5 m wide road, expansion joint shall also be provided longitudinally at the center. 100mm dia. RCC Hume pipe (NP-3) shall be provided at every 100m interval across the length Design and material specification shall be confirmed during detailed engineering.

10. FOUNDATION / RCC CONSTRUCTION

10.1. GENERAL

a) Work covered under this Clause comprises the design, supply, and construction of foundations and other RCC constructions for switchyard structures, equipment supports, trenches, drains, jacking pad, pulling block, fencing, boundary wall, control cubicles, bus supports, transformers, reactors, marshalling kiosks, auxiliary equipment's & systems, buildings, tanks, rail tracks or for any other equipment or service and any other foundation / RCC construction required to complete the work. This clause is as well applicable to the other RCC constructions.

b) Concrete shall conform to the requirements mentioned in IS:456 and all the tests shall be conducted as per relevant Indian Standard Codes as mentioned in Standard field quality plan appended with the specification. However, a minimum grade of M25 concrete (Design Mix) or above as per IS depending on the type of soil shall be used for all structural/load bearing members as per latest IS 456.

c) If the site is sloping, the foundation height will be adjusted to maintain the exact level of the top of structures to compensate such slopes. The switchyard foundation's plinths and building plinths shall be minimum 300 mm & 800 mm above finished ground level respectively.

d) Minimum 75mm thick lean concrete (1:4:8) shall be provided below all underground structures, foundations, trenches etc. to provide a base for construction.

e) Cement used shall be 43 grade OPC only. Cement shall be properly stored in a closed store & stacked as per norms mentioned in relevant standards. In Case other types of cement are to be used specific approval of the employer needs to be taken. Concrete made with ordinary Portland cement shall be carefully cured and special importance shall be given during the placing of concrete and removal of shuttering.

f) The design and detailing of foundations shall be done based on the approved soil data and sub -soil conditions as well as for all possible critical loads and the combinations thereof. The Spread footings foundation or pile foundation as may be required based on soil/sub -soil conditions and super imposed loads shall be provided.

g) Atmospheric condition shall be considered as "severe".

h) Concrete made with Portland slag cement shall be carefully cured and special importance shall be given during the placing of concrete and removal of shuttering.

i) If pile foundations are adopted, the same shall be cast -in-situ driven/bored or pre-cast or under reamed type as per relevant parts of IS Code 2911. Only RCC piles shall be provided. Suitability of the adopted pile foundations shall be justified by way of full design calculations. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups proposed to be used. Necessary initial load test shall also be carried out by the bidder at their cost to establish the piles design capacity. Only after the design capacities

of piles have been established, the Contractor shall take up the job of piling. Routine tests for the piles shall also be conducted. All the work (design & testing) shall be planned in such a way that these shall not cause any delay in project completion. Grade of concrete shall be M-35 conforming to IS-456 with minimum cement content as 400kg/cum. For pile foundations, pile integrity test and pile profile are mandatory.

10.2. DESIGN

The following clauses shall be applicable only for the foundation which the contractor may have to design as mentioned at Clause 2.

a) All foundation shall be of reinforced cement concrete. The design and construction of RCC structures shall be carried out as per IS: 456 and minimum grade of concrete shall be M25. If required, higher grade of concrete than specified above may be used as per standards at the discretion of Contractor without any additional financial implication to the Owner.

b) Limit state method of design shall be adopted unless specified otherwise in the specification.

c) For detailing of reinforcement IS:2502/ IS:5525 and SP:34 shall be followed. Cold twisted deformed bars (Fe=500 N/mm2) conforming to IS: 1786 or TMT bars as per CPWD specifications shall be used as reinforcement. However, in specific areas, mild steel (Grade I) conforming to IS: 432 can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thickness of 150 mm and above. Clear cover to reinforcement shall be as per IS:456 (latest). The reinforcement steel shall be stored in an elevated platform to prevent rusting and the fabricated rods shall be properly stacked in an orderly manner.

d) RCC water retaining structures like storage tanks, etc. shall be designed as un-cracked section in accordance with IS: 3370 (Part I to IV) by working stress method. However, water channels shall be designed as cracked section with limited steel stresses as per IS: 3370 (Part I to IV) by working stress method.

e) The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and/or equipment and/or superstructure and other conditions which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design.

f) When pile foundations are adopted, the same shall be cast-in- situ / driven / bored or pre -cast type as per relevant IS. Only RCC piles shall be provided. Suitability of the adopted pile foundations shall be justified by way of full design calculations. Detailed design calculations shall be submitted by the Contractor showing complete details of piles/pile groups proposed to be used. Necessary initial load test s hall also be carried out by the Contractor at their entire cost, to establish the piles design capacity. Only after the design capacity of piles has become established, the Contractor shall take up the job of piling. All the work (design & testing) shall be planned in such a way that these shall not cause any delay in project completion. Detailed design calculations shall be submitted by the bidder showing complete details of piles/pile groups proposed to be used.

g) All foundations shall rest below virgin ground level and the minimum depth of foundation below the virgin ground level shall be at least 1000 mm. For small equipment's & minor foundations like marshalling kiosks, pylon supports, cable trenches, drains, etc., this may be reduced to 500 mm with specific approval of

the Employer.

h) All R.C.C. piles (including short piles) shall be suitably anchored into hard virgin strata (shale). The friction resistance of back fill earth shall be neglected for calculation of pile capacity for design purposes, however negative friction due to earth fill, if any, must be duly considered for deciding pile capacity.

i) Design shall consider any sub -soil water pressure that may be encountered following relevant standard strictly.

j) Necessary protection to the foundation work, if required shall be provided to take care of any special requirements for aggressive alkaline soil, black cotton soil or any other type of soil which is detrimental/harmful to the concrete foundations.

k) RCC columns shall be provided with rigid connection at the base.

l) All sub-structures shall be checked for sliding and overturning stability during both construction and operating conditions for various combinations of loads. Factors of safety for these cases shall be taken as mentioned in relevant IS Codes or as stipulated elsewhere in the Specifications. For checking against overturning, weight of soil vertically above footing shall be taken and inverted frustum of pyramid of earth on the foundation should not be considered.

m) Earth pressure for all underground structures shall be calculated using co -efficient of earth pressure at rest, co -efficient of active or passive earth pressure (whichever is applicable). However, for the design of substructures of any underground enclosures, earth pressure at rest shall be considered.

n) In addition to earth pressure and ground water pressure etc., a surcharge load of 2T/Sq. m shall also be considered for the design of all underground structures including channels, sumps, tanks, trenches, substructure of any underground hollow enclosure etc., for the vehicular traffic in the vicinity of the structure.

o) Following conditions shall be considered for the design of water tank in pumps house, channels, sumps, trenches, and other underground structures:

   i. Full water pressure from inside and no earth pressure & ground water pressure & surcharge pressure from outside (application only to structures which are liable to be filled up with water or any other liquid)
   ii. Full earth pressure, surcharge pressure and groundwater pressure from outside and no water pressure from inside.
   iii. Design shall also be checked against buoyancy due to the ground water during construction and maintenance stages. Pressure release value shall not be used for buoyancy check.

   Minimum factor of safety of 1.5 against buoyancy shall be ensured ignoring the superimposed loadings.

p) Base slab of any underground enclosure shall also be designed for empty condition during construction and maintenance stages with maximum ground water table (GWT). Minimum factor of safety of 1.5 against buoyancy shall be ensured ignoring the super -imposed loadings.

q) Base slab of any underground enclosure like water storage tank shall also be designed for the condition of different combination of pump sumps being empty during maintenance stages with maximum GWT. Intermediate dividing piers of such enclosures shall be designed considering water in one pump sump only and the other pumps sump being empty for maintenance.

r) The foundations shall be proportioned so that the estimated total and differential movements of the foundations are not greater than the movements

that the structure or equipment is designed to accommodate. Foundation settlements shall, in no case, exceed the permissible limits specified in relevant Indian Standard Specification.

s) All machine foundations shall be designed in accordance with the provisions of the relevant parts of IS -2974, IS -456 and IS -2911. The provisions of DIN - 4024 (latest) shall also be followed.

For the foundations of rotating machines, detailed static and dynamic analysis shall be done. A fatigue factor of at least 2.0 shall be considered for dynamic forces.
Minimum reinforcement shall be governed by IS -2974 as well as IS -456. RCC design shall be done by working stress method.

For the foundations supporting minor equipment weighing less than one ton or if the mass of the rotating parts is less than one -hundredth of the mass of the foundation, dynamic analysis is not must. However, if such minor equipment is to be supported on building structures, floors etc. suitable vibration isolation shall be provided by means of springs, neoprene pads etc. and such vibration isolation system shall be designed suitably.

t) The foundations of transformer / reactor and circuit breaker shall be of block type foundation. Minimum reinforcement shall be governed by IS:2974 and IS:456.
u) All foundations (including Buildings) shall be checked for a factor of safety of 2.0 for normal condition and 1.5 for short circuit condition against sliding, overturning and pullout or FOS shall be checked as specified by owner. The same factors shall be used as partial safety factor overloads in limit state design also.
v) All foundation shall be designed considering minimum percentage contact area of 85%.
w) Minimum three piles shall be provided in any pile group.
x) Bitumen paint as per manufacturer specification shall be provided and painted over all required concrete surfaces of foundation, column, pedestal etc. up to plinth level.
y) Wherever required as per the environmental and soil condition all reinforcement steel shall have epoxy coating. Bidder to provide and supply the same without any financial implications.

10.3. ADMIXTURES & ADDITIVES

a) Only approved admixtures shall be used in the concrete for the works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.
b) Admixtures in concrete shall conform to IS:9103. The water proofing cement additives shall conform to IS:2645. Concrete Admixtures/ Additives shall be approved by Owner. The cost of the Concrete admixtures used shall be deemed to be included in the concrete cost.
c) The Contractor may propose, and the Owner (at his discretion) may approve the use of a water -reducing set -retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.
d) The water -reducing set -retarding admixture shall be an approved brand of

Ligno-sulphonate type admixture.

e) The water proofing cement additives shall be used as required/ advised by the Owner.

f) The Contractor shall use an approved neutralized vinsol resin or air - entraining agent in concrete on specific approval from the Employer. The Air-entraining agent shall be supplied and batched as a solution with a solid content not exceeding 15% by weight with suitable, stable, and consistent pH. Air- entraining requirements shall be in accordance with CP 100 Part I.

11. HOT WEATHER REQUIREM ENTS

During hot weather all necessary precautions, as per relevant Codes, shall be taken to avoid premature stiffening of the fresh mix and to reduce water absorption and evaporation losses and when the temperature of the surrounding air is higher than 30°C. The following shall apply unless otherwise approved by the Employer:

a) The formwork shall be continuously sprayed with cold water in advance of concreting and excess water shall be removed from inside the forms immediately prior to placement of concrete.

b) The reinforcement and the formwork (if metal forms are used), shall be protected from the effects of hot winds and direct sunlight.

c) Suitable barriers shall be provided to protect the freshly placed concrete from wind until the concrete is sufficiently hard to allow it to be covered according to point no:5 below.

d) The concrete when placed, shall be maintained at a temperature of less than 30-degree C using chilled mixing water or by spraying the aggregate with cold water.

e) The concrete shall be mixed, transported, placed, and consolidated, as rapidly as possible and shall then be covered with an impervious membrane or wet Hessian until moist curing begins.

f) Curing compounds shall not be used as an alternative to the requirements of Clause 11.5

g) During hot weather (atmospheric temperature above 40 deg C) or cold weather (atmospheric temperature at & below 5 deg C) the concreting shall be done as per the procedure set out in IS -7861 (Part I & II).

12. CABLE & PIPE TRENCHES

RCC trenches and pre -cast removable concrete covers (with lifting arrangement) shall be designed to withstand loads of 1000 kg/sq. m from maintenance trucks, a concentrated load of 250 kg at mid span of cover and self-weight of Top Slab. Cable trench wall shall also be designed with water pressure along with earth pressure. Dead Load of the cables shall be considered in design as approved by the owner.

a) Trenches shall be of reinforced cement concrete, having minimum M25 grade of concrete conforming to IS 456 (latest). The design of trench should be such that the top inner edges are not prone to failure.
b) Trenches shall be drained. Necessary sumps and sump pumps shall be supplied, as required. Cable trenches shall not be used as storm water drains. No extra payments regarding the pumps or sumps thus made shall be entertained by the employer. The costs shall be deemed to be included in the respective prices of trenches.
c) The top of trenches shall be kept at least 150 mm above the final gravel level and be constructed such that the surface rainwater does not enter the trench.
d) All metal parts inside the trench shall be connected to the grounding system.
e) Cables from trench to equipment shall run in hard conduits that are heavy duty PVC or GI pipe
f) Trench wall shall not foul with the foundation. Suitable clear gap shall be provided.
g) A clear (vertical) space of at least 300 mm shall be available for each tier in cable trench. From trench bed to lowest tier, a minimum clearance of 200 mm shall be available for one tie r trench & 300 mm for trench having tiers more than one.
h) At least the following tray to opposite wall (and between trays for multi row trench) clear clearance shall be available:

for trenches having depth	minimum clearance
< 500 mm	200 mm
501 - 1000 mm	400 mm
> 1000 mm	500 mm

Instead of cable trays, the contractor may use steel brackets as per the requirements of relevant clause elsewhere of this specification.

i) The trench bed shall have a slope of 1/500 along the run & 1/250 perpendicular to the run.
j) All construction joints of cable trenches i.e., between base slab to base slab and the junction of vertical wall to base slab as well as from vertical wall to wall shall be provided with approved quality PVC water stops of approx. 230 mm x 5 mm size for those cable trenches where the ground water table is expected to be above the junction of base slab and vertical wall of cable trenches.

Suitable expansion joints with PVC water stops and bitumen impregnated board sealing shall be provided at an approx. interval of 30 m for all sections of cable trenches.

13. TRANSFORMER / REACTOR FOUNDATION, RAIL TRACK / ROAD CUM RAIL TRACK

The Contractor shall provide a RCC Rail cum road system integrated with the transformer / Reactor foundation to enable installation and the removal of any failed unit. The transfer track system shall be suitable to permit the movement of any failed unit fully assembled (including OLTC, bushings) with oil. The rail cum road track shall be provided along such length of the transformer area so that any failed unit can be moved from its foundation to the nearest road. If trench/drain crossings are required, then suitable R.C.C. culverts shall be provided in accordance with I.R.C. standard / relevant IS. The permanent transfer track system shall have RCC raft type foundation integrated with the transformer foundations. The road cum rail track shall be of RCC construction and the surface shall be rendered smooth and suitable drainage system shall be provided.

The Contractor shall provide a pylon support system for supporting the firefighting system.

Each transformer / reactor including oil conservator tank and cooler banks etc. shall be placed in a self -sufficient pit surrounded by retaining walls (Pit walls). The clear distance of the retaining wall of the pit from the converter transformer/Reactor shall be 20% of the Converter transformer/Reactor height or 0.8m whichever is more. The oil collection pit thus formed shall have a void volume equal to 200% volume of total oil in the transformer/Reactor. However, in case common oil pit is envisaged during detailed engineering, the individual oil collection pit thus formed shall have a void volume equal to 33% of the total oil in the transformer/Reactor. The common oil collection pit shall have a void volume equal to 140 % volume of maximum total oil of either transformer/Reactor.

The minimum height of the retaining walls shall be 15 cm above the finished level of the ground to avoid outside water pouring inside the pit. The bottom of the pit shall have a uniform slope towards the sump pit. While designing the oil collection pit, the movement of the transformer must be considered. Suitable drainage arrangements shall be made to drain the oil / water collected in the sump to the nearest drains by using natural / mechanical means like pumps.

The grating shall be made of MS flat of size 40mmx 5mm placed at 30mm center to center and 25mm x5mm MS flat at spacing of 150mm at right angle to each other.
Maximum length of grating shall be 2000 mm and width shall not be more than 500mm. The gratings, supported on ISMB 150mm, shall be placed at the formation level and shall be covered with 100mm thick layer of broken/crushed/non-crushed stone having size 40mm to 60mm which acts as an extinguisher for flaming oil.

Each oil collection pit shall be drained towards a sump pit within the collection pit whose role is to drain water and oil due to leakage within the collection pit so that collection pit remains dry.

Complete foundation shall be made of reinforced cement concrete and shall be designed as per guidelines for design of foundations given in relevant clauses of the specification.

A pump of suitable rating shall be supplied and installed in each pit by the Contractor to drain out the fire fighting & rainwater from the sump pit into the nearest drain.

The rails shall be first quality 52 kg/m medium manganese steel as per Indian Railway Specification shall be supplied and provided.

14. FIRE PROTECTION WALLS

14.1. GENERAL

Fire protection walls shall be provided, if required, in accordance with Tariff Advisory Committee (TAC) recommendations.

A fire wall shall be erected between each of the transformers / Reactors (in the case of single-phase equipment) to protect each one from the effects of fire on another.

14.2. FIRE RESISTANCE

The firewall shall have a fire resistance of 4 hours. The partitions, which are made to reduce the noise level, shall have the same fire resistance. The walls of the building, which are used as firewalls, shall also have a minimum fire resistance of 4 hours.

The firewall shall be designed to protect against the effect of radiant heat and flying debris from an adjacent fire.

14.3. DIMENSIONS

The firewall shall extend 600 mm on each side of the transformer/Reactors and 600 mm above the conservator tank or safety vent or as per TAC norms. In case of dispute between the three the most critical of the above shall be followed.

These dimensions might be reduced in special cases, as per the approval of Employer where there is lack of space. A minimum of 2.0meter clearance shall be provided between the equipment's e.g., transformer/Reactors and firewalls.

The building walls, which act as firewalls, shall extend at least 1 m above the roof to protect it.

The firewall shall be made of reinforced concrete (min M25 grade) framed structure with brick / laterite masonry/ AAC blocks infill, as per the system requirements.

15. Boundary Wall, Chain-link Fencing and Gate:

15.1. Boundary Wall

The entire area of the switchyard including the Substation, Administrative area and Residential Area etc. shall be enclosed by a boundary wall and Main Gate. The Boundary wall shall be of Composite type of construction with RCC frame & brick/ laterite masonry work filler or with precast pole and panels. The actual execution of the work shall be as per the Design of the boundary wall developed by the contractor as per the soil investigation report. The survey work like marking the boundary points, taking spot levels etc. shall be included in the scope of the contract. Boundary wall shall be painted on both sides. For detail of Precast Boundary Wall, Technical Specification for Prestressed Precast Boundary Wall (DOC NO: AGE1-E-CIV-BWL-IPTC-S-I-001) shall be referred and followed. Refer **Annexure-5** for standard drawing of precast boundary wall.

Fencing and gate shall be provided as per details given below:

15.2. Chain-link Fencing

a) Fencing shall be provided for complete switchyard and separate gate shall be provided for men and equipment. Refer annexure-4 for standard chain link fencing drawing.

b) Internal fence surrounding the various equipment's (if) mounted on ground or a height lower than 2.5m. Necessary gates shall be provided for each area so surrounded.

15.2.1. Product materials:

The minimum requirements are as follows:

a) Chain link fence fabric (without galvanization) in accordance to IS: 2721.

I. Size of mesh : 75mm
II. Nominal wire size : 3.15mm dia. meter
III. Width of chain link : 500mm
IV. Painting : Two or more coats of Approved standard make synthetic enamel paint over a coat of standard steel primer.

b) Posts

i. The posts shall be of medium M.S. tubes of 50mm diameter conforming to grade Yst -22 (Kg/mm2). The tubes shall also conform to IS: 1161/IS 806. The length of tubular post shall be 2800.
ii. An M.S. base plate of size 160 X 160 X 6mm thick shall be welded with the tubular post. The post shall be provided on the top with MS plate as shown in the drawing.
iii. The tubular post shall be welded with 8 number of M S flat of size 50 x 6mm – 75mm long as shown in the drawing. Two number of 13.5 mm diameter holes on each cleat shall be provided to bolt the fence fabric panel. The cleats shall be welded at equal spacing in such a way that 4 numbers of cleats are on one side and remaining4 cleats are on the opposite side of the post. The cleats on the corner posts shall be welded in such a way that it suits the site requirement.
iv. The whole assembly of tubular post shall be hot dip galvanized. The zinc coating shall be minimum 610 grams per sq. meter. The purity of zinc shall be 99.95% as per IS: 209.

c) Precast Concrete Poles

i. Prestressed Precast Concrete Pole using cement concrete of M25 (design mix or nominal mix as per IS: 456:2000) with 16mm downgraded aggregate including 4mm dia. high strength steel wires (type of wire -IS 6003 -1983 indented PC S/R 4mm (TATA STEEL)), recesses, chamfering, tampering, curing, and rendering required to give a smooth and even surface etc. all complete, as per specifications and detailed drawings. (Water cement ratio shall not exceed 0.42.) BASF make water reducing agent shall be used.
ii. Pole size-2.7 M Long Square section - 100x100mm as shown in drawing (with reinforcement as 4 nos., 4mm dia. of high tensile steel wires for each pole).
iii. Quality of steel wire should be as per IS 6003 -1983.

d) Fence Fabric Panel

Chain link fencing shall be fabricated in the form of panel 1300 X 2928 mm. An M.S. angle of at least 50x6 mm size shall be welded all -round fence fabric to form a panel. Four pairs of 13.5mm diameter holes on the vertical M S angle matching the spacing of holes in cleats fixed with pipe as shown in the drawing shall be provided to fix the fence panel with the tubular posts. A washer shall also be provided below each nut. The

contractor, for fixing the panels, shall supply the 12mm diameter bolts including nuts and washers. All nuts, bolts and washers shall be hot dip galvanized. The fence panel shall be provided with two or more coats of approved standard synthetic enamel paint over approved standard steel primer to achieve even finish.

15.2.2. Installation

a) Fence shall be installed along the switchyard line.
b) Post holes shall be excavated by approved method.
c) All posts shall be 3.0m apart measured parallel to ground surface.
d) Posts shall be set in 1:2:4 Plain Cement Concrete block of minimum 0.40x0.40x1.2m depth. 75mm thick plain cement concrete 1:4:8 shall be provided below concrete blocks. Posts shall be braced and held in plumb position and true alignment and elevation until concrete has set.
e) Fence fabric shall not be installed until concrete has cured a minimum of 7 days.
f) Fence fabric panel shall be fixe d to the post at 4 nos. MS flat each of 50x6, 75 long through 2 nos. of bolts (12 diameter) on each flat.
g) The painting pattern of fence panels shall be decided by Engineer - charge. It shall be preferable to paint the panel in Different color pattern such that it gives better aesthetic look.

15.3. Gate (Internal)

a) The gate shall be made of medium duty M.S. pipe conforming to relevant I.S. with welded joints. The main frame (outer frame) of the gate shall be made of 40mm dia. pipe and vertical pipes of 15mm dia. @125mm spacing (maximum) shall be welded with the main frame. Other details shall be as shown in the drawing.
b) The gates shall be fabricated with welded joints to achieve rigid connections. The gate frames shall be painted with one coat of approved steel primer and two or more coats of synthetic enamel paint (anti corrosive) to achieve even finish.
c) The gates shall be provided with suitable locking arrangement.
d) The main gate shall be 5.0m wide and shall be of double leaf type (refer-Annexure 6). Next to the main gate, a wicket gate (1.25m wide single leaf) shall also be provided.
e) The switchyard internal gate shall be 3.75m wide and shall be of double leaf type (refer Annexure 6). Next to the switchyard gate, a wicket gate (1.25m wide single leaf) shall also be provided.
f) Steel roller shall be provided with the gate.
g) Gate shall be fixed on RCC column with RCC footing as per the design.

16. WATER SUPPLY (EXTERNAL)

a) Water shall be made available by contractor (unless stated otherwise elsewhere) at any feasible point near Switchyard boundary at single point by the contractor.
b) The contractor shall carry out all the external plumbing / erection works required for supply of water to the control room building beyond the single point as at (i). or any other point as applicable.
c) A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be got approved from the Owner before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works.
d) Bore wells and pumps for water supply shall be in the scope of contractor.

17. BUILDINGS

For additional detail apart from as mentioned below for Buildings refer **Annexure - 3** for PEB buildings.

17.1. GENERAL (Applicable for RCC / PEB building / Modular Building)

17.1.1. DIMENSIONS

The building design shall also take into consideration the layout of the panels, equipment's, etc., to allow enough area for maintenance. An open space as per IE rules shall be provided on the periphery of the rows of panels, and equipment generally to allow easy operator movement and access as well as maintenance. The building layouts shall be designed considering the present as well as future scope requirement. Space for future requirement shall be considered inside the building and shall be developed accordingly. Due approval for the same shall be taken from Employer

17.1.2. DESIGN

a) The buildings shall be designed:
   i. to the requirements of the National Building Code of India, and the standards quoted therein, and as specified in this Specification.
   ii. for the specified climatic & loading conditions.
   iii. to adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.
   iv. with a functional and economical space arrangement, for a life expectancy of structure, systems, and components not less than that of the equipment which is contained in the buildings
   v. to be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design; 3D of buildings to be submitted to Employer for approval along with architectural drawings. The Horticultural planning and execution are also part of Contract.
   vi. to allow for easy access to equipment and maintenance of the equipment wherever access to roof is required, RCC staircase shall be provided.
   vii. With, wherever required, fire retarding materials for walls, ceilings, doors etc., which would prevent supporting or spreading of fire
   viii. with material preventing dust accumulation.

b) Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns.

c) Individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.

d) Permissible stresses for different load combinations shall be taken as per relevant IS Codes.

e) The building lighting shall be designed in accordance with the requirements of relevant clauses in the detailed specifications.

f) The building auxiliary services like illumination, air conditioning and ventilation systems, fire protection and detection systems and all other miscellaneous services shall be designed in accordance with the requirements specified in relevant section or elsewhere in this Specifications.

17.1.3. DESIGN LOADS

Building structures shall be designed for the most critical combinations of dead loads, super -imposed loads, equipment loads, erection loads, crane loads, wind loads, seismic loads, short circuit loads and temperature loads. In addition, loads and forces developed due to differential settlement shall also be considered.

Dead loads shall include the weight of structures complete with finishes, fixtures and partitions and shall be taken as per IS -875, PART -1.

Super-imposed loads in different areas shall include live loads, minor equipment loads, cable trays, small pipe racks/hangers and erection, operation & maintenance loads. Equipment loads shall constitute, if applicable, all load of equipment to be supported on the building frame including those expected during erection.

For crane loads an impact factor of 30% and lateral crane surge of 10% of (lifted weight + trolley weight) shall be considered in the analysis of frame according to provisions of IS -875. The horizontal surge shall be 5% of the static wheel load.

The wind loads and seismic forces shall be computed as specified in relevant section of this specification. Response spectrum method shall be used for the seismic analysis using at least first five modes of vibration.

For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for the purpose shall be taken as the difference between the mean of the daily minimum temperature during the coldest month of the year and mean of daily maximum temperature during the hottest month of the year. The structure shall be designed to withstand stresses due to 50% of the total temperature variation.

Wind and Seismic forces shall not be considered to act simultaneously.

Floors/slabs shall be designed to carry loads imposed by equipment, cables, piping, travel of maintenance trucks (if required) and equipment and other loads associated with the building. In general, floors shall be designed for live loads as per relevant

IS and cable and piping loads, if applicable, of not less than 5 kN/sq. m hanging from the underside.

In addition, beams shall be designed for incidental point loads of 20 kN to be applied at any point along the beams. The floor loads shall be subject to the Employer's approval.

For consideration of loads on structures, IS -875, "Code of practice for structural safety of buildings" shall be followed.

The following minimum superimposed live loads shall, however, be considered for the design:

a) Roof: 150 kg/m^2 for accessible roofs and 75 kg/m^2 for non -accessible roofs

b) RCC Floors: 500 kg/m^2 or actual requirement, if higher than 500 kg/m^2, based on equipment component weight and layout plans.
c) Stairs & balconies: 500 kg/m^2
d) Toilet Rooms: 200 kg/m^2
e) Chequered plate floor: 400 kg/m^2
f) Walkway: 300 kg/m^2

17.1.4. SUBMISSIONS

The following information shall be submitted for review and approval to the Employer:

a) Design criteria for structural steel and reinforced concrete design. The criteria shall comprise the codes and standards used, applicable climatic data including wind loads, earthquake factors and maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads impact factors, safety factors and other relevant information.

b) Structural design calculations and drawings (including construction/fabrication) for all reinforced concrete and structural steel structures.

c) Fully dimensioned floor plans, cross sections, longitudinal sections, and elevations of each building identifying the major building components.

d) Fully dimensioned drawings showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.

e) Product information of building components and materials, including walls, partitions, flooring, ceilings, roofing, doors, wall paneling and windows and building finishes

f) A detailed schedule of building finishes including color schemes.

g) A door & window schedule showing door & window types and locations, lock sets and latch sets and other door hardware.

h) 3D Drawing of Building showing different views from all directions and top view.

Approval of the above information shall be obtained before ordering materials or starting fabrication or construction as applicable.

Details of other documentation requirements are also specified in relevant sections.

17.1.5. FLOORS, WALLS & ROOFS

a) All walls shall be non-load bearing in filled panel walls.
b) Design of RCC floor/roof slab shall be carried out either by limit state method or working stress method.
c) Ground floor slab of buildings shall be of RCC of minimum M25 grade, minimum 150 mm thick. Reinforcement shall consist of minimum 8 mm diameter bars at 200 mm c/c at top in both directions.
d) Sunken RCC slab shall be provided in false flooring area and toilet area to keep the finished floor level of these areas same as that of the surrounding area.
e) All RCC roofs shall be provided with access through a RCC staircase.

f) All Puff roofs shall be provided with access through a Steel staircase with safety fall protection.

g) Roofs of all the buildings shall be provided with safety lifeline to prevent the falling of the person during maintenance activity.

h) Minimum height of skirting above finished floor level shall be 150 mm.

i) All up stands and parapet walls on roof shall be of RCC construction for all buildings. Minimum height of parapet walls shall be 900 mm.

j) All the air - conditioned rooms shall be provided with false ceiling.

k) Outdoor Cable Trench shall be connected with indoor cable trench from above plinth Beam.

l) Minimum height of the building shall be 4000mm (including false ceiling of minimum 500mm depth).

17.2. CONTROL ROOM BUILDING

17.2.1. GENERAL

A Control Room building is required at switching station to house the control equipment, the mechanical and electrical equipment and any other facilities required for other services including future scope requirements inside the building.

17.2.2. FIRE SEPARATIONS

Rooms housing electrical installations (Battery room / Switchgear room) shall be provided with Fireproof doors with fire rating of minimum 2hrs. or as per TAC norms whichever is critical. Fire protection inside the building shall be as per Indian Electricity Rule/ applicable standards/ Tariff advisers.

17.2.3. BUILDING ARRANGEMENT

The layout of the Control Room building shall be submitted to the Employer for approval. The layout of the control room building shall be planned to keep in mind the functionality / aesthetics / min space requirements and future requirement as per relevant standards, rules & regulations etc. A concept drawing shall be first submitted for approval & then the detailed drawings must follow.

The main floor shall be above grade and shall be designed and constructed to ensure that flooding shall not occur. No floor below grade shall be accepted.

Convenient routing of cables from the switchyard into the building shall be considered. It must be ensured that there is no inflow of water from outside to inside of building. The slopes in cable trenches shall be so designed to drain water away from buildings.

The control room building shall be oriented to offer convenient tie-in to the switchyard.

Passage with minimum width of 2000 mm shall be provided in control room building.

17.2.4. STATION CONTROL ROOM

The station control room shall house all the equipment specified in various Clauses in the equipment specifications as per relevant standards & regulations,

for the control of the AC System as well as all other panels like auxiliary power, fire alarm panel etc. Adequate workspace shall be provided for the fault recorders, the chronological event recorders, and the printers. The arrangement of rooms shall be such that the coming and going of personnel or visitors does not disturb the operators. Emergency exit shall be provided in SCADA room.

17.2.5. BATTERY ROOM / BATTERY CHARGER ROOMS / ELECTRICAL ROOMS

These rooms housing the batteries, charger's & AC&DC distribution boards shall be located. The room shall be air conditioned. The dimensions shall be as required to suit the equipment. Battery room shall be provided with exhaust fan with louvers. Eye wash station shall be provided in battery room.

17.2.6. MAINTENANCE WORKSHOPS AND STORAGE FACILITIES

The Control room building shall be provided with the following workshops with necessary equipment's and furniture:

a) Mechanical -Electrical Maintenance Workshops

The workshop shall be used for maintenance of heavy equipment such as pumps, fans, electric motors etc. It shall also contain all special tools and spare parts. A lifting system of adequate capacity and a work bench shall be included.

b) Controls and Protection (Electronics) Workshop

17.2.7. OFFICES

The Control building shall be provided with the minimum areas required for the offices in line with the various standards and Specifications.

The contractor shall provide all suitable furniture (tables and executive chairs) for reception desk, all processor, servers, and workstation consoles. The contractor shall provide printer / logger trolleys & tables as required. The executive chairs shall have caster base, arm rest, swivel, tilt, and pneumatic seat adjustment features. The contractor shall provide conference table with 16 chairs in the conference room. The specific design, finish and color of all furniture shall be subject to Employer's approval.

17.2.8. MISCELLANEOUS ROOMS

Each control room building shall be provided with at least the following miscellaneous rooms:

- Reception lobby with seating arrangement.
- Conference room for minimum 12 persons.
- One bathroom, washroom & Toilet per floor (with WC, urinal & washbasin)
- One pantry with seating arrangement of minimum 6 persons.
- Storage of plant documentation
- Workstations
- Staff Room for technicians

- Loading dock/lifting hole
- First aid room **- as required**

Normal as well as fire escape exit and staircases shall be located as per TAC requirements.

17.3. FIRE FIGHTING PUMP HOUSE AND RESERVOIR

The water pumps for the service/domestic water system as well as for fire protection shall be housed in a pump house. A separate pump house shall be located, if required for station drainage system. The raw water tank(s) also may be located next to this pump house. The pump foundations shall be vibration free and independent of building foundation. Suitable ventilation & exhaust shall be provided.

17.4. GUARD HUT

A guard hut shall be located near the main entrance to station fully equipped with toilet, pantry, water supply, & sewage system etc. (**Refer Annexure-7).**

17.5. PARKING SHED

A covered car parking of pleasant architecture consisting of reinforced concrete pavement with approaches from the main road by the side of central control building shall be provided. The capacity shall be at least for 10 numbers of cars.

18. TECHNICAL DETAILS OF THE BUILDINGS

a) All buildings shall have framed super structure. All walls shall be non-load bearing in filled panel walls.
b) External walls of all buildings shall either be with solid concrete block masonry (minimum 200 mm thick) or with brick/ laterite masonry/ AAC blocks masonry (minimum 230 mm thick) in cement sand mortar 1:6.
c) All internal walls shall be either with solid concrete block masonry (minimum 230 mm thick except the internal partition walls for office area and toilets which shall be 115 mm thick) or with brick / laterite masonry/ AAC blocks masonry. (Minimum 230 mm thick including internal partition walls for office area and toilets) in cement sand mortar 1:6.
d) All half brick / laterite masonry/ AAC blocks masonry walls shall be provided with reinforcement consisting of 2 nos. of 6 mm diameter bars every fourth layer.
e) A 50 mm thick DPC shall be provided at plinth level before starting the masonry work.
f) 12mm cement plaster of mix 1:6 (1 cement: 6 fine sand) shall be provided on the smooth side of internal walls. Inside surface of all walls shall be provided with plaster of Paris punning over the plastered surface except for areas where wall paneling is provided.
g) 6 mm cement plaster of mix 1:3 (1 cement: 3 fine sand) to all ceilings.
h) 15mm cement plaster of mix 1:6 (1 cement: 6 fine sand) on external rough side of single or half brick/ laterite masonry/ AAC blocks wall. All half brick / laterite masonry/ AAC blocks masonry walls shall be provided with reinforcement

consisting of 2 nos. of 6 mm diameter bars every fourth layer.

i) 12 mm thick pre laminated three-layer medium density (exterior grade) particle board Grade, Type II conforming to IS: 12823 bonded with phenol formaldehyde synthetic resin, of approved brand and manufacture shall be provided in paneling fixed in aluminum doors, windows shutters, and partition frames with C.P brass/ stainless -steel screws etc. complete as per architectural drawings and directions of engineer -in-charge.

j) Distempering / acrylic emulsion on all internal walls and ceilings with oil bound washable distemper of approved brand and manufacture to give an even shade (two or more coats) over and including priming coat with cement primer.

k) Enamel Painting with synthetic enamel paint of approved brand and manufacture of required color to give an even shade shall be provided on the steel glazed doors, windows, ventilators and rolling shutters in various buildings as specified in drawings. Two or more coats over an under coat of suitable shade with primer paint of approved brand and manufacture

l) Outside face of all buildings and pump houses shall have weatherproof exterior paint as per manufacturer's specification.

m) Two or more coats of French spirit polishing with a coat of wood filler shall be provided on the wooden doors of Control Room building.

n) ACDB and DCDB room in Control Room building and FFPH building shall be provided 52 mm thick cement concrete flooring with "Hard Crete" concrete hardener topping with glass partition under layer 40 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and top layer 12 mm thick metallic concrete hardener consisting of mix 1: 2 (1 cement hardener mix : 2 stone aggregate 6 mm nominal size) by volume with which "Hard Crete" hardening compound of "Snowcem India Ltd" or equivalent is mixed @ 2 liter "hard Crete" per 50kg of cement including cement slurry, complete. (In ACDB/DCDB Room and FFPH building only).

o) Cement plaster skirting (up to 15 cm height) with cement mortar 1:3 (1 cement: 3 coarse sand) mixed with metallic concrete hardener in same ratio as for floor finished with a floating coat of neat cement. 21 mm thick in ACDB/DCDB room

p) Floor tiles of Polished porcelain (vitrified) in different sizes with water absorption less than 1 % and flexural strength not less than 30 N/mm2 in all colors and shades, laid on 20 mm thick cement mortar 1:4 (1 cement: 4 coarse sand) including grouting the joints with white cement and matching pigments shall be provided as mentioned in drawings. Size of Tile shall be 60X60 cm

q) 1st Quality Ceramic glazed floor tiles (anti -skid) 300x 300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS: 13755 of NITCO, ORIENT, SOMANY, KAJARIA or equivalent shall be provided in toilet/pantry area in all color shades as approved by Engineer-in-charge laid on 20mm thick cement mortar 1:4 (1 cement: 4 coarse sand) including pointing the joints with white cement and matching pigment etc. complete.

r) 1st quality ceramic glazed tiles conforming to IS : 13753 of minimum thickness 5mm of approved make like NITCO, ORIENT, SOMANY, KAJARIA or equivalent make shall be provided in toilet/pantry area in all colors shade of any size as approved by engineer -in-charge in dados (height as specified in drawings) over 12mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete.

s) 18mm polished granite in cement mortar 1:4, 20mm thick made to a level cut to size shall be provided and laid at entrance area or as specified in drawings. The joints are filled with jointing compound matching to the tiles. Wherever granite

tiles are specified for the floor, 100mm granite skirting shall be provided with the walls. The granite outer surface shall be flushed to the plaster finish of the wall.

t) Granite counter shall be provided and fixed in the pantry with 18mm granite slab mounted on 75mm RCC slab supported by 115mm brick/ laterite masonry/ AAC blocks wall plastered on all sides as per the drawing. The shelves are made of 18mm thick well cut and polished white marble slabs. The outer side of the brick/ laterite masonry/ AAC blocks wall and the RC C slab visible in the front is finished with 18mm granite with edges molded on the exposed end. The shutters shall be finished with 19mm particle finished laminate edge lipping. The shutters are to be provided with 100mm handles and shutter locks. The ins ide of the shutter shall be painted with synthetic enamel paint.

u) All Brick/ laterite masonry/ AAC blocks work shall be with cement mortar 1:6 (1 cement: 6 coarse sand). Half brick / laterite masonry / AAC blocks work masonry shall be with cement mortar 1:4 (1 cement: 4 coarse sand). Bricks used shall be of minimum class – 75.

v) Anti-termite treatment shall be carried out for all buildings.

w) M.S. Rolling shutters (electrically operated) as per drawing shall be provided and fixed interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets along with ball bearing for rolling shutter, side guides and arrangements for inside and outside locking with push & pull operation including the cost of providing and fixing necessary 27.5 cm long wire springs grade No. 2 and M.S top cover of required thickness for rolling shutters. 80 x 1.25 mm M. S laths with 1.25 mm thick top cover.

x) Circular/hexagonal M.S. sheet ceiling fan box shall be provided in the ceiling with clamp of internal dia. 140 mm, 73 mm height, 3 mm thick rim, top and bottom lid of 1.5 mm M.S. Sheet. Lids shall be screwed into M. S. box by means of 3 mm round headed screws, clamps shall be made of 12 mm dia. M. S. bar bent to shape as per standard drawing with overall length as 80 cm.

y) Anodized aluminum work for doors, windows, ventilators, and partitions shall be provided and fixed in control room building with extruded built-up standard tubular and other sections of approved make conforming to IS:733 and IS: 1285, anodized transparent or dyed to required shade according to IS: 1868. (Minimum anodic coating of grade AC 15) fixed with rawl plugs and screws or with fixing clips, or with expansion hold fasteners including necessary filling up of gaps at junctions at top, bottom and sides with required PVC/neoprene felt etc. and joined mechanically wherever required including cleat angle, Aluminum snap beading for glazing / paneling, CP. Brass / stainless steel screws including glazing and fittings as specified.

Shutters of doors, windows and ventilators shall be provided and fixed with hinges/pivots fittings wherever required including PVC/neoprene gasket.

Exhaust fans shall be covered with GI cowl with bird screen.

SECTION FOR AL. WINDOWS:

Shutters bottom section - 61.85X37X45.5 WS 1027, 1.058 Kg/mt, side and top section 61.85X31.75, WS 1029, 0.650 Kg/mt, shutter sections, one side and both side open 40X18X10 WS 1023, 0.43 Kg/mt, Interlock sections 40X18X26.5X10, WS 1022, 0.530 Kg/mt, with 5.5 mm toughened glasses, PVC gaskets, nylon wheels, aluminum handles cum locks. Jindal/ Indal/ Hindalco make. All windows and ventilators shall be covered with Grill.

SECTION FOR AL. DOORS:

2-1/2 X 1-1/2 sections for outer frame for fixed partition 63.5 X 38.1 X1.5 mm, DP1212, 0.700 Kg/mt, with glazing clips 17.27 X 19.05 X 1 mm, 0.098 Kg/mt, (equivalent section) with 5.5 mm toughened glasses and rubber gasket with bottom three feet pre -laminated sheet of 12 mm thick of color grey, ivory. Jindal / Indal / Hindalco make. All doors shall be covered with grills.

SECTION FOR AL. PARTITION:

Outer frames 2 -1/2 X 1-1/2, 63.5 X 38.10 X 1.5 mm, DP 1212, 0.700Kg/mt, to work as fixed partition & door with door verticals 44.45 X 47.62 X 1.5 mm, DP 2022, 0.850 Kg/mt, top and center pieces as per drawing.

All doors and windows dimensions shall be as per NBC. Bidder to provide the sizes of doors and windows as required and duly approved by the employer.

z) Cement based water proofing treatment of roofs, balconies, terraces etc. shall be provided with average thickness of 120mm and minimum thickness at Khurra as 65mm and laid consisting of following operations:

i. A slurry coat of neat cement using 2.75 kg/m2 of cement admixed with proprietary water proofing compounds conforming to IS: 2645 shall be applied and grouted over the RCC slab including cleaning the surface before treatment

ii. Plain Cement concrete 1:5:10 (1 Cement: 5 fine sands: 10 burnt brick aggregate of 40mm nominal size) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement mortar of min 1:5 (Cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 to required slope and treating similarly the adjoining walls up to 300mm height including rounding of junctions of walls and slabs.

iii. After two days of proper curing, a second coat of cement slurry admixed with proprietary water proofing compound conforming to IS: 2645 shall be applied.

iv. The surface shall be finished with 20mm thick joint less cement mortar of mix 1:4 (1 cement: 4 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 and finally the surface shall be finished with trowel with neat cement slurry and making of 300 x 300 mm square.

v. The whole terrace so finished shall be flooded with water for minimum period of two weeks for curing and for final test. All above operations shall be done in order and as directed and specified by the Engineer-in- charge.

aa) The building design shall provide for the collection of storm water from the roofs. This water shall be collected in junction boxes and these boxes shall drain to the main drainage system of the station.

Un-plasticized rigid PVC rainwater pipes 110mm dia. shall be provided and fixed on the wall face conforming to IS:13592 type A as per drawing including jointing with seal ring conforming to IS: 5382 leaving 10mm gap for thermal expansion single socketed pipes.

All drains inside the buildings shall have minimum 40 mm thick grating covers and in areas where heavy equipment loads would be coming, pre-cast RCC covers shall be provided in place of steel grating.

Garland drain shall be provided around the buildings. Garland drain shall be of RCC / Brick Drain with minimum clear depth and width of 300mm. Garland drain shall be covered with perforated precast RCC covers.

For all buildings, suitable arrangement for draining out water collected from equipment blow downs, leakages, floor washings, firefighting etc. shall be provided for each floor.

bb) Un-plasticized PVC Molded fittings/accessories including 110mm bend and 110mm shoes shall be provided and fixed for un-plasticized rigid PVC rainwater pipes conforming to IS:13592 type A including jointing with seal ring conforming to IS: 5382 leaving 10mm gap for thermal expansion.

cc) Un-plasticized PVC pipe clips of approved design shall be provided and fixed to un-plasticized 110mm PVC rainwater pipes by means of 50x50x50mm hard wood plugs, screwed with MS screws of required length including cutting brick work and fixing in cement m ortar1:4 (1 cement: 4 coarse sand) and making good the wall etc.

dd) Double action hydraulic floor spring of approved brand and manufacture IS:6315 marked "hardwyn" make (Model 3000) or equivalent for doors shall be provided and fixed at the following door including cost of cutting floors as required, embedding in floors and cover plates with brass pivot and single piece MS sheet outer box with slide plate etc. as per the direction of Engineer-in-charge.

With stainless steel cover plate:

- Main Entrance to Control Room Building.
- Room for HOD
- Conference Room
- Control Room

ee) Plinth protection 75 mm thick of cement concrete 1:2:4 (1 cement: 2 coarse sands: 4 graded stone) aggregate 20 mm nominal size) shall be laid over 75 mm bed of dry brick ballast 40 mm nominal size well rammed and consolidated and shall be grouted with fine sand including finishing the top smooth. Plinth protection shall be 1000 mm wide.

ff) Colored vitreous China pedestal type water closet (European type) with seat and lid, 40mm flush bend, overflow arrangement with specials of standard makes and mosquito proof coupling of approved municipal design including painting of fittings and brackets, cutting and making good the walls and floors shall be provided for all toilets.

gg) Colored vitreous China wash basin of size 630 x 450mm with C.I/M.S brackets along with single 15 mm C.P brass pillar taps, jaguar/ hind ware/ Kingston/ Gem/ Techno/Parko, 32 mm C.P brass waste of standard pattern, shall be provided and fixed in the toilets including painting of fittings and brackets, cutting and making good the walls wherever required along with C. P brass trap and C.P brass union.

hh) All urinals shall be colored vitreous China flat back half stall urinal of 580x380x350mm with 10 litre PVC automatic flushing cistern, Jaguar/ hind ware/ Parry ware/ Seabird/Orient (Coral) with fittings, standard size C.P. brass flush pipe, spreaders with unions and clamps (all in C.P. brass) with waste

fitting as per IS:2556 C.I. trap with outlet grating and other couplings in C.P. brass including painting of fittings and cutting and making good the walls and floors wherever required.

ii) Following fittings (of approved make) shall be provided in all the toilets:

- Toilet paper roll holder.
- Double type coat & hat hooks with flanges, fixed to wall / shutter, etc. with necessary screws, washers &plugs.
- CP/PP liquid soap holder of approved make fixed with each wash basin to the wall with necessary CP /PP brackets, CP screws, washers, plugs etc.
- 100mm dia. vitreous chinaware half round channel of approved make fixed to correct grade, level, opening for floor trap below urinals set in CM 1:3 & pointed using white cement etc.
- CP brass bib cock 15mm nominal bore of approved quality conforming to IS :8931.
- CP brass angle valve of 15mm nominal bore provided and fixed in position for basin and cistern points of approved quality conforming IS :8931.
- Best quality marble / granite partition slab provided and fixed in position for urinals, of size 610x1150mm, 20mm thick, polished on both sides & machine cut, exposed corners rounded etc.
- Towel rail / rack / ring of approved make of 600mm length, 25mm dia. with a pair of brackets or flanges provided and fixed to wall beside each wash basin/set of wash basin with necessary screws, plugs, etc.
- 6mm thick beveled edge mirror 1000x600mm shall be provided and fixed mounted on 12mm thick waterproof plywood backing and hardwood beading all -round and mirror fixed to the backing with 4 Nos. of CP cap screws & washers, including fixing the mirror to the wall with necessary screws, plugs & washers etc., with each wash basin.

jj) Salem Stainless Steel A ISI 304 (18/8) Kitchen sink of 510x1040mm bowl depth 178mm with drain board shall be provided and fixed as per IS 13983 with C.I brackets, and stainless steel plug 40mm including painting of fittings and bracket s, cutting and making good the wall.

kk) GI Pipe work for Internal and External works:

- All concealed GI pipe shall be painted with anticorrosive bitumastic paint including cutting of chases and making good the wall.
- All exposed GI pipes and fittings shall be painted with synthetic enamel paint of desired shade over a ready mixed priming coat, both of approved quality for new work.
- Wherever GI pipes are buried the same shall be provided and laid in position including trenching sand cushion and refilling, painted with anticorrosive bitumastic paint etc.
- Gun metal ball valve with operating levers, non -return valves conforming to IS specification shall be provided and fixed in position as per drawing or direction of Engineer -in-charge.

ll) Masonry chamber for sluice valve shall be 600x600mm size in plan and depth 750mm, or matching with the site condition inside with 50 class designation brick/ laterite masonry/ AAC blocks work in cement mortar 1:5 (1 cement : 5 fine sand) with CI surface box 100 mm. Top diameter, 160 mm bottom dia. and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4

mix (1cement : 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) necessary excavation foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design with FPS bricks of class 75.

mm) Polyethylene water storage tanks (2 nos. of 1000 litres capacity each) shall be provided and placed on roof of control room building of approved brand and manufacture with cover and suitable locking arrangement, float value and making necessary holes for inlet, outlet and overflow pipes.

nn) PVC floor traps of self -cleansing design shall be provided & fixed in position with outlet size of 75mm diameter of approved make, including making connection with PVC soil/waste pipes using rubber gaskets, embedding the trap in 150 mm thick PCC 1:2:4, providing & fixing of top tile & strainer of CP or PVC on top of the trap etc.

oo) Square-mouth SW gully trap grade 'A' 100x100mm size P type with FPS Bricks class designation 75 shall be provided and fixed complete with CI grating brick/ laterite masonry/ AAC blocks masonry chamber with watertight C.I. cover with frame of 300X300mm size (inside) the weight of cover to be not less than 4.5 Kg and frame to be not less than 2.70 Kg as per standard design

pp) Glazed stoneware pipes of 150mm diameter grade 'A' shall be provided, laid and jointed with stiff mixture of cement mortar in the proportion of 1:1 (1cement :1 fine sand) including testing of joints etc. complete.

qq) Cement concrete 1:5:10 (1 cement :5 coarse sand: 10 graded stone aggregate 40 mm nominal size) shall be provided and laid around S.W pipes including bed concrete.

rr) Brick/ laterite masonry/ AAC blocks masonry manhole shall be constructed in cement mortar 1:4 (1 cement :4 coarse sand) RCC top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) foundation concrete 1:4:8 mix (1cement : 4 coarse sand :8 graded stone aggregate 40 mm nominal size) inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement: 2 coarse sand :4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design.

- Inside size shall be 90 x 80 cm and 60 cm deep including CI cover with frame (light duty) 455 x 610 mm internal dimensions' total weight of cover and frame shall not be less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) and shall be constructed with F.P.S. bricks with class designation 75.
- Inside size shall be 1 20 x 90 cm and 90 cm or more deep including CI cover with frame (medium duty) 500mm internal diameter total weight of cover and frame to be not less than 116 kg (weight of cover 58 kg and weight of frame 58 kg) with FPS Bricks class designation 75.

ss) MS foot of 20 x 20mm square rests shall be provided and fixed in manholes with 20 x 20 x 10 cm cement concrete blocks 1:3:6 (1 cement :3 coarse sand :6 graded stone aggregate 20 mm nominal size) as per standard design.

tt) Steel glazed doors, windows and ventilators of standard rolled steel sections shall be provided and fixed in FFPH building, joints mitered and welded with 15 x 3 mm lugs, 10cm long, embedded in cement concrete blocks 15 x 10 x10

cm of 1:3:6 (1 cement 3 coarse sand: 6 graded stone aggregate 20mm nominal size) or with wooden plugs and screws or rawl plugs and screws or with fixing clips or with bolts and nuts as required, including providing and fixing of glass panes with glazing clips and special metal sash putty of approved make complete including applying a priming coat of approved steel primer, necessary hinges or pivots as required.

uu) Pressed steel door frames manufactured from commercial mild steel sheet of 1.25mm thickness shall be provided and fixed in FFPH building including hinges jamb, lock jamb, bead and if required angle threshold of mild steel angle of section 50x25mm, or base ties of 1.25 mm pressed mild steel welded or rigidly mixed together by mechanical means, adjustable lugs with split end tail to each jamb including steel butt hinges 2.5mm thick with mortar guards, lock strike - plate and shock absorbers as specified and applying a coat of approved steel primer after pre -treatment of the surface as directed by Engineer -in-Charge.

vv) Asbestos cement 6mm thick corrugated sheets roofing shall be provided and fixed with G, I, J or L hooks, bolts, and nuts 8mm diameter G, I plain and bitumen washers complete excluding the cost of purlins, rafters and trusses for water tank.

ww) All air-conditioned areas shall be having false ceiling. The conference room shall have special false ceiling with POP work and special designer lighting. The entire work is included in the scope of the contractor

xx) All internal & external windowsills shall be fixed with appropriately colored granite counters with nosing

yy) All internal / external staircases shall have stainless steel balustrades & teak wood railing or combination of both. Details shall be finalized during detailed engineering

zz) The entrance of the control room building shall be enclosed with Porch suitably designed structurally & architecturally.

Emergency exit shall be provided for each building and the same shall be fire proof doors as per TAC norms.

Clear dimension of all the buildings shall be considered from inner to inner of the columns in both the direction i.e length and width.

The above finishing schedule is indicative only and the employer reserves the right to alter the same during detailed engineering / execution considering local architecture, functionality etc.

19. MISCELLANEOUS GENERAL REQUIREMENTS

a) Dense concrete with controlled water cement ratio, preferably 0.45, as per IS- code shall be used for all underground concrete structures such as pump-house, tanks, water retaining structures, cable, and pipe trenches etc. for achieving water tightness.

b) All joints including construction and expansion joints for the water retaining structures shall be made watertight by using PVC ribbed water stops with central bulb. However, kicker type (externally placed) PVC water stops shall be used for the base slab and in other areas where it is required to facilitate concreting. The minimum thickness of PVC water stops shall be 5 mm and minimum width shall be 230 mm.

c) All mild steel parts used in the water retaining structures shall be hot double dip galvanized. The minimum coating of the zinc shall be 750 gm/sq. m. for galvanized structures and shall comply with IS:2629 and IS:2633. Galvanizing shall be checked and tested in accordance with IS:2633. The galvanizing shall be followed by the application of an etching primer and dipping in black bitumen in accordance with BS: 3416.

d) Bricks having minimum 75 kg/cm2 compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 75 kg/cm2 compressive strength before submitting his offer. Laterite masonry of neatly dressed stones or random rubble masonry of laterite stones shall be used as per the details provided in design drawings. IS: 3620 shall be followed for selection of the laterite stone blocks.

e) Autoclaved aerated cement blocks masonry work to be carried out using approved quality of AAC blocks and to be procured from the approved source (Specification for AAC to be followed as per IS: 2185 (Part III)

f) Angles 50x50x5 mm (minimum) with lugs shall be provided for edge protection all round cut outs/openings in floor slab, edges of drains supporting grating covers, edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of manhole precast cover and any other place where breakage of corners of concrete is expected.

g) Anti-termite chemical treatment shall be given to column pits, wall trenches, foundations of buildings, filling below the floors etc. as per IS:6313 and other relevant Indian Standards.

h) For all civil works covered under this specification, nominal mix by volume batching as per CPWD specification is intended. The relationship of grade of concrete and ratio of ingredients shall be as below:

S.No	Mix	Cement	Sand	Coarse Aggregate of 20mm down aggregate
1.	M 10	1	3	6
2.	M 15	1	2	4
3.	M 20	1	1.5	3

The material specification, workmanship and acceptance criteria shall be as per relevant clauses of CPWD specification and approved standard Field Quality Plan.

i) Items/components of buildings / station not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

20. INTERFACING

The proper coordination & execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors, fixing of foundation bolts, fixing of lighting fixtures, fixing of supports/embedment, provision of cut outs etc. shall be the sole responsibility of the Contractor. He s hall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and

dismantling, breakage etc. is reduced to minimum.

21. STATUTORY RULES

a) Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the State). Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control etc.

b) Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

c) Requirement of sulphate resistant cement (SRC) for sub structural works shall be decided in accordance with the Indian Standards based on the findings of the detailed soil investigation.

d) All building/construction materials shall conform to the best quality specified in CPWD specifications if not otherwise mentioned in this specification.

e) All tests as required in the standard field quality plans have to be carried out.

22. STEEL STRUCTURES

22.1. GENERAL

The scope of specification covers design (except design of those tower structures of AC switchyard which are enclosed with the specification), fabrication, proto-assembly, supply, and erection of galvanized steel structures for towers, girders, lightning masts, and equipment support structures. The scope shall include supply and erection of all types of structures including bolts, nuts, washers, hangers, shackles, clamps anti -climbing devices, bird guards, step bolts, inserts in concrete, gusset plates, equipment mounting bolts, structure earthing bolts, foundation bolts, spring washers, fixing plates and any other items as required to complete the job.

The connection of all structures to their foundations shall be by base plates and embedded anchor/foundation bolts. All steel structures and anchor/foundation bolts shall be fully galvanized. The weight of the zinc coating shall be at least 0.610 kg/m2 & for coastal area with in 30km shall be 0.900kg/m2. For anchor bolts / foundation bolts and for structural members the galvanization requirement shall depend on the location / pollution conditions. One additional nut shall be provided below the base plate which may be used for the purpose of levelling.

For filter equipment and valve cooling towers etc. anchor fasteners (e.g., Hilti etc.) may be used.

22.2. DESIGN REQUIREMENTS

For design of steel structures loads such as wind loads shall be based on critical of IS: 875, Part III & IS 802 Part -1/Sec-1 latest revision. For materials and permissible stresses IS:802, Part -I, Section -2 shall be followed in general. However, additional requirements given in following paragraphs shall be also considered.

A) The minimum thickness of members shall be as follows:

	OPEN SECTIONS	CLOSED SECTIONS
Main Members	6 mm	4 mm
Other Members	5 mm	4 mm
Redundant Members	4 mm	5 mm

B) The maximum slenderness ratios for leg members, other stressed members and redundant members for compression force shall be as per IS -802.

C) The minimum distance from hole center to edge shall be 1.5 x bolt diameter and the minimum distance between center to center shall be 3.0 x bolt diameter.

D) The minimum bolt diameter shall be 16 mm.

E) To facilitate inspection and maintenance, the structures shall be provided with climbing devices.

F) Following design criteria shall be adopted for design of switchyard structures:

I. All structures shall be designed for the worst combination of dead loads, live

loads, wind loads as per IS -875, seismic forces as per IS -1893, loads due to deviation of conductor, load due to unbalanced tension in conductor, torsional load due to unbalanced vertical and horizontal forces, erection loads, short circuit forces including "snatch" in the case of bundled conductors etc. Short circuit forces shall be calculated in accordance with IEC -865 considering a fault level as specified in tender technical documents.

II. Switchyard structures shall be designed as per IS -802 but for the condition of all the three wires on one side being broken. The design of all structures shall be based on the condition where stringing is done only on one side i.e., all the three (phase) conductors broken on the other side. A factor of safety of at least 2.0 under normal as well as broken wire conditions and 1.5 under combined short circuit & broken wire conditions shall be considered for the design of all structures.

III. For purpose of design, static tension pull & transverse reaction on the gantries as calculated for each individual span shall be considered. Vertical load of half the span of conductors/string and the earth wires on either side of the beam shall be considered. Weight of man with tools shall be considered at least 150 kgs. for the design of structures.

IV. Terminal/line take off gantries shall be designed for a minimum conductor tension of 4 MT per phase or as per above requirement, whichever is more for 400 kV switchyard.

V. The design of the terminal gantries along with other gantries having conductor deviations shall also be checked considering +/ - 30 degrees' deviation of conductor in both vertical and horizontal planes.

VI. All gantries shall be designed considering oblique wind conditions along with wind in transverse and longitudinal direction.

VII. The girders shall be connected with lattice columns by bolted joints.

VIII. All equipment supports shall be designed for the worst combination of dead loads, erection load, wind load/seismic forces, short circuit forces and operating forces acting on the equipment and associated bus bars as per IS-806.

IX. When luminaries are proposed to be fixed on gantries/towers, then the proper loading for the same shall be considered while designing. Also holes for fixing the brackets for luminaries should be provided wherever required.

X. The design of steel structures for buildings shall be done by working stress method based on IS: 800.

22.3. BOLTING

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

b) All steel items, bolts & nuts shall be hot dip galvanized.

c) All washers shall be electro galvanized.

d) 2% extra nuts and bolts shall be supplied for erection.

22.4. WELDING

The work shall be done as per approved fabrication drawings which clearly indicate various details of joints to be welded, type of weld, length, and size of weld, whether shop or site weld etc. Symbols for welding on erection and shop drawings shall be according to IS:813. Efforts shall be made to reduce site welding to avoid improper joints due to constructional difficulties.

22.5. FOUNDATION BOLTS

Foundation bolts for the towers and equipment supporting structures and elsewhere shall be embedded in first stage concrete while the foundation is cast. The Contractor shall ensure the proper alignment of these bolts to match the holes in the base plate.

The Contractor shall be responsible for the correct alignment and levelling of all steel work on site to ensure that the towers/structures are plumb.

All foundation bolts for lattice structure, pipe structure is to be supplied by the Contractor.

All foundation bolts shall be fully galvanized to achieve 0.75 kg. per Sq.m. of Zinc Coating as per specifications.

All the bolts shall be properly machined so that there are no gas cutting and welding marks & every bolt shall have a center punch marked on the projected face of the bolts to facilitate the bolt alignments.

All foundation bolts shall conform to IS 5624 but the material, however, shall be MS conforming to IS:2062.

22.6. STABILITY OF STRUCTURE

The Supplier shall be responsible for the stability of the structure at all stages of its erection at site and shall take all necessary measures by the additions of temporary bracings and guying to ensure adequate resistance to wind and also to loads due to erection equipment and their operations.

22.7. GROUTING

The method of grouting the column bases shall be subject to approval of Purchaser and shall be such as to ensure a complete uniformity of contact over the whole area of the steel base. The procedure shall be submitted in a document form for the approval of the employer. The Contractor shall be fully responsible for the grouting operations. Grouting shall be done by FOSROC CONBEXTRA GP2 / FOSROC CEBEX 100

22.8. GALVANISING

All structural steel works and pipe supports shall be galvanized after fabrication. Zinc required for galvanizing shall have to be arranged by the manufacturer. Purity of zinc to be used shall be 99.95% as per IS: 209.

The Contractor shall be required to make arrangement for frequent inspection by the Purchaser as well as continuous inspection by a resident representative of the Purchaser, if so desired for fabrication work.

22.9. TOUCH-UP PAINTING

The touch up primers and paints shall consist of Red Oxide / Zinc chromate conforming to the requirements of IS: 2074 with a pigment to be specified by the Employer.

Annexure – 1

AREA GRADING WORK
EARTH WORK IN FILLING

1. SOIL MANAGEMENT PLAN

The process to meet the required technical and chemical quality standards for the fill material specifically on HSE is described in the Soil Management Plan and is full part of this work.

2. STRIPPING

Before earth filling works commence, the area concerned shall be stripped of the surface soil including vegetation, overlying grass organics matter, bushes, roots and other perishable or unsuitable matter and disposing of these as directed. Similar operations shall be done in the borrow area also. The stripping shall generally be done for a depth of about 30 cm.

2.1. Earth fill:

The filling of earth shall be of materials that it can be compacted at optimum moisture content by suitable compacting equipment to their maximum dry density.

The material shall be compacted to a density not less than 95% of their standard/Modified Proctor Density. Prior to and during compacting operations the material in each layer shall have optimum moisture content. Compaction shall be done by mechanical compactors like Power rollers / vibratory rollers standard sheep foot rollers hauled by tractors.

Where compaction of cohesion less materials such as sand is required, the material shall be deposited in horizontal layers and compacted to the relative density specified below. Water shall be added to the materials as much as required to obtain the specified density by method of compaction being used. The relative density of the compacted materials shall not be less than 65 percent as determined by laboratory tests.

The thickness of the horizontal layers after compaction shall not be more than 10 cm if compaction is performed by tampers, not more than 20 cm if by rollers and not more than 30 cm if compaction is performed by vibratory or pneumatic rollers or similar equipment.

2.2. Acceptance Criteria for Filling Soils:

- Following soils are suitable for earth filling.
- Soil group: GP, GM, GC, SP, SM, SC, CL, CI, ML, MI as per I.S. - 2720.
- Density: shall not be less than 1.65 g/cc
- Free swell value: shall be less than 30 %
- Swell pressure at MDD & zero % Moisture content: shall be less than 0.1 kg/cm^2
- Liquid limit: shall not be more than 50%
- Plastic limit: shall not be more than 25%

2.3. Chemical Composition:

See the document "Soil Management Plan" shall be followed inclusive the trigger

parameters mentioned.

3. QUALITY CONTROL OF EARTH WORK

Quality of fill material and its compaction shall be controlled through exercise of checks on borrow material. The tests shall be done in a third-party laboratory recommended / approved by Client / consultant. The third-party laboratory testing can be witnessed by Client / Consultant / Contractor or witness requirement can be waived off. In either case if results are not complying with technical specifications the contractor shall be responsible for arranging different set of material which compiles technic al specification without any extra cost / time impact to the client. Cost of all technical tests mentioned in the specification is part of the contractor scope and the unit price of the contractor shall be inclusive of the same. The test results shall be duly transmitted by the investigating laboratory to Client / consultant/ contractor.

The specifications envisage two main types of tests as under:

1) On borrow material
2) On compaction control.

As mentioned in soil management plan excavation cannot start unless the first sample is test and approved and for subsequent it is preferred as per this contract that test on borrow material be arranged before transporting the material under consideration to site however incase the contractor prefers otherwise, he can do the same at his risk and cost. The contractor shall not use untested / unapproved material for filling / compaction at project site for any batch of material. For compaction control the testing will be done as per technical specifications during the progress of compaction and incase if desired compaction is not achieved then contractor shall redo the same at his cost / time to achieve the compaction as mentioned in this specification.

3.1. Control Tests on Borrow Material

3.2. Gradation (IS: 2720 -part IV) -1965:

At least, one test for each kind of soil. Usual rate of testing, 1 test per 2,000m ^{3} of soil. The test would be necessary only if specification call for checks using gradation or grain -size distribution as a criterion for selecting the soil. However, sand content determination should be carried out invariably, at the rate of 1 test per 2,000m ^{3}.

- **Plasticity Index (IS: 2720 -Part V)-1970:** At least, one test each kind of soil. Usual rate of testing 1 test per 2,000 m ^{3} of soil.
- **Proctor Test (IS: 2720 - Part VIII)-1965:** This test is performed to ensure that soil of requisite quality is coming out of borrow areas a s also to provide information on optimum moisture content and maximum laboratory dry density, Usual rate of testing 1 tests per 2,000 m ^{3} of soil.
- **Natural Moisture Content (IS: 2720 -Part II)-1973 Second Revision:** One test for every 2000 m ^{3}of soil. The natural moisture content of the soil coming out of the borrow pits will have to be determined to evaluate h o w far the natural moisture content tallies with the optimum value and whether further addition or reduction of water content would be necessary.
- **Table 1** gives a summary of the tests for borrow material discussed above along with minimum desirable frequencies.
- **Compaction control** Compaction control mainly involves two operations namely, control of moisture content just before compaction and density of

compacted layer.

- **Moisture content determination:** Moisture content determination for compaction control shall be in addition to those on borrow material spelt out as below. This test is necessary for ensuring proper moisture content at the time of compaction. Usual rate of testing should be 1 test per 2000 m^3 of soil.
- **Density Measurement:** Except when otherwise directed, at the last one measurement of density shall be made for each layer 1000 m^2 of compacted area. Test location shall be chosen only through predetermined random sampling techniques. The numbers of tests in one set of measurements shall be 5. The acceptances of results shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 g per cc. Table 1.a & 1.b sets out the minimum desirable frequency of tests for compaction control.

Table 1.a Control test on Borrow Material

Sr. No.	Test	Test Method	Test frequency
1	Gradation, sieve analysis	IS 2720 Pt.IV	1 test per 2,000 m^3 of soil.
2	Plasticity Index	IS 2720 Pt. V	-----do-----
3	Standard Proctor Test	IS 2720 Pt. VII	-----do-----
4	Modified Proctor Test	IS 2720 Pt. VIII	-----do-----
5	Natural Moisture Content	IS 2720 Pt. II	-----do-----
6	Natural Dry Density	IS 2720 Pt. XXIX	-----do-----

Table 1.b Test for Compaction Control

Sr. No.	Test	Test Method	Minimum Desirable Frequency
1	Moisture Content just before compaction	IS 2720 Pt. II	1 test per 2000m^3 of loose soil.
2	Dry Density of compacted layer	IS 2720 Pt. XXIX	One test per 1000 m^2 of each layer compacted area.

TEST PROCEDURE

1.0 DETERMINATION OF WATER CONTENT OF SOIL (IS: 2720 PART-2, 1973)- (OVEN DRYING METHOD)

Scope: This method covers the determination of water content of soils expressed as a percentage of the oven -dry weight.

Soil Specimen: The soil specimen taken shall be representative of the soil mass. The size of the specimen selected depends on the quantity required for good representation, which is influenced by the gradation and the maximum size of particles, and on the accuracy of weighing. The following quantities are recommended for general laboratory use:

Size of particles more than 90 per cent passing	Minimum quantity of soil specimen to be taken for test, Mass in grams
425 μ I S Sieve	25
2 mm I S Sieve	50
4.75 mm I S Sieve	200
9.5 mm I S Sieve	300
19 mm I S Sieve	500
37.5 mm I S Sieve	1,000

Representative sample from the bulk is taken by coning and quartering method.

Procedure: Clean the container with lid, dry and weight (W 1). Take the required quantity of the soil specimen in the container crumbled and placed loosely, and weigh with lid (W 2). Then keep in an oven with the lid removed and maintain the temperature of the oven at 110 ±5 ^{0} C. Dry the specimen in the oven for 24 hours. Every time the container is taken out for weighing, replace the lid on the container and cool the container in a desiccator. Record the final mass (W3) of the container with lid and dried soil sample. If soil sample contains gypsum or organic matters, then it shall be dried at 60 ^{0} to 80 ^{0} C.

The percentage of water content is calculated as, w = ((W2 – W3) / (W3-W1)) x 100

2.0 GRAIN SIZE ANALYSIS – (SIEVE ANALYSIS) I S: 2720 (PART 4) – 1985

Scope: This covers the quantitatively determination of grain size distribution in soil sample.

Sieve Analysis of Soils Fraction Retained on 4.75 mm IS Sieve

Procedure: The portion of the soil sample retained on 4.75 mm IS sieve shall be weighed and the mass recorded. The quantity of the soil sample taken shall depend on the maximum particle size contained in the soil.

Maximum size of material present in substantial quantities(mm)	Mass to be taken for test(kg)
75	20

40	10
20	5.0
12.5	2.5
10	1.0
6.5	0.75
4.75	0.3

The sample shall be separated into various fractions by sieving through the Indian Standard Sieves. While sieving through each sieve, the sieve shall be agitated so that the sample rolls in irregular motion over the sieve. The material from the sieve may be rubbed, if necessary, with the rubber pestle in the mortar taking care to see that individual soil particles are not broken and re -sieved to make sure that only individual particles are retained. The quantity taken each time for sieving on each sieve shall be such that the maximum weight of material retained on each sieve at the completion of sieving does not exceed much. The mass of the material retained on each sieve shall be recorded. The percentage of soil retained on each sieve shall be calculated based on the total mass of soil sample taken and from these results the percentage passing through each of the sieve shall be calculated.

Sieve Analysis of Soil Passing 4.75 mm IS Sieve and Retained on 75– Micron IS Sieve.

Analysis by wet sieving

Procedure: The portion of soil passing 4.75 mm IS Sieve shall be oven dried at 105 to 110 C. The oven dried material shall then be riffled so that a fraction of convenient mass is obtained. This shall be about 300 g. The soil fraction shall be weighed to 0.1 percent of its total mass and the mass recorded. The riffled and weighed fraction shall be spread out in the large tray or bucket and covered with water. The soaked soil specimen may be washed on the 75 micron IS Sieve until the water passing the sieve is substantially clean. The fraction retained on the sieve should be tipped without loss of material in a tray, dried in the oven and sieved through the nest of sieves either by hand or by using mechanical sieve shaker. The fraction retained on each sieve should be weighed separately and masses recorded.

The cumulative mass of soil fraction retained on each sieve shall be calculated. The percentage of soil fraction retained on each sieve shall be calculated based on the mass of the sample passing 4.75 mm IS Sieve taken for the initial analysis. The combined gradation based on the total soil sample taken for analysis shall then be calculated.

3.0 DETERMINATION OF ATTERBERG'S LIMIT

1) DETERMINATION OF LIQUID & PLASTIC LIMIT [I S: 2720 (PART 5) – 1985]

LIQUID LIMIT

Scope: The scope of this method is to determine liquid limit using one-point method.

Procedure: A sample weighing about 150 g shall be taken from the thoroughly mixed portion of material passing 425 microns IS sieve. The soil sample shall then be worked well into a paste with addition of water. In the case of highly clayey soil, to ensure uniform moisture distribution, the soil in the mixed state is left sufficient time in the container. The wet soil paste shall then be transferred to the cylindrical cup of cone penetrometer apparatus, ensuring that no air is trapped in this process. Finally, the wet soil is leveled up to the top of the cup and placed on the base of the cone penetrometer apparatus. The penetrometer shall be so adjusted that the cone point just touches the surface of the soil paste in the cup clamped in this position. This initial reading is noted. The vertical clamp is then released allowing the cone to penetrate the soil paste under its own weight. The penetration of the cone after 30 seconds shall be noted to the nearest millimeter. If the difference in penetration lies between 20 and 30 mm, the test shall be repeated with suitable adjustment to moisture content. If the penetration gives the exact 25 mm, the moisture content at 25 mm penetration is the liquid limit value. If any other penetration value is attained, then it is calculated using formula:

$$W_L = W\alpha + 0.01(25-\alpha)\,(W\alpha+15)$$

Where $W\alpha$= moisture content of soil paste corresponding to penetration of ∞ (depth of penetration in mm).

Plastic Limit

Procedure: A sample weighing about 20g from the thoroughly mixed portion of the material passing 425 microns shall be used for the test. The soil sample shall be mixed thoroughly with water in an evaporating dish or on a flat glass plate till the soil mass becomes plastic enough to be easily molded with fingers. A ball shall be formed with about 8 g of this plastic soil mass and rolled between the fingers and the glass plate with just sufficient pressure to roll the mass into a thread of uniform diameter throughout its length. The rolling shall be done till the threads are of 3mm diameter. The soil shall then be kneaded together to a uniform mass and rolled again. This process of alternate rolling and kneading shall be continued until the thread crumbles under the pressure required for rolling and soil can no longer be rolled into a thread. This shall be considered a satisfactory end point. The pieces of crumbled soil thread shall be collected in an airtight container and the moisture content determined. This moisture content is reported as plastic limit of the soil.

4.0 Method of determination of MDD/OMC Standard Proctor test

The test is conducted to determine the moisture content and density relationship of soil under specified standard compaction energy. It is carried out as per the specifications laid in I.S.2720 (part -vii).

For standard proctor tests the apparatus required at site are:

1) Proctor mould
2) Proctor rammer 2.6 Kg weight having free fall of 31cm.
3) Balance of 10 kg capacity and one having 500 gm capacity.
4) Thermostatically controlled oven
5) No corrodible airtight container
6) Spatula
7) Sieve 4.75mm and 19mm

Procedure

5 kg air -dried soil passing 20 mm IS sieve is taken and thoroughly mixed. The mould with base attached is weighed to the nearest 1 gm. The soil is then moistened by adding 8% to 10% water and compacted into the mould in three equal layers. Each layer being compacted by 25 blows of 2.6 kg hammer dropped from a height of 310 mm. The blows are distributed uniformly over the surface of each layer. The extension collar is removed, soil is trimmed and mould with base plate & specimen is then weighed to nearest 1 gm. The compacted soil specimen is removed, and moisture content is determined (by drying small portion of the crumbled compacted mass). The process is repeated by adding more water to the soil (about 2 percent of dry soil), till the density of sample decreases. The curve in between dry density and moisture content is plotted, and maximum dry density and corresponding optimum moisture content is reported.

4.1 Modified Proctor test

The test is conducted to determine the moisture content density relationship of soil under specified standard compaction energy. It shall be carried out as per I.S.27 20 (part -viii).

Apparatus required at site are:

1) Proctor mould
2) Proctor rammer 4.9 Kg weight having free fall of 45cm.
3) Balance of 10 kg capacity and one having 500 gm capacity.
4) Thermostatically controlled oven
5) Non -corrodible airtight container
6) Spatula
7) Sieve 4.75mm and 19mm

Procedure:

The test is conducted to determine the moisture density relationship of soil under specified increased compaction energy. A 5 kg air -dried soil passing 20 mm IS sieve is taken and thoroughly mixed. The mould with base plate attached is weighed to the nearest 1 gm. The soil is then moistened by adding 8 -10%

water and compacted into the mould in five equal layers. Each layer being compacted by 25 blows of 4.9 kg hammer dropped from a height of 450 mm. The blows are distributed uniformly over the surface of e ach layer. The extension collar is removed, soil is trimmed and mould with base plate & specimen is then weighed to nearest 1 gm. The compacted soil specimen is removed, and moisture content is determined (by drying small portion of the crumbled compacted mass). The process is repeated by adding more water to the soil (about 2 percent of dry soil), till the density of sample decreases. The curve in -between dry density and moisture content is plotted and maximum dry density and corresponding optimum moisture content is reported.

5.0 Method of determination of Field density by Core cutter method

Scope: Suitable for fine grained soils (F.G.) having 90 percent passing 4.75 mm IS sieve

Apparatus:

a) Cylindrical core cutter: 130 mm long and 10 cm I.D. wall thickness 3 mm, beveled edge at one end.

b) Steel Dolley: 2.5 cm high and 10 cm I.D. wall thickness of 7.5 mm to fit the cutter.

c) Steel Rammer: Mild steel foot 140mm diameter and 75mm height fitted on steel staff, overall length of 900 mm approx.

d) Balance: Accurate to 1 g

e) Knife 20 cm x 30 m, steel rule Pick axe, St edge 30 cm x 2.5 cm x 3 to 5 mm thick.

Procedure:

a) Internal volume (Vc) of cutter is calculated from its dimensions, measured to 0.25 mm accuracy.

b) Cutter is weighed nearest to gram (Wc)

c) Area approx. 30 cm square of soil layer to be tested is exposed, leveled.

d) Cutter with dolley on top is placed on the soil layer& rammed down vertically into it until only about 15 mm of dolley protrudes above the surface.

e) The cutter is then dug out of the surrounding soil, allowing some soil to project from the lower end of the cutter. The ends of soil core are then trimmed flat by a straight edge.

f) The cutter with the soil is weighed to the nearest gram (W)

g) A representative sample from the soil core is placed in container and its water content (W %) is then determined.

Results are recorded in the Performa.

Calculations:

a) Bulk density (rb) = ((Ws - Wc) / Vc) g/cm3

b) Dry density (rd) = (100 rb / (100+w)) g/cm3

Report:

Dry density of soil to the second place of decimal in g/cm3. Water content of soil

(percent) to two significant figures.

Note: Repeat at least two more times and report average results which would not alter from the additional determination.

5.1 Procedure for Determination Of Percentage Compaction Achieved At Field.

The maximum dry density and optimum moisture content of the soil to be used for backfilling shall be determined by proctor test (Standard/ Modified). After compacting the soil at the site, Core cutter shall be collected and the density and moisture content of soil at the field shall be obtained. The percentage compaction is then expressed as

% compaction = (field dry density/maximum dry density) x 100

SOIL MANAGEMENT PLAN

General comment

To meet the required technical and chemical quality standards for the fill material, a soil management is suggested.

Only clean (contamination -free) and suitable material of homorganic composition, with low organic content and suitable for a standard proctor density of 95%, shall be used for refilling.

1. Source area for soil

Sources for fill materials need to be identified prior to the start of the work. Identification of all soil sources shall be done be the contractor, the Clients Engineer in charge and the owner by visiting the sites.

The identified sites will be registered in a list which includes a short description of the targeted source area, description of soil (especially natural soil, residual soil, waste soil etc.), the results of the visual inspection, date, responsible, photo's etc. Only visited source locations with entrance in the register can get eventually final approval by the owner. The selection and testing of the source of the filling soil should be decided in advance to the extraction works.

Testing and excavation should be supervised by a representative of the owner and the engineer in charge. Excavation should not start before the first test results are available and show that the soil is not contaminated and geotechnical suitable for raising our land. The material shall be tested at the source to guarantee chemical mechanical and engineering suitability.

Soil samples shall be taken by means of soundings. The depth of the soundings shall consider the later excavation depth. Soundings (drillings) shall be done in a grid of 50 m. Soil profiles shall be documented to show homogeneity and quantity of the material.

2. Sample taking

2.1 Source area: Several samples from the targeted soil sources / soundings have to be taken for geotechnical specifications:

Namely one sample for 2000 m³ of compacted material if no obvious or proven changes in soil quality and condition appear.

The samples shall be tested in a laboratory for the following mechanical parameters:

- Grain size distribution
- Natural and dry water content
- Plasticity limit
- Organic content
- Proctor test.

Testing/analysis will be executed by a third and independent laboratory with has the appropriate accreditations and certifications to perform these tests.

Sample taking shall be supervised by the Clients Engineer in Charge and a representative of the owner.

Random samples shall **also be tested for chemical contamination.** The number of samples and the parameters to be tested shall be selected in accordance with the source area, e.g., soil from agricultural or waste land requires another sampling frequency and range of parameters as land soil from industrial or commercial. These requirements will be decided with the register document with all mentioned sources by the engineer in charge and the owner.

In any case the following parameters shall be analytically tested:

- TDS
- Chlorides
- Sulphate
- TPH
- Heavy metals

The trigger values for these parameters are mentioned below:

Trigger values (mg/kg TM)	
Substance	**Industrial and commercial real properties**
arsenic	140
lead	2000
cadmium	60
cyanide	100
chromium	1000
nickel	900
mercury	80
aldrin	--
benzo(a)pyrene	12
DDT	--
hexachlorobenzene	200
hexachlorocyclohexane (HCH-mix or -HCH)	400
pentachlorophenol	250
polychlorinated biphenyls PCB's	40

Remark PCB's: as far as PCB-total contents are determined, the measured values shall be divided by a factor of 5.

3. Transport and delivery Approach

Only registered vehicles and drivers should be allowed to transport the materials. The list of transport companies and drivers must be made available before the start of work and must be handed over to the contractor, the clients engineer in charge and the owner.

That way uncontrolled dumping of unsuitable or contaminated materials can be excluded.

Daily, several vehicles leaving the borrow site shall be briefly controlled.

Excavation and transport shall immediately stop if unsuitable material encountered at the borrow site.

Daily, vehicles arriving at the construction site shall be inspected prior to and while unloading. All materials being suspiciously unsuitable or contaminated will not be accepted and shall be removed by the contractor at his own cost. The decision is taken by the engineer in charge and the representative of the owner.

The control on site shall be done by the engineer in charge or any representative of the owner.

Periodically, soil samples will be taken at the site for testing in a laboratory for the same parameters and trigger values as mentioned in point 2 Sample taking:

This will be decided by the engineer in charge and the representative of the owner.

All materials being suspiciously unsuitable or contaminated will not be accepted and shall be removed by the contractor at his own cost.

Annexure – 2

BORE-WELL

1. DESIGN CONSIDERATION

1.1. ANNULAR SPACE

The annular space between the bore and the casing pipe shall be as follows :

Type of Borewell	Depth of Borewell	Thickness of Annular Space	Diameter of bore hole
Borewells with filter pack	Less than 125m	3"	D+6"
	125 to 250m	4"	D+8"
	More than 250m	6"	D+12"
Naturally developed borewells without gravel pack	Less than 125m	1"	D+2"
	More than 125m	1½"	D+3"

1.2. NATURALLY DEVELOPED BORE WELLS AND BORE WELLS WITH FILTER PACK

In aquifers of silts and sands, bore wells shall be provided with a filter pack, but in aquifers having gravelly sands, sandy gravel, and gravel with D10 (grain size to which 10% of the formation material finer) more than 0.3mm and uniformity coefficient more than 5 (D60 / D10 >5) gravel pack shall not be provided, and such wells shall be naturally dev eloped to create a graded zone at the screen in the intake zone

1.3. DESIGN YIELD

Bore wells shall be designed for a rate of discharge 25% more than the required rate of discharge.

1.4. SCREENS

Slotted pipes may be used as screens in fine grained aquifers, but preferably continuous wire wound screens shall be used in all types of aquifers. Screens conforming to para 7.2 of IS 8110: 2000 "Well screen and slotted pipes- Specifications" should be used. The total surface area of the screen shall be such as to give entrance velocity less than 3 cm/sec even with 50% decrease in the effective open area due to "incrustation, rearrangement of the aquifer particles around the screen and coverage by gravel etc." at the design discharge of the well (Para 7.3 of IS: 8110: 2000). The diameter of the screen shall be kept the same as the diameter of the casing pipe.

1.5. SLOT SIZE

Slot size shall be selected as follows:

1.5.1. BORE WELLS WITH FILTER PACK

Slot size shall be so selected as to retain 90 -100% of the pack material.

1.5.2. BORE WELLS NATURALLY DEVELOPED AND WITHOUT FILTER PACK

Slot size shall be such that it would allow 40 - 60% of the aquifer materials to pass through.

1.6. FILTER PACK

Following aspects of design of gravel pack need special attention

- Filter pack shall consist of well -rounded particles, with uniformity co - efficient (D60/D10) less than 2.5. The gravel / sand used in the filter pack shall be 95% siliceous (Not>5% soluble in hydrochloric acid), free from foreign matters, washed and disinfected. Gravel shall conform to IS: 4097:1988 "Gravel for use as filter pack in bore wells".
- The filter pack shall extent above the screen 1 to 2 m, to account for setting and loss during development to prevent the filter pack around the screen from being fouled by and the sealing grout. iii. The size and grading shall be as per B -3 of Annexure B of IS: 8110:2000 "Well screens and slotted pipes – Specifications". Gravel shall be consisting of sand or gravel. The grain size shall be so selected as to have D50 of the filter pack 9 – 12.5 times the D50 of the formation in the aquifer in uniform aquifers and 11-15.5 times the D50 of the formation in the aquifer in non-uniform aquifers. Another criterion is that the average pore size of the gravel pack, which may be taken as 0.4 times D10 of the gravel pack, should be less than D85 of the formation in the aquifer

1.7. CASING PIPE

Casing pipe shall be of mild steel conforming to IS Code 4270:2001. However, in areas where bore wells are known to give water with high levels of TDS (>1000ppm), chlorides (>500ppm), high acidity (pH <6) the casing pipe and screens made of corrosion resistant material like PVC and alloy steels shall be used (refer IS:12818:2010 Plasticized polyvinyl chloride (PVC -U) Screen and casing pipes for Bore/ tube wells – specification).

1.8. INTAKE ZONE

The intake zone shall be so selected as to cover a continuous aquifer of the same type of formation. If the intake zone is nonhomogeneous, the slot size and filter media for the coarser and the finer formation shall be designed as per para-B -3.2 of Annexure B of IS: 8110.

1.9. FIELD MEASUREMENT OF GRAIN SIZE

The grain size distribution (value of $D_{10,}$ D_{15}, D_{60} and $D_{85)}$ shall be measured by the field method of classification by putting the sample of formation mixed with water in a calibrated cylindrical jar of glass, shaking well the solution and allowing to mixture to settle down so that the coarsest particle settle down at the bottom and the finest at the top.

1.10. ANNULAR SEAL AND WELL CAP

Sealing the well protects the well from contamination. The diameter of the borehole is usually slightly larger than the casing. The space between the borehole and the casing is called the annular space. It must be sealed to prevent any surface contamination from migrating downward and contaminating the water supply. A commercially manufactured, vermin -proof well cap is designed to keep animals, insects, and contaminants from entering the well. It comes equipped with rubber gaskets and screened vents to ensure air circulation. Coverings for large diameter wells must be custom made because of their larger size. Ideally, they should be made of steel, or fiberglass or plastic.

2. DRILLING

Drilling of 200mm dia. Bore well to accommodate housing and assembly pipe using manual drilling, rotary drilling, percussion drilling or any other method for all type of alluvium strata, unconsolidated formation such as pebbles, boulders etc. and odex drilling/ DTH drilling for hard rock from ground level to up-to depth for harnessing

desired quality, quantity, and least probability of drawdown water level conforming to IS 2800 (part 1) 1991.

3. INSTALLATION

After boring, lowering of casing and strainer pipes (as per design consideration) of 150 mm dia. with pea gravel packing suitable for slot between casing pipe and assembly pipe if required. Installation of submersible pump motor capacity and stages requisite as per actual condition with GI pipe (class B) of 40 mm dia. (conform to IS 1239) and suitable electrical feeder panel for 200mm dia. bore -well to get discharge range of 150 ltr/minute to 600 ltr/minute and minimum operating head of standard make as per vendor list of Adani conform to IS 8034 – 2002 along with necessary accessories.

PVC sheathed armed copper conductor (LT cable) from ACDB to starter to pump including PVC pipe casing or buried wherever required or as per direction of site In -charge. Testing shall be done as per IS 2800 (part 2) 1979

4. COMMISSIONING

After testing as per IS 2800 (part 2) 1979, bore well supply shall be connected to water tank with 80mm dia. or requisite size as per approved drawing CPVC pipe.

Annexure – 3

PEB BUILDINGS

1. CONTROL ROOM BUILDING

1.1. The building design shall also take into consideration the layout of the panels, equipment's, etc., to allow enough area for maintenance. An open space as per NBC/IE rules shall be provided on the periphery of the rows of panels, and equipment generally, to allow easy operator movement and access as well as maintenance.

1.2. Roof shall be with puff sandwiched panels as specified in material specification. The base plate of steel columns shall be mounted on the RCC foundation by means of hot dip galvanized foundation bolts (Min. zinc coating shall be minimum 610 grams per square meter. In case the substation is located within 30 km from seacoast, the zinc coating shall be 900gm per square meter. The purity of zinc shall be 99.95% as per IS: 209).

1.3. Peripheral & partitions wall shall be made of puff sandwiched panel as specified in material specification.

1.4. The isometric view of the CRB with local aesthetic and best industry practices shall be submitted by vendors for approval of ADANI. Colored (Roof Color – RAL 5002 & Wall Color RAL 9001) isometric view as per standard of Adani shall be submitted for approval.

2. GIS BUILDING / GIS HALL

2.1 The GIS building shall be of pre -engineered steel structure. GIS building consist of GIS hall, Room for control, protection & communication panels, and AHU room. Provision for service bay and future extension of the building shall be made. Suitable space shall be provided to facilitate maintenance of GIS equipment's. Panels shall be kept in an air-conditioner enclosure. The building shall be designed for future expansion also. Building shall be designed in such a manner that the same crane shall be extended in future expansion.

2.2 Size of the building shall be as per requirement of GIS modules, panel, O&M needs, and housekeeping considerations. Any clearance required as per Electricity Act or any other Standard shall also be kept. Separate fire escape doors shall also be provided in the IS Building

2.3 A Glazed partition made of aluminum extruded sections powder coated frame (min. 50-micron powder coating) and 5.5 mm (min) thick ened glass shall be provided between GIS hall and panel room. The total height of glazed partition shall 3000 mm above FFL include sill level of 900mm. Up to sill level full brick masonry wall to be provided and finished with non-VOC acrylic emulsion paint to give an even shade on plastered surface over 2mm POP putty

2.4 Overall Width of crane walkway shall not be less than 1.0m and shall be provided at gantry girder level on the two longer side of GIS hall along with climbing arrangement to facilitate maintenance of crane. Suitable arrangement shall be made on top of the crane, to facilitate maintenance of lighting fixtures. Structural steel of walkway shall be finished with priming coat of standard steel primmer followed by one coat of epoxy paint and final coating of PU (Minimum 100 Micron). The minimum clear height of the building shall be kept 2000 mm from the top of walkway or 800 mm above the topmost point of crane, whichever is higher.

2.5 The base plate of steel columns shall be mounted on the RCC foundation by means of hot dip galvanized foundation bolts (The zinc coating shall be minimum 610 grams per square meter. In case the substation is located within 30km from seacoast, the zinc coating shall be 900gm per square meter. The purity of zinc shall be 99.95% as per IS: 209).

2.6 PVC electrical conduits of ISI marked or IS approved shall be provided as per the

requirement of electrical installations its accessories, junction boxes/surfaces boxes, fan boxes etc. Areas where false ceiling is provided and on puff panels, electrical conduit may be laid on exposed surfaces of walls or ceiling, above false ceiling area. In rest area conduit & junction boxes, fan boxes etc. shall be concealed wherever brick wall/RCC is provided.

2.7 The walls of GIS building and the attached relay room shall be of full height PUF sandwiched panels

2.8 Open cable trenches in the GIS hall shall be covered with minimum 6mm thick steel chequered plate with suitable stiffeners. Chequered plate shall be painted with two or more coats of epoxy paint as per item 13.52 of DSR' 2014 over a coat of steel primer.

2.9 Color Scheme matching with Adani approved color code (CI-1.4 of Annexure-3) shall be submitted by vendors for approval of ADANI.

2.10 External masonry walls (up to 900mm from FGL) shall be painted with suitable approved color (RAL-9001) in consultation with Employer.

2.11 Roof of the PEB shall be provided with safety lifeline to prevent the falling of person during maintenance activity.

3. BUILDING DESIGN CONSIDERARIONS

3.1 To the requirements of the National Building Code of India, and the standards quoted therein.

3.2 For the specified climatic & loading conditions

3.3 To adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.

3.4 With a functional and economical space arrangement.

3.5 To be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design.

3.6 To allow for easy access to equipment and maintenance of the equipment.

3.7 With wherever required, fire retarding materials for walls, ceilings, and doors, which would prevent supporting or spreading of fire.

3.8 With materials preventing dust accumulation.

3.9 With the plinth level of building shall be minimum 800 mm above finished ground level or as indicated in the tender drawings. In case of extension of existing buildings, plinth level should match with the existing buildings.

3.10 With anti -termite treatment, plinth protection, DPC, peripheral drain, sanitary, water supply, electrification etc.

3.11 With the building lighting, in accordance with the requirements of relevant section.

3.12 With the building auxiliary services like air conditioning and ventilation systems, fire protection and detection systems and all other miscellaneous services, in accordance with the requirements specified in relevant section or elsewhere in this Specification.

3.13 Most critical combinations of dead loads, super - imposed loads, live loads, crane load, wind loads, Snow load, seismic loads, any other load etc. whichever is applicable shall be considered.

3.14 The individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.

3.15 The permissible stresses for different load combinations shall be taken as per relevant IS Codes.

3.16 The design of Reinforced cement concrete shall be done in accordance with IS: 456 unless otherwise specified elsewhere.

3.17 Cold formed members to be designed as per IS: 801. Hot rolled sections to be

designed as per IS: 800 -2007. Bracing and sag rod shall conform to IS: 2062 with 15% margin in design of all structural member.

3.18 Limit state method of Concrete design shall be adopted unless specified otherwise in the specification.

3.19 Detailing of reinforcement shall be done in accordance with IS: 2502 and SP: 34. Ductile Detailing shall confirm to IS: 13920.

3.20 Clear cover to reinforcement shall be as per IS: 456 (latest).

3.21 Expansion joints wherever necessary with provision of twin columns shall be as per the provisions of relevant IS or National building codes.

3.22 Any sub-soil water encountered at founding level, same shall be considered in the design.

3.23 Welding end plate to be minimum 6 mm thick or the thickness of flange whichever is greater. The minimum plate size used for PEB steel section shall be 6mm.

Column Base Plate: -
For main frame column: 16mm thick
For gable end column: 12mm thick
Stiffener : 8mm thick

3.24 Permissible Deflections: -

Vertical Deflection: -
For Primary Member : span/300
For Secondary Member: span/240

Horizontal Deflection: -
For Primary Member : Height/300

4. DESIGN LOADS

The following loads shall be considered in design, in addition to the equipment manufacturer's requirements if any. However, all the loads, which are required for design, are subjected to employer's approval.

4.1 DEAD LOADS

i) Dead loads shall include the self -weight of all structures complete with finishes, fixtures, and partition.

4.2 IMPOSED LOADS

I. Super-imposed loads in different areas shall include live loads, minor equipment loads, cable trays, small pipe racks/hangers and erection, operation, and maintenance loads wherever these loads are expected. Equipment loads shall constitute, if applicable, all load of equipment's to be supported on the building frame.

II. Floors/slabs shall be designed to carry loads imposed by equipment, cables and other loads associated with building. Cable load shall also be considered additionally for floors where these loads are expected

III. Rafter shall be designed for additional concentrated load of 1000 kg (10kN) applied at center of span.

IV. Purlin shall be designed for additional concentrated load of 100kg (1kN) applied at the center of span.

V. All connections shall be as per IS: 800 -2007.

VI. The floor loads shall be subject to Employer's approval. Floors shall be designed for live loads as per relevant IS 875 part 2 (latest), however, for Buildings, the following loads may be considered.

Roof	1.5 kN/m2 for accessible roofs and 0.75 kN/m2 for in -accessible roofs
RCC-Floor	i) 5 kN/m2 for offices ii) 10 kN/m2 (min.) for equipment floors or actual requirement, if higher than 10kN/m2 on equipment component and layout plans
Stairs & balconies	5 kN/m2
Toilets	2 kN/m2
Chequered plate floor	4 kN/m2
Walkways	3kN/m2

VII. For crane loads an impact factor of 30% and lateral crane surge of 10% (lifted weight + trolley) shall be considered in the analysis of frame according to provisions of IS:875. The horizontal surge shall be 5% of the static wheel load. Crane load shall be applied as per the requirement of building.

4.3 WIND LOAD

i) The wind loads shall be computed as per IS 875 part 3 (latest), the class of structure for design, k1 factor, shall be considered under the category as 'important buildings and structures like hospitals, communication buildings / towers, power plant structures' for Control Room building, GIS hall, Towers, Gantries, equipment structure. For other buildings/structures wind loads shall be computed as per IS 875 part 3 (latest).

ii) Wind and Seismic forces shall not be considered to act simultaneously.

4.4 SEISMIC LOAD

i) Seismic Coefficient method/Response Spectrum method shall be used for the seismic analysis as per IS: 1893: Part 1 with importance factor 1.5.

ii) Wind and Seismic forces shall not be considered to act simultaneously.

4.5 SNOW LOAD

i) Snow load shall be computed as per IS: 875 part 4 (latest).

ii) When snow load is present in roofs, replace imposed load by snow load in respective load combinations.

4.6 LOAD COMBINATIONS

i) The critical load combinations for design of RCC structures shall be computed or generated by using IS: 875 Part -5 (latest), IS: 456 (latest), IS: 1893 - part 1 (latest).

ii) The critical load combinations for design of Steel structures shall be computed or generated by using IS: 875 Part -5 (latest), IS: 800, IS: 1893 - part 1 (latest).

5. MATERIAL SPECIFICATION FOR ALL PRE -ENGINEERED BUILDINGS

5.1 STRUCTURAL STEEL MEMBERS

i) Primary structural framing shall include the transverse rigid frames, columns, corner columns, end wall wind columns and crane gantry girders and Frames at Door openings.

ii) Primary members are fabricated from plates and sections with minimum yield strength of 340 Mpa to suit design by continuous double side welding.

iii) All miscellaneous structural members, rod bracings, angle bracings, pipe bracings, wind bracings, sag rods, etc. shall conform to the physical specification of IS:2062 with a minimum 245Mpa Yield Strength.

iv) All welded structural steel members shall be provided with suitable treatment of shot blasting before application of steel primer.

v) All structural steel members including walkway structural steel members shall be painted with a steel priming coat (Zinc Phosphate Epoxy) followed by one coat of Zinc phosphate epoxy paint and final coating of PU (Minimum 150 Micron).

vi) The structural steel members of cage ladder shall be galvanized with 610 gm/sqm.

5.2 PURLINS AND GIRTS MEMBERS

i) Purlins, girts, necessary clips and other cold rolled structural members shall conform to the physical specification of ASTM A572 (Grade 50) or equivalent IS Standards having a minimum yield strength of 340 MPa and shall be of Pre galvanized having a total coating thickness of 275 gm/sqm. Inclusive of both sides.

ii) The minimum thickness of secondary members shall be 2.5mm.

5.3 ROOF & WALL SHEETING

i) Factory assembled 50mm thick puff (overall average density 40kg/cu.m. +/- 2 Kg/cu m as per IS: 11239 Part -2) sandwiched panels shall be provided. These panels shall be made of puff insulation sandwiched between two high tensile steel sheets each of 0.5 mm thickness. The material of sheets shall confirm to ASTM 792 M with minimum yield strength of 340 Mpa. However, higher grades of steel sheet may be supplied without any further cost implication.

ii) The steel sheets shall be provided with hot dip coating of Zinc aluminum alloy (approximately 55% Al, 43.5% Zn and 1.5 % silicon). Total mass of zinc aluminum alloy coating shall be minimum 200 gm/Sq. m inclusive of both sides. The tolerance of base metal thickness (BM T) of steel sheet shall be as per IS 16163. After hot dip coating of Zinc aluminum alloy, the sheet shall be provided with steel primer and silicon modified polyester (SMP) paint. The total thickness of primer and paint shall be 40 microns inclusive of both sides (TCT) comprising of 20 microns of SMP paint on top surface and 10 microns of backer coat (polyester coat) on back surface over 5 microns' thick primer each on both surfaces with inorganic pigments coated free from heavy metals. Painting shall conform to IS: 15965. In case SMP paint is not available, Super Durable Polyester paint (SDP) can also be used by the bidder without cost implication to ADANI.

5.4 SHEETING FASTENERS

Standard fasteners shall be self -tapping zinc plated metal screws with EPDM bonded zinc plated washers. All screws shall be color coated to match roof and wall sheeting.

5.5 SEALER

This is to be applied at all side laps and end laps of roof panels and around self -flashing windows. Sealer shall be pressure sensitive elastomeric Butyl tapes. The sealer shall be non -asphaltic, non -shrinking and nontoxic and shall be superior adhesive metals, plastics and painted at temperatures from 51°C to +104°C.

5.6 CLOSURES

Solid or closed cell closures matching the profiles of the panel shall be installed along the eaves, rake, and other locations. It should be specifically specified on drawings. The steel sheets shall be provided with hot dip coating of Zinc aluminum alloy (approximately 55% Al, 43.5% Zn and 1.5 % silicon). Total mass of zinc aluminum alloy coating shall be minimum 200 gm/Sq. m inclusive of both sides. The tolerance of base metal thickness (BMT) of steel sheet shall be as per IS 16163. After hot dip coating of Zinc aluminum alloy, the sheet shall be provided with steel primer and silicon modified polyester (SMP) paint. The total thickness of primer and paint shall be 40 microns inclusive of both sides (TCT) comprising of 20 microns of SMP paint on top surface and 10 microns of backer coat (polyester coat) on back surface over 5 microns' thick primer each on both surfaces with inorganic pigments coated free from heavy metals. Painting shall conform to IS: 15965. In case SMP paint is not available, Super Durable Polyester paint (SDP) can also be used by the bidder without cost implication to ADANI.

5.7 FLASHING AND TRIM

Flashing and / or trim shall be furnished at the rake, corners, eaves, and framed openings and wherever necessary to provide weather tightness and finished appearance. Color shall be matching with the color of wall. The steel sheets shall be provided with hot dip coating of Zinc aluminum alloy (approximately 55% Al, 43.5% Zn and 1.5 % silicon). Total mass of zinc aluminum alloy coating shall be minimum 200 gm/Sq. m inclusive of both sides. The tolerance of base metal thickness (BMT) of steel sheet shall be as per IS 16163. After hot dip coating of Zinc aluminum alloy, the sheet shall be provided with steel primer and silicon modified polyester (SMP) paint. The total thickness of primer and paint shall be 40 microns inclusive of both sides (TCT) comprising of 20 microns of SMP paint on top surface and 10 microns of backer coat (polyester coat) on back surface over 5 microns' thick primer each on both surfaces with inorganic pigments coated free from heavy metals. Painting shall conform to IS: 15965. In case SMP paint is not available, Super Durable Polyester paint (SDP) can also be used by the bidder without cost implication to ADANI.

5.8 WALL LIGHTS

For day lighting purpose of GIS hall, minimum 5 mm thick approved translucent polycarbonate sheet shall be provided for wall lighting in addition to windows for at least 10% of wall area on upper portion of both long walls & 3% for the skylights. The polycarbonate sheet shall be fixed with necessary EPDM/rubber gasket, Silicon

Sealant, cold forged fastener, aluminum profile etc. including MS supporting structural steel (conforming to IS:1161/4923) frame to ensure watertight arrangement.

5.9 CONNECTIONS

i) SITE CONNECTIONS: -

a) All primary bolted connections shall be provided with galvanized high strength bolts, washers, nuts conforming to specifications of grade 8.8 of IS 1367/IS: 3357.

b) All secondary bolted connections shall be furnished with bolts, nuts, washers conforming to the specifications of grade 4.6 of IS 1367 or ASTM
-
A307

c) Minimum 2 nos. of 16 dia. bolt shall be provided for all bracing connections.

ii) SHOP CONNECTIONS: -

a) All shop connections shall be welded with appropriate arc welding process and welding shall be in accordance with IS: 816, IS -818, IS1024, IS: 1261, IS1323, IS-9595, AWSD 1.1. As appropriate. The Webs should be welded on to the flanges at both the faces at top and bottom for columns, beams, and crane girders. Weld material should have strength more than the parent metal.

5.10 GUTTERS AND DOWN SPOUTS

Gutters and downspouts shall be adequately designed to ensure proper roof drainage system. The steel sheets shall be provided with hot dip coating of Zinc aluminum alloy (approximately 55% Al, 43.5% Zn and 1.5 % silicon). Total mass of zinc aluminum alloy coating shall be minimum 200 gm/Sq. m inclusive of both sides. The tolerance of base metal thickness (BMT) of steel sheet shall be as per IS 16163. After hot dip coating of Zinc aluminum alloy, the sheet shall be provided with steel primer and silicon modified polyester (SMP) paint. The total thickness of primer and paint shall be 40 microns inclusive of both sides (TCT) comprising of 20 microns of SMP paint on top surface and 10 microns of backer coat (polyester coat) on back surface over 5 microns' thick primer each on both surfaces with inorganic pigments coated free from heavy metals. Painting shall conform to IS: 15965. In case SMP paint is not available, Super Durable Polyester paint (SDP) can also be used by the bidder without cost implication to ADANI.

5.11 ROLLING SHUTTER

Hot rolled double dipped galvanized steel lath section of 18 SWG (Minimum Galvanized 90 microns or 610gm/Sq.m Conforming to IS: 6248), tested mild steel strips at 75 mm rolling centers interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements f or inside and outside locking with push and pull operation including wire springs, top cover, primer & two top coats of approved synthetic enamel paint etc. motors, wires, gearbox assembly all complete as per specification and of approved make – Electrically operated. The bottom lath shall be coupled to a lock plate fabricated from 3 mm thick steel plate and securely

riveted with stiffening angles etc. all complete as approved by the project manager.

5.12 GIS HALL FLOORING

52mm thick cement concrete flooring with hardener. Two coats of PU / EPOXY coating over the floor shall be provided. The final coat of PU / EPOXY shall be applied after Installation of equipment's. Total thickness of PU / EPOXY coats shall be minimum 3.5mm (2mm before installation and 1.5mm after installation of equipment)

5.13 RELAY ROOM FLOORING

Vitrified tiles of 8mm thick size 600 mm x 600 mm.

5.14 AHU ROOM FLOORING

52mm thick cement concrete flooring with hardener.

General Note:

1. Detailing of PEB shall be done in accordance with Chapter-12
2. All the design calculation of tower structures, equipment structures, tower foundations, equipment foundations, building's structure and foundation, roads, cable trench, drains, anchor bolts, base plate, connections, purlins, girts, associated members and any other required design and drawing as per the technical specification shall be submitted in pdf along with design calculation in excel sheet and staad file for approval.

FORMAT OF NO DEVIATION CERTIFICATE

(To be submitted in the bidder's letter head)

REF: ……. **Dated**…….

BHARAT HEAVY ELECTRICALS LIMITED,
TRANSMISSION BUSINESS GROUP,
6th Floor, BHEL SADAN,
Plot No- 25, Sector- 16A, Noida,
Distt. Gautambudh Nagar, UP-201301

TENDER REF.: TBSM/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000 MW BHADLA FATEHPUR PROJECT".

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,
AGM/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/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025

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,

AGM/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/BF/DESIGN CONSULTANCY SERVICES/TENDER/25-26 DATE: 08.07.2025**
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.

UNDERTAKING FOR ENGAGING SEPARATE DESIGN TEAM

(To be submitted in the bidder's letter head)

REF: …….. **Dated**…….

BHARAT HEAVY ELECTRICALS LIMITED,
TRANSMISSION BUSINESS GROUP,
6th Floor, BHEL SADAN,
Plot No- 25, Sector- 16A, Noida,
Distt. Gautambudh Nagar, UP-201301

TENDER REF.:

SUB: TENDER FOR "PROVIDING DESIGN CONSULTANCY SERVICES FOR HVDC Yard OF +/- 800kV 6000MW BHADLA FATEHPUR PROJECT".

Dear Sir,

In reference to above tender floated by BHEL for the Design Consultancy of Bhadla Fatehpur HVDC Project, we, M/s. _____hereby confirm and undertake the following:

1. We are currently engaged as Design Consultant for BHEL TBG for other project/s listed as below:

Sl. No.	LOI/WO No.	DETAILS OF WORK	% COMPLETED
1			
2			
3			

2. In case, we receive the order for above work, we hereby confirm that we shall deploy a separate team with desired experience for this assignment, with no overlapping personnel from our ongoing BHEL projects, to ensure independence and dedicated focus on the **Bhadla Fatehpur HVDC Project**.
3. We hereby submit the details of the new team (including qualifications and experience) along with our bid.

Sl. No.	NAME	QUALIFICATION	EXPERIENCE
1			
2			
3			
4			
5			

4. We understand that any deviation from this undertaking may lead to disqualification from the tender process or termination of the contract, if awarded.

This undertaking is issued in good faith and shall remain binding on us for the duration of the project.
Thanking you,

Yours faithfully,

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

DECLARATION REGARDING NO CONFLICT OF INTEREST

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

Ref: **Date……..**

To,
AGM/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 regarding no conflict of interest.

Ref: 1) NIT/Tender Specification No.:

We, M/s. a company/Firm incorporated under the laws of the country having its registered office at , hereby declare and confirm the following in connection with the tender No.

We confirm that no conflict of interest exists in our participation in this tender.

None of our personnel, agents, or subcontractors have any personal, financial, or business relationship with BHEL's employees or officials involved in this tender process that could constitute a conflict of interest.

None of our directors, employees, agents, or allied firms have been involved in need assessment, procurement planning, or evaluation of this tender.

If we are acting as an agent/distributor, we confirm that we do not represent more than one manufacturer in this tender and that the OEM is not bidding separately.

We are not participating in more than one bid in this tender. *

*Participating in any capacity by a bidder (including the participation of a Bidder as a partner/JV member or sub-contractor in another bid or vice-versa) in more than one bid shall result in the disqualification of all bids in which he is a party. However, this does not limit the participation of an entity as a sub-contractor in more than one bid if he is not bidding independently in his own name or as a member of a JV.

We understand that false declarations may result in disqualification or legal action."

Signature of the Authorized Signatory

Note:

1) Attach separate sheet, if necessary.