

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



TENDER DOCUMENTS

FOR

Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

- 1. 765kV AIS Switchyard at PGCIL Sikar project.**
- 2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan.**

CUSTOMER

POWERGRID CORPORATION OF INDIA LIMITED (PGCIL)

TENDER SPEC. NO.: TBSM/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

TRANSMISSION BUSINESS GROUP
SUBCONTRACTS MANAGEMENT
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BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

SECTOR-16A, NOIDA -201301

e-mail: dipak.mandal@bhel.in

NOTICE INVITING TENDER

REF.: TBSM/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

SUB: TENDER FOR "Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1. 765kV AIS Switchyard at PGCIL Sikar project
2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan".

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
Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for 1. 765kV AIS Switchyard at PGCIL Sikar project 2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan.	<u>FOR SIKAR SITE:</u> 05 months from the date of LOI <u>FOR KHETRI SITE:</u> 05 months from the date of LOI	Rs. 2,00,000/- As per Annexure to conditions of contract for ETC works	15.10.2024 14.30 hrs.	15.10.2024 15.30 hrs. (Technical bid only)

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

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

Offers are invited in two-parts only.

Documents Comprising the e-Tender

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

- a) **Technical Bid (Un priced Tender)**

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

- i) Earnest money Deposit (EMD) furnished in accordance with NIT Clause 4.0
- ii) Technical Bid (without indicating any prices).

b) Price Bid:

- i) Prices are to be quoted in the attached Price Bid format online on e-tender portal.
 - ii) The price should be quoted for the accounting unit indicated in the e-tender document.
 - iii) Note: It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.
 - iv) A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrantee that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.
 - v) A tender, which does not fulfil any of the above requirements and/or gives evasive information/reply against any such requirement, shall be liable to be ignored and rejected.
- c)** Uploading of the price bid in prequalification bid or technical bid may RESULT IN REJECTION of the tender.
- d)** Tenders shall be uploaded with all relevant PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION digital signature certificate (DSC).

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

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

TO,

Dipak Kumar Mandal
AGM (TBSM)
BHARAT HEAVY ELECTRICALS LIMITED,
TRANSMISSION BUSINESS GROUP,
5th Floor, BHEL SADAN, Plot no.: - 25, Sector- 16A, Noida,
Distt. – Gautam Buddh Nagar, UP-201301
TELEPHONE: 0120-6748134, 99111 63182
E-mail: dipak.mandal@bhel.in

- 4. Bidders may please note that no other mode of bid submission shall be considered for evaluation apart from Clause no. 02 to 03 mentioned above.**
5. The prospective bidders who have downloaded the tender documents from our website are requested to send their acknowledgement and willingness to participate in the tender to the undersigned, through fax or email.

6. Offers should be strictly in accordance with the Tender Specifications and General Instructions to Tenderer enclosed herewith.
7. "BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders.

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

8. The contractor shall give his explicit confirmation without any deviations to the HSE (Health, Safety and Environment) requirements as per enclosed specification No. TBSM/HSE/NIT-01, Rev-02 Date 31.01.2024. Contractors are also required to furnish details as per Annexure (HSE) to NIT along with their offer. Offers received without compliance & data about HSE requirements are liable to be rejected.
9. All documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder.
10. Clarifications, if any, can be obtained from the undersigned but such requests should be submitted well before the due date for submission of tenders. Due date for submission and opening of tenders will not be extended on such grounds.
11. Please note that wherever there is a contradiction between the 'ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS' and 'Conditions of contract for ETC works', the 'ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS' clauses shall be governing and binding on the contractor.
12. Drawings & FQP enclosed with the NIT (if provided) are for tender purpose only. Drawings & FQP may get change during execution stage and work to be carried as per latest RFC drawings & Field Quality Plan (FQP).
13. Construction/ RFC drawing/ Fronts shall be furnished progressively as per project requirement and no claim towards idling charges/ project overheads etc. borne by the contractor on account of non-availability of drawings/ fronts shall be entertained.
14. Completion period of the work has been envisaged under best possible conditions. Any changes/ deviation during execution shall be dealt as per relevant clauses mentioned in general/ special conditions of contract for ETC works.
15. *"In case this tender is awarded to first time contractor*, then the bidder shall be eligible to qualify for the next tender of similar work# of BHEL, TBG; only after successful executing of 50% (fifty percent) of this work prior to the date of next tender (in which bidder desires to quote) and on satisfactory performance feedback by BHEL site Incharge."*

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

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

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

16. **Before submission of offer, the tenderer is advised to inspect the work & the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, sourcing of material and labour, means of transport and access to site, accommodation, etc.** No claim will be entertained later on the grounds of lack of knowledge on any of these conditions/ resources.

17. The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.
18. Integrity commitment, performance of the contract and punitive action thereof:
- 18.1. Commitment by BHEL:
- BHEL commits to take all measures necessary to prevent corruption in connection with the tender process and execution of the contract. BHEL will during the tender process treat all Bidder(s) in a transparent and fair manner, and with equity.
- 18.2. Commitment by Bidder/ Supplier/ Contractor:
- 18.2.1. The bidder/ supplier/ contractor commits to take all measures to prevent corruption and will not directly or indirectly influence any decision or benefit which he is not legally entitled to nor will act or omit in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India.
- 18.2.2. The bidder/ supplier/ contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.
- 18.2.3. The bidder/ supplier/ contractor will perform/ execute the contract as per the contract terms & conditions and will not default without any reasonable cause, which causes loss of business/ money/ reputation, to BHEL.
- If any bidder/ supplier/ contractor during pre-tendering/ tendering/ post tendering/ award/ execution/ post-execution stage indulges in mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the price or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, then, action may be taken against such bidder/ supplier/ contractor as per extant guidelines of the company available on [www. bhel.com](http://www.bhel.com) and/or under applicable legal provisions”.
19. Also, offer of the bidders who are suspended (under hold/ delist) for business dealings by BHEL, TBG shall not be considered. Please note that lifting/ restoration of suspension (Ban/Hold/ De-list) of business dealing is not automatic after expiry of specified suspension period. Hence, vendor shall be considered as suspended for business till suspension is lifted by BHEL in writing on specific request of the vendor as per extant guidelines.
20. BHEL Fraud Prevention Policy, "The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice."
21. Offers will be scrutinized based on the qualifying requirements and only those who are technically and financially capable to execute the Job and who fulfil the Pre-Qualifying Requirements (PQR) are eligible to quote against the above NIT. However, final acceptance of the bidder/ offer shall be subject to acceptance of our customer.
22. The evaluation currency for this tender shall be INR.
23. The Submission of EMD is compulsory for subject tender. In case requisite Amount of EMD not submitted by the bidder before tender opening or along with offer, the offer shall not be considered for evaluation and the offer shall be rejected.
24. In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.
- In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by toss/ draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

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

25. Technical Bid will be opened in the office of undersigned. If required, technical discussions will be held with only those bidders who have taken any deviations. The price bids will be opened subsequently, after Technical Bids of all the bidders have been evaluated and frozen. Bidders should quote their most competitive rates as there will not be any price negotiation. However, if felt necessary by BHEL, price negotiation will be held with lowest bidder (L-1) only. **IT WOULD BE PREFERRED THAT YOUR OFFER IS WITHOUT ANY DEVIATION w.r.t. TENDER SPECIFICATIONS AND THE SAME MAY BE CLEARLY MENTIONED ON THE COVERING LETTER ACCOMPANYING THE TECHNICAL BID.** Offers with deviations are likely to be rejected.
26. In case any adverse information is received concerning performance, capability or conduct of the bidder after issue of tender enquiry, BHEL reserves the right to reject the offer at any stage as deemed fit.

27. **Integrity Pact (IP)**

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

Sl no.	IEM	E- mail
1	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

- (b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (part-I in case of Two/ Three Part Bid). Only **those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding**. In other words, entering into this Pact would be a preliminary qualification,
- (c) Please refer Section-8 of the IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through e-mail only.

Note: -

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

Details of contact person (s): -

1) Name: - Dipak Kumar Mandal Department: - TBG, Subcontracting Address: - BHEL/ TBG, Noida Phone: - 01206748134 E mail: - dipak.mandal@bhel.in	2) Name: - Ashok Kumar Meena Department: - TBG, Subcontracting Address: - BHEL/ TBG, Noida Phone: - 01206748545 E mail: - akmeena@bhel.in
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28. Any materials (if required) for ETC works have to be procured from Customer approved sources only. It will be the bidder's responsibility to get the approval of materials and vendors for materials.
29. The purchase preference for central P.S.U.s shall be given as per the prevailing Government policy.
30. Work schedule and the deployment of manpower and T&P resources committed by the contractor in their offer, to match the scheduled completion, shall be submitted by contractor and mutually agreed with site In-charge immediately after the award of work. Further, the contractor shall mobilise at site within two weeks of award of work.

31. In case an offer is not being submitted by the prospective bidders against this tender, they may send their "regret" letter to this office, for information.
32. Details of qualifying work(s) executed by the bidder will be forwarded to the principal employer for verification of the work with respect to completion, commencement & completion date and value of the work executed. Performance feedback of the bidder will also be sought from the principal employer.
33. The bidder representative may be called for discussion with the committee. His originals may be verified by the committee. In addition to above their organisation chart and detail list of manpower, tools & plants and technically capability will be discussed and ascertained by the committee.
34. **Conflict of Interest among bidders/Agents: -**

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

- a) they have controlling partner (s) in common; **or***
- b) they receive or have received any direct or indirect subsidy/ financial stake from any of them; **or***
- c) they have the same legal representative/agent for purposes of this bid; **or***
- d) they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; **or***
- e) Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid; **or***
- f) In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorise only one agent/dealer. There can be only one bid from the following:*
 - 1. The principal manufacturer directly or through one Indian agent on his behalf; and*
 - 2. Indian/foreign agent on behalf of only one principal;*

or
- g) 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***
- h) In case of it holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "*

Thanking you,

Yours faithfully,
For and on behalf of BHEL,

(Dipak Kumar Mandal)

AGM /TBSM

TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD

ANNEXURE - X

REF TBSM/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

SUB: Tender for “Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

- 1. 765kV AIS Switchyard at PGCIL Sikar project**
- 2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan”.**

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 competitiveness or to introduce cartelization in the bidding process.

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

(Signature of Tenderer)

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

(TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD)

ANNEXURE - Y

REF TBSM/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

SUB: Tender for “Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1. 765kV AIS Switchyard at PGCIL Sikar project
2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan”.

Subject: Declaration confirming knowledge about Site conditions

I/We, _____ hereby declare and confirm that we have visited the Project Site with reference to above BHEL Tender Specifications and acquired full knowledge and information about the Site conditions including Wage structure, Industrial Climate, the Law & Order and other conditions prevalent at and around the Site. Also, we have acquired information about availability of manpower, construction material, water, electricity etc.

We further confirm that the above information is true and correct and we shall not raise any claim of any nature due to lack of knowledge of Site conditions.

I/We, hereby offer to carry out work as detailed in above mentioned Tender Specification, in accordance with Terms & Conditions thereof.

Site Visited Official Name & Contact Details:

(Signature of Tenderer)

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

ANNEXURE – Z

Ref:- TBSM/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

SUB: Tender for “Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1. 765kV AIS Switchyard at PGCIL Sikar project
2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan”.

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/SIKAR-KHETRI/ETC/TENDER/24-25

DATE: 27.09.2024

SUB: TENDER FOR "Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1. 765kV AIS Switchyard at PGCIL Sikar project
2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan".

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 as under:

Sl. No.	Criteria	Description
A	Turn Over	<p>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 ₹. 4,06,90,419/- for best three fin. Years i.e. 36 months out of last five financial years and should submit audited balance sheet and Profit & Loss Account Sheet of these years.</p> <p>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.</p> <p>"In case of proprietorship and partnership firms where Audited Profit & Loss A/c and Balance Sheet is not available, 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.</p>
B	Profit	<p>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)</p>

C	Similar Work*	<p>Bidder should have successfully executed <u>Erection, Testing & Commissioning/Pre-Commissioning works of 220kV or above voltage rating AIS/GIS Substation and allied works</u> during last seven years ending on 31.08.2024 and should be either of the following:</p> <p>i. Three similar jobs costing (except service tax/GST) not less than <u>₹. 1,35,63,473/-</u> each.</p> <p>OR</p> <p>ii. Two similar jobs costing (except service tax/GST) not less than <u>₹. 1,69,54,341/-</u> each.</p> <p>OR</p> <p>iii. One similar job costing (except service tax/GST) not less than <u>₹. 2,71,26,946/-</u></p>
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Note:

1. The Bidder shall submit the Contract Agreement/Work Order/LOI, BOQ/Drawings and Performance/completion/execution certificate issued by customer/contractor along with technical bid in support of qualification.
2. The word ‘executed’ means the bidder should have achieved the criteria specified in the PQR. Only those work credentials will be considered that already completed and completion certificate available for that work.
3. In order to technically qualify in this tender, bidder should meet all criteria i.e. A, B & C mentioned above.
4. If the job is executed in the **last seven-year period**, as specified above, even if it has been started earlier, the same will also be considered meeting the qualifying requirements.
5. Consortium/ JV bidding is not allowed.
6. BHEL reserves the right to:
 - (a) Accept or reject any bid received at its discretion without assigning any reasons whatsoever.
 - (b) Postpone the above-mentioned date, split and distribute the work among more than one bidder without assigning any reason whatsoever.
 - (c) May ask for further qualification during techno commercial scrutiny of bids received.
 - (d) May ask for further proofs including TDS certificates/ Form 26AS/ Final bill/ payment detail for the said job for cross- verification.
7. BHEL shall not be responsible for any delay, loss, damage for bids sent by post.
8. BHEL shall not be liable for any expenses incurred by bidder in preparation of bid irrespective of whether it is accepted or not.
9. Quotations received from bidders who do not fulfil the PQR shall be summarily rejected without any further evaluation and information to bidders.
10. Canvassing i.e. soliciting favour, seeking advantage etc. in any form is strictly prohibited and any bidder found to have engaged in canvassing shall be liable to have his bid rejected summarily.
11. If the bidder deliberately gives any wrong information in his tender to create in circumstances for the acceptance to his bid, BHEL reserves the right to reject such application.

12. Bidder's selection is subject to approval of BHEL's customer for this work. The approval/acceptance of bidders from Customer is mandatory requirement for subject tender.
13. All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in web page, www.bhel.com and <https://eprocurebhel.co.in> and not in the newspaper. Bidders shall keep themselves updated with all such amendments.

PROJECT INFORMATION

1.0 CUSTOMER:

M/s POWERGRID CORPORATION OF INDIA LIMITED

2.0 PROJECT LOCATION AND DETAILS:

TENDER FOR "Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1. 765kV AIS Switchyard at PGCIL Sikar project
2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan."

SITE ADDRESS:

I. <u>SIKAR</u> 765/400 kV POWERGRID Sikar-II Sub-Station, Village: Jurathara, Near Bheru Nath Mandir, Prithvipura (Palsana), Tehsil & District: Sikar-332402 (Rajasthan) (Site is approx. 35 kms from Sikar Town)	II. <u>KHETRI</u> 765/400kV Substation, Village- Jasrapur, Tehsil- Khetri, Dist- Neem Ka Thana (Rajasthan)- 333514 (Site is approx. 50 kms from Jhunjhunu)
--	--

3.0 CONTACT PERSON: FOR CONTRACTUAL ISSUES

DIPAK KUMAR MANDAL
AGM (TBSM)
SUBCONTRACTS MANAGEMENT,
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301

PHONE: 0120-674-8134/ 99111 63182
E-mail: dipak.mandal@bhel.in

CONTACT PERSON: FOR ENGINEERING ISSUES

Jai Kumar
Dy GM (TBEM-Electrical)
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301

PHONE: 0120- 674-8534/ 9214448521
E-mail: jaik@bhel.in

CONTACT PERSON: FOR CONTRACT EXECUTION ISSUES

Sunil Kumar
Sr. DGM (TBNS-Construction)
TRANSMISSION BUSINESS GROUP,
Plot No. 25, Sector-16A, Noida,
Distt. Gautambudh Nagar, UP-201301
PHONE: 9761724520; E-mail: sunil.kumar@bhel.in

HSE CONDITIONS

at a GLANCE (for bidders)



Health Safety and Environment Management



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP

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DOCUMENT CONTROL			
Document number:	TBG/HSE/NIT-01		
Issue number:	00	Issue date:	08.01.2020
Revision number:	01	Revision date :	22.10.2021
Revision number:	02	Revision date :	31.01.2024
	Prepared by	Approved and Issued for use by	
Name	Arvind Kumar Pandey	RS Pathwar	
Designation	Sr. Engineer	Dy. General Manager	
Signature	-sd-	-sd-	
Date	31.01.2024	31.01.2024	
Doc. copy issue no. :		Doc. copy issue date :	
Issued to :	Name	Designation	Signature
Issued by :	Name	Designation	Signature

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

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

1. BHEL HSE Policy



**HEALTH
SAFETY
ENVIRONMENT
POLICY**


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

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

June 5, 2018


Atul Sobti
 Chairman & Managing Director

Creating  of tomorrow

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2. Legal Compliances:

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

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


b. **Indian Standard (IS) Codes related to HSE**

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

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

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

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

c. The Sub-contractors need to

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


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

3. Labour Welfare and Medical Facilities

a. Labour Welfare

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

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b. Medical facilities and Health centres

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


4. House Keeping & Storage

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

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

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

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

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5. Site Safety

a. Induction and others safety trainings

Every sub-contractor shall make arrangement to provide induction training as per BHEL and/or customer requirement on a pre-approved and fixed module to all its new inductees irrespective of class or grade of appointment/hire. He shall also arrange the required facilities for induction training such as board, marker, dummy, posters/banners with all the mandatory PPEs.

Sub-contractor shall also arrange for periodic trainings on fire-fighting, first aid, CPR, importance and use of PPEs, electrical safety, hot work safety, Height work safety, confined space, deep excavations and barricading, concreting work safety etc.

b. Appointment of Safety Officer/Supervisor

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

c. Safety organisation, Safety committees and meetings


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

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

d. Personal Protective Equipment.

Unless mentioned otherwise, there will be three mandatory PPEs- Safety shoes, Safety Helmet and Reflective jackets conforming to relevant IS codes as mentioned above. Every person entering in the project premises shall use above mandatory PPEs.

There will be other PPEs too, based on the work requirement like: Twin lanyard full body harness, fall arresters and life lines for height workers, Face shield for welders and grinders, Induction helmets and Electrical resistant shoes with FRP/PVC toe for electricians and commissioning engineers, Gum boots for concrete workers and manual excavators, Goggle for gas cutters and grinders, Aprons for welders, shoulder pads for material handlers, Hand gloves – Leather for binders/welders/grinders, certified Rubber gloves for electricians, PVC for concrete/cement

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

e. Material Handling

BHEL as a policy discourages continuous manual handling. Material handling contributes a major portion in the project and hence proper means (mechanical/ electrical powered) should be deployed appropriately for this work. Cranes/Faranas/hydras should not be used for material transportation for long distances(>100m), if such movement is un-avoidable, it must be accompanied by a trained signal man. Long materials should be guided by tagline. Roads for material movement should be free from obstructions. Lifting appliances must be in good condition and must have test/inspection certificates.

Lifting tackles like- D-shackles, chains, ropes, slings, belts shall be periodically inspected and shall have valid test certificate and/or third-party inspection certificates.

Painted/galvanized structures/materials to be lifted by adequate capacity nylon belts only.

If a machine undergoes a major maintenance, fresh TPI shall be required before use. Hydraulic/pneumatic machines shall be free from leakages. Daily checklist to be filled and witnessed by the concerned supervisor before start of the work.

f. Vehicle/Machinery Documents and other safety requirements

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

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

- **Tipper, Transit mixtures (TM), Self-loading concrete mixture (Ajax Fiori), Tractors**

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


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

- **Cars, Taxis, scooters, motor cycles and other public carriers**

- Valid 2/4-wheeler license (as applicable- commercial/non-commercial)
- Registration Challan
- Valid Insurance
- Pollution under control

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

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

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Note:

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

h. Excavation

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

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

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


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

i. Bar bending and Binding

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

j. Concreting

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

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k. Welding, Gas Cutting & other hot works

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

Gas cutting: If LPG is being used, domestic cylinder is strictly prohibited inside the project premises, (not allowed for site kitchen too). Hose pipes shall be in good condition without cracks, cuts, punctures or joints. Ends should be clamped with worm clamps. Dial gauges shall be of good quality and duly calibrated. Flash back arresters is a must for both oxygen/acetylene or LPG/Oxygen combination. Cylinders shall be stored, transported and used in vertical position only. When not in use, they shall be capped. Empty and filled cylinders to be stored separately with distinct marking.

Cylinders shall neither be rolled on the ground nor thrown during loading/unloading.


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

l. Erection & Height Work

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

m. Electrical Safety

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

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

n. Dust Gases and fumes

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

o. Vehicular Traffic

Speed limits defined within the premises shall strictly be followed by the drivers/commuters of construction as well as other vehicles.

Every construction machinery, man-lift shall display the name, contact no and passport size photograph of the authorised operator (There can be one or more authorised operators).

No one other than operator and co-operator shall sit inside the cabin of any construction machine while it is working.

Construction machineries (tractor, trucks, tippers, JCBs, hydra, Fassi cranes etc. shall never be used as mode of public transport. Machineries like Ajax Fiori and hydra shall not be driven in back direction except for small distances. No overloaded vehicle shall be permitted entry in the project premises.

Over speeding shall be reported and driver/operator shall be barred from entry or shall be penalised.


Drunken drivers shall be barred from entry in the project.

Carrying harmful weapons like knives (>6"), guns etc. shall permanently disqualify the person from entry in project premises.

p. Barricading and floor openings

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

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

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q. Scaffold & Ladder

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

Scaffolds under erection shall be tagged **"RED"**, under repair/maintenance/inspection shall be tagged **"YELLOW"** and ready for use shall be tagged **"GREEN"**

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

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

r. Illumination


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

s. Safety banners/posters, caution boards

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

t. Waste management and disposal

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

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

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

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

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

v. Cable Laying


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

w. Fire Protection

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

x. Fencing of exposed rotating parts

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

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y. Emergency preparedness response plan and periodic mock drills.

Sub-contractor shall comply JSA (Job Safety Analysis) and arrange to mitigate the effects of identified possible hazards. He shall also define following in response to emergency preparedness:

An emergency assembly point and put a board of the same with information to all in induction training.

Have facility of ambulance or tie-up with nearest hospital for service in minimum possible time (Max-30min) if there is not ambulance inside the premises.

Ensure availability of emergency vehicle with driver all the time at site during work.

Conduct mock-drills on possible risks like electrocution, fall from height, fire, heat stroke etc., record responses and take photographs to submit in BHEL office. Stretchers availability in emergency vehicle or at work place should be well accessible. Provide fire extinguishers of right type at right place in right quantity with information to all. Display emergency contact nos. to various risk locations and at office, service building or at major work locations. Provide first aid training by doctors for and display names of such trained first aiders and fire fighters. Rescue kit with trained staff or man lift or both to rescue a man hanging by safety belt at height. Provide running water tap near chemical storage and handling points. Agencies shall follow emergency response plan prepared by BHEL in each area of work, store and office.

z. Safety reports & Reporting of accidents

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

Agency shall also promote such an environment that the near misses, incidents and accidents are reported by every person, whosoever witnesses them. These shall help in analysing the trend and taking measures in reducing/stopping the accidents/incidents. Initial reporting can be in any form-by call, SMS, WhatsApp, e-mail, letter etc.

Major and fatal accidents or high potential incidents shall be investigated for root cause and outcomes shall be immediately implemented to check recurrences.


6. General conditions and penalty clauses

Following are the general conditions:

PPEs shall not only bear the ISI mark but also be conforming to the required standards, 100% compliance of the PPEs is mandatory.

Over speeding of vehicles shall attract penalty/notice and recurrence will attract debarring from entry into project premises.

Hiding of facts like incidents, accidents, fake/forged reports/certificates shall also attract penalty/ notice or both. Only approved third party agencies shall be allowed to inspect the machines, T&Ps. Reports shall directly be sent to BHEL/customers by the third parties.

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

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


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

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

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

Monitory penalty will be

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

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Revision History

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

-:End of Document:-

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP,
NEW DELHI



CONDITIONS OF CONTRACT
FOR
ERECTION WORKS

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

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

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SECTION- A

GENERAL

INSTRUCTIONS TO

TENDERERS

BHARAT HEAVY ELECTRICALS LTD.
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SECTION - A

GENERAL INSTRUCTIONS AND INFORMATION FOR TENDERER

A.1.0 : PROCEDURE FOR SUBMISSION OF SEALED TENDERS

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

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

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

A.2.0 : PROCEDURE FOR EVALUATION OF PRICE BID

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

BHARAT HEAVY ELECTRICALS LTD.
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A.3.0

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

A.4.0

A.5.0

A.6.0

A.7.0

A.8.0

A.9.0

BHARAT HEAVY ELECTRICALS LTD.
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A.10.0

A.11.0

A.12.0

A.12.1

A.12.2

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

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

BHARAT HEAVY ELECTRICALS LTD.
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A.12.4 ORGANISATION CHART & MANPOWER DEPLOYMENT:

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

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

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

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

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

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

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

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

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

A.13.0 EARNEST MONEY DEPOSIT

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

BHARAT HEAVY ELECTRICALS LTD.
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A.13.2

A.13.3

A.13.4

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

A.13.6

A.13.7

A.13.8

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

A.14.0 **AUTHORISATION AND ATTESTATION:**

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

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A.15.0 VALIDITY OF OFFER:

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

A.16.0 EXECUTION OF CONTRACT :

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

A.17.0 SECURITY DEPOSIT:

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

A.17.1

BHARAT HEAVY ELECTRICALS LTD.
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e)

f)

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

g)

h)

i)

j)

k)

l)

Note

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

A.17.2

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

A.17.3

A.17.4

A.17.5

A.17.6

A.17.7

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

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

A.19.1

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

A.19.2

A.19.3

A.19.4

A.19.5

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A.19.6

A.19.7

A.19.8

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

A.19.9

A.19.10

A.19.11

A.19.12

**BHARAT HEAVY ELECTRICALS LTD.
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Conditions of Contract for Erection Works, Rev-02

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

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

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

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - A

DETAILS OF WORK EXECUTED / BEING EXECUTED

A) WORK EXECUTED

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

B) WORK BEING EXECUTED

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

(SIGNATURE OF TENDERER)
WITH STAMP

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

ANNEXURE - B

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

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

(B) MONTH WISE MANPOWER DEPLOYMENT PLAN

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

- (C) Total Man-days planned to be deployed for the work :Man-days
Plus man-days for unskilled labour as per site requirement.

**(SIGNATURE OF TENDERER)
WITH STAMP**

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - C

(A) STATUS OF TOOLS, PLANTS & INSTRUMENTS

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

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

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

(SIGNATURE OF TENDERER)
WITH STAMP

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - D

ANALYSIS OF UNIT RATE

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

(SIGNATURE OF TENDERER)
WITH STAMP

**BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE -E

DECLARATION SHEET

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

**(SIGNATURE OF TENDERER)
WITH STAMP**

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - F

CHECKLIST & SCHEDULE OF GENERAL PARTICULARS

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

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

Date

(SIGNATURE OF TENDERER)
WITH STAMP

WITNESS : (Signature with full particulars)

- 1.
- 2.

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ANNEXURE - H

CONTRACT AGREEMENT

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

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

AND

M/S (hereinafter called the SECOND PARTY which expression shall include their executors, administrators, successors and permitted assigns).
2. And whereas the FIRST PARTY called for the offer for the work of..... as per approved specifications, drawings and quality plan at as per Tender Specification No....., dated
3. Whereas the SECOND PARTY submitted their offer No. dated against above.
4. Whereas the FIRST PARTY has accepted the offer referred to above & issued Letter of Intent No....., dt..... and also detailed Work Order No..... dt
5. Whereas the SECOND PARTY has agreed to work as Sub-Contractor of the FIRST PARTY on the conditions specified in the Tender Specifications at a contract price of Rs.....(Rupees.....)
6. Now, therefore it is hereby mutually agreed to by and between the parties hereto as under :
 - a) The SECOND PARTY shall execute the works of at on the conditions specified in Tender Specifications of FIRST PARTY and Letter of Intent referred to herein before at a total contract price of Rs..... (Rupees))
 - b) That the SECOND PARTY shall organise all activities and mobilisation of facilities so that the work specified herein before is completed byas per the time bound programme mentioned in the Tender Specifications.

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- c) That all disputes arising out of or relating to this agreement shall be referred to the sole Arbitrator as per arbitration clause mentioned in the Tender Specifications. The Arbitrator from time to time with the consent of the parties enlarge the time for making and publishing award without reference to the court for the purpose.
 - d) That the jurisdiction in all suits or claims arising out of this agreement shall be of New Delhi Courts only.
 - e) The Following documents shall form part of this agreement :-
 - i)
 - ii)
 - iii)
 - iv)
 - v)
 - vi)
7. Deviation Limit : The contract value is subject to deviations depending upon the actual requirement within plus or minus 30%. Quantities of individual items may vary to any extent or may get deleted.
8. Terms of Payment : The terms of payment applicable to this contract shall be those covered under Point No.... of Work Order dt. and as per Tender Specifications.
9. Abandoning the work : In the event of the SECOND PARTY abandoning the work, FIRST PARTY reserves the right to get the unfinished work done at the risk and cost of the SECOND PARTY.
10. All other terms and conditions shall be as stipulated in the Tender Documents.
11. This contract agreement consists.... pages.
- IT WITNESS WHEREOF, the parties have signed this agreement on the date, month and year first above written in presence of:

For and on Behalf of
(FIRST PARTY)

WITNESS (WITH ADDRESS)

For and on Behalf of
(SECOND PARTY)

- 1.
- 2.

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ANNEXURE - I

MODEL FORM OF BANK GUARANTEE (FOR SECURITY DEPOSIT)

1.

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

2.

b)

c)

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5.

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

6.

7.

NOTE

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - J

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

1. This deed of guarantee made this day of 20... by Bank Limited in favour of Bharat Heavy Electricals Limited, having their registered office at BHEL House, Siri Fort, New Delhi - 110 049.
2. Whereas M/s (hereinafter called the CONTRACTOR / SELLER have entered into a Contract bearing No. dated..... (hereinafter called the CONTRACT) for supply / civil works /erection, testing and commissioning of M/s Bharat Heavy Electricals Limited (hereinafter called the COMPANY).
3. And whereas the said CONTRACT Inter - alia provides that the CONTRACTOR / SELLER shall pay to the COMPANY a sum of Rs. only towards Performance Guarantee in the form and manner therein specified.
4. And whereas the SELLER / CONTRACTOR have approached Bank Limited (hereinafter referred to as the GUARANTOR) and at their request and in consideration of the arrangement arrived at between the CONTRACTOR and the GUARANTOR, the GUARANTOR has agreed to give the Guarantee as hereinafter mentioned in favour of the COMPANY.

NOW THIS DEED WITNESSES AS FOLLOWS:

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

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6. The COMPANY shall have the fullest liberty without effecting in any way the liability of the GUARANTOR under this guarantee, from time to time to vary any of the terms and conditions of the CONTRACT or extend time by the SELLER / CONTRACTOR or to postpone for any time and from time to time any of the powers exercisable by its against the SELLER / CONTRACTOR and either to enforce or forbear from enforcing any of terms and conditions governing the CONTRACT or securities available to the COMPANY and the GUARANTOR shall not be released from its liability under these presents by any exercise by the COMPANY of the liberty with reference to the matters aforesaid or by reason of time being given to the SELLER or any other forbearance, act or omission on the part of the COMPANY or any indulgence by the COMPANY to the SELLER / CONTRACTOR or of any other matter or thing whatsoever which under the law relating to sureties, would but for this provision have the effect of so releasing the GUARANTOR / CONTRACTOR from its liability under this Guarantee.
7. This Guarantee shall remain in full force and effect and the GUARANTOR shall be liable under the same irrespective of any concession or time being granted by the COMPANY to the CONTRACTOR in or for fulfilling the said CONTRACT and this Guarantee shall remain in full force irrespective of any change in terms and conditions, stipulations or any variations in the terms of CONTRACT irrespective of whether notice of such change and / or variation is given to the GUARANTOR or not and the claim to receive such notice of any change and or variation of the terms / or conditions of the CONTRACT is hereby specially waived by the GUARANTOR.
8. The GUARANTEE herein contained shall not be determined, prejudiced or effected by the liquidation or winding up or insolvency of or change in the constitution of the CONTRACTOR but shall in all respects and for all purposes be binding and operative until all payments or all moneys due or that may hereafter become payable to the COMPANY are paid in respect of any liability or obligation of the CONTRACTOR under the CONTRACT.
- b) The GUARANTOR further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the commencement of the CONTRACT till end of the CONTRACT and its claim satisfied or discharged and till the COMPANY certified that the terms and conditions of the CONTRACT have been fully and properly carried out by the SELLER and accordingly discharges this guarantee, subject, however, that the COMPANY shall have no claim under this Guarantee after months from the date of completion of the Guarantee has been served on the GUARANTOR before the expiry of the said period in which case the same shall be enforceable against GUARANTOR notwithstanding the fact that the same is enforced after expiry of said period.

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

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

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

10. Notwithstanding anything herein before contained, our liability under this Guarantee is restricted to Rs. (Rupees only) and will expire on and unless a claim in writing is presented to us or an action or suit to enforce the claim is filed against us, within six months from the date, all our rights shall be forfeited and we shall be relieved and discharged from all our liabilities thereunder.

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

**SIGNED FOR AND ON
BEHALF OF THE BANK**

WITNESS:

NAME AND ADDRESS

SIGNATURE

1.

2.

BHARAT HEAVY ELECTRICALS LTD.
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ANNEXURE - K

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

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

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

**(SIGNATURE OF TENDERER)
WITH STAMP**

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

ANNEXURE -L

(On Bank's Letter Head)

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

Ref & Date

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

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

The format of the Bank guarantee is strictly as per the format prescribed by M/s BHEL and the stamp papers forming part of the BG are as per the state rules extant.

The signatures to the Bank Guarantee are duly authorised.

Thanking you,

For & On behalf of
Name of the Bank & Seal

(Please Sign here)

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

SECTION-B

GENERAL TERMS AND **CONDITIONS**

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP, NEW DELHI.
Conditions of Contract for Erection Works, Rev-02

SECTION - B

GENERAL TERMS AND CONDITIONS

- B.1.0 The following terms shall have the meaning hereby assigned to them except where the context requires otherwise:-
- B.1.1 BHEL (or B.H.E. Ltd.) shall mean Bharat Heavy Electricals Limited, a Company registered under Indian Companies Act 1956, with its Registered Office at BHEL House, Siri Fort, New Delhi-110 049 or its Authorised Officers or its Engineer or other Employees authorised to deal with any matters with which these persons are concerned.
- B.1.2 "GENERAL MANAGER" shall mean the Officer in Administrative charge of the Contracting Unit of BHEL.
- B.1.3 "ENGINEER" OR "ENGINEER-IN-CHARGE" shall mean Engineer deputed by BHEL. The term includes "Deputy General Manager, Construction Manager, Resident Engineer, Assistant Site Engineer of BHEL/at the site as well as the officers in charge at Head Office.
- B.1.4 "SITE" shall mean the place or places at which the plants/equipments are to be erected and services are to be performed as per the specification of this tender.
- B.1.5 "CLIENTS OF BHEL" or "CUSTOMER/OWNER" shall mean the organisation to whom BHEL is responsible for this work.
- B.1.6 "CONTRACTOR" or "ETC CONTRACTOR" shall mean the individual, firm or Company who enters into this Contract with BHEL and shall include their executors, administrators, successors and assigns.
- B.1.7 "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the agreement, the work order, the accepted appendices of rates, Schedules of Quantities, if any, General Terms and Conditions of Contract, Special Conditions of Contract, Instructions to Tenderer, the drawings, the Technical Specifications, the Special Specifications, if any, the tender documents and the Letter of Intent/Accepting Letter issued by BHEL. Any conditions or terms stipulated by the tenderer in the tender documents or subsequent letters shall not form part of the Contract unless specifically accepted in writing by BHEL in the Letter of Intent and incorporated in the Agreement.
- B.1.8 "GENERAL CONDITIONS OR CONTRACT" shall mean the "Instructions and Information for Tenderer and General Terms and Conditions" pertaining to the work detailed.

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- B.1.9 "TENDER SPECIFICATIONS" shall mean the Special Conditions, Technical Specifications, Appendices, Site Information and drawings pertaining to the work for which the tenderer are required to submit their offer. Individual Specification Numbers will be assigned to each technical specifications.
- B.1.10 "TENDER DOCUMENTS" shall mean the General Terms and Conditions and Tender Specifications.
- B.1.11 "LETTER OF INTENT" shall mean the intimation by a letter/telegram/telex/ fax to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all the terms and conditions of contract are applicable from this date.
- B.1.12 "COMPLETION TIME" shall mean the period by date specified in the Letter of Intent/Work Order or date mutually agreed upon for handing over of the erected equipment/plant which are found acceptable by the Engineer being of required standard and conforming to the specifications of the contract.
- B.1.13 "ZERO DATE" shall mean the planned commencement date of work under this tender and shall be date of issue of Letter of Intent.
- B.1.14 "PLANT OR PROJECT OR SWITCHYARD" shall mean and connote the entire assembly of the plant and equipments covered by the contract.
- B.1.15 "EQUIPMENT" shall mean all equipments, machineries, materials, structural, electrical and other components of the plant covered by the contract.
- B.1.16 "TESTS" shall mean and include such test or tests to be carried out by the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contracted work or part thereof.
- B.1.17 "APPROVED" "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

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- B.1.18 "WORK OR CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles required for complete and satisfactory site transportation, handling, stacking, storing, civil and electrical works, erection, testing & commissioning of the equipment to the entire satisfaction of BHEL.
- B.1.19 "SINGULAR AND PLURAL" etc. words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting masculine gender shall be taken to include the feminine gender and words imparting persons shall include any Company or Association or Body or Individuals, whether incorporated or not.
- B.1.20 "HEADINGS" The headings in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation of construction thereof or the contract.
- B.1.21 "MONTH" shall mean calendar month.
- B.1.22 "WRITING" shall include any manuscript typewritten or printed statement under the signature or seal as the case may be.

B.2.0 LAW GOVERNING THE CONTRACT & COURT JURISDICTION:

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

B.3.0 ISSUE OF NOTICE:

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

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B.4.0 USE OF LAND:

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

B.5.0 COMMENCEMENT OF WORK:

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

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

B.5.2 If the successful tenderer fails to commence the work within the stipulated time, BHEL, at its sole discretion will have the right to cancel the Letter of Intent/Contract. His Earnest Money and/or Security Deposit will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

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

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

B.6.0 MEASUREMENT OF WORK AND MODE OF PAYMENT:

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

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

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

- B.6.3 The measurement sheets will be checked by the Engineer and quantities and percentage eligible for payment under different groups shall be decided by him. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in the Measurement Book & signed by both the parties. Where required counter signature of Customer/Owner shall have to be taken.
- B.6.4 Based on the above quantities, contractor shall prepare the bills in the prescribed proforma and work out the financial value. These will be entered in the Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the Contractor.
- B.6.5 All recoveries due from the contractor for the month/period shall be effected in full from corresponding running bills unless specific approval from Competent Authority is obtained to the contrary.
- B.6.6 Measurement shall be taken jointly by person duly authorised by BHEL and the Contractor.
- B.6.7 The Contractor shall bear the expenditure involved, if any, in taking the measurements and testing of materials to be used in the works. The Contractor shall without extra cost to BHEL, provide all the assistance with appliances and other things necessary for measurement.
- B.6.8 If at any time due to any reason whatsoever, it becomes necessary to remeasure the work done, in full or in part, the expenses towards such re-measurement shall be borne by contractor.
- B.6.9 Passing of bills covered by such measurement does not amount to acceptance by BHEL of the completion of the work measured. Any left out work has to be completed by the Contractor, as directed by BHEL.
- B.6.10 Final measurement bill shall be prepared in the proforma prescribed for the purpose, based on the certificate issued by the Engineer that the entire work as stipulated in the tender specification has been completed in all respects to the entire satisfaction of BHEL.

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

B.7.0 RIGHTS OF BHEL:

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

B.7.2

B.7.3

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B.7.4

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

B.7.6

B.7.7

B.7.8

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B.7.9

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

B.7.10

B.7.11

B.8.0 RESPONSIBILITY OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC:

The following are the responsibilities of the Contractor in respect of observance of local laws, employment of personnel, payment of taxes etc.

- B.8.1 As far as possible, unskilled workers shall be engaged from the local areas in which the work is being executed. In case of any necessity is felt by the contractor to bring labourers from out side State, provisions of law governing such immigration by the concerned State are to be followed.
- B.8.2 The Contractor at all times during the currency of this contract, shall in all his dealings with the local labour for the time being employed on or in connection with the work, have due regard to all local festivals, religious and other customs.
- B.8.3 The contractor shall comply with all State and Central Laws, Statutory Rules, Regulations etc., such as : The payment of wages to, The Minimum Wages Act, The Workmen Compensation Act, The Employees Liability Act, The Industrial Dispute Act, The Employees Provident Fund and Miscellaneous Provisions Act 1952, Employees State Insurance Scheme, The Contract Labour (Regulations & Abolition) Act 1970 and other Acts, Rules and Regulations for labour as may be enacted by the Government during the tenure of the contract and having in force or jurisdiction at site. The Contractor shall give to the local Governing Body, Police and other concerned Authorities all such notice as may be required under law.

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

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- B.8.4 The contractor, as required, will obtain independent license under the Contract Labour (Regulations and Abolition) Act 1970 from the concerned authorities based on the certificate (Form-V) issued by the Principal Employer/Customer.
- B.8.5 The Contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalty, commissions or other charges which may be Leviable on account of any of his operations connected with this contract. The Contractor is responsible to furnish documentary evidence towards GST Registration of the State wherein the site is located and any other documents as per GST Act which may be required from time to time by BHEL. The contractor should have to get the contract registered immediately after award of works as per rules and regulations of the State Government. The contractor will file regular return as per statute of the State/ Centre and provide all information to BHEL as required for the assessment of the project concerned. In case BHEL is forced to make any of such payments, BHEL shall recover the same from the contractor either from moneys due to him or otherwise as deemed fit.
- B.8.6 Arrangements for the periodical visits of inspection agencies such as Electrical Inspector etc. to site, inspection certificates etc. will have to be made by the contractor at his cost. The contractor will also meet all expenses in connection with his welder's qualification/ re-qualification tests etc.
- B.8.7 The contractor shall be responsible for provision of health and sanitary arrangements {more particularly described in the Contract Labour (Regulation & Abolition) Act 1970} and safety precautions as may be required for safe and satisfactory execution of the contract.
- B.8.8 The Contractor shall be responsible for proper accommodation including adequate medical facilities for the personnel employed by him.
- B.8.9 The Contractor shall be responsible for the proper behaviour and observance of all regulations by the staff employed by him.
- B.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it shall be the responsibility of the contractor to make good the losses or compensate them.

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- B.8.11 All the properties/equipment/components of BHEL/its customer loaned with or without deposit, to the contractor, shall remain the properties of BHEL/its customer. The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be taken to in good condition unless notified to the contrary by the contractor within 48 Hrs. The Contractor shall return them in good conditions as and when required by BHEL/its customer. In case of non-return, loss, damage repairs etc., the cost thereof, as may be fixed by the Engineer, will be recovered from the contractor.
- B.8.12 It shall not be obligatory on the part of BHEL to supply any tools and tackles or materials other than those specifically agreed to be given by BHEL. However, depending upon availability/possibility, BHEL/its customer's equipment and other materials may be made available to the contractor on payment of the hire charges as fixed by them, subject to the conditions laid down by BHEL/its Customer from time to time. Unless paid in advance, such hire and other charges shall be recovered from out of dues to the contractor or Security Deposit in one instalment.
- B.8.13 The Contractor shall fully indemnify and keep indemnified BHEL/its customer against all claims of whatsoever nature arising during the course of execution of this contract.
- B.8.14 In case the contractor is required to undertake any work outside the scope of this contract, the amount payable shall be as may be mutually agreed upon.
- B.8.15 Any delay in completion of works or non-achievement of periodical targets, due to reasons attributable to the contractor, will have to be compensated by the contractor either by increased manpower and resources or by working extra hours or more than one shift at no extra cost to BHEL.
- B.8.16 The contractor shall execute the work under the conditions usual to such construction work and in conjunction with numerous other operations at site and proceed in a manner that shall help in the progress of work at site as a whole.
- B.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving details of all payments made to the workmen duly signed by the contractor's representative should be furnished to BHEL, along with each Running Account Bill. Also, Contractor shall display wages paid by him as per The Minimum Wages Act.

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- B.8.18 In case of any class of work for which there is no specification laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.
- B.8.19 No levy, payment or charges made or imposed shall be impeached by reason of any clerical error or by reason of any mistake in the amount levied, demanded or charged.
- B.8.20 No idle labour charges will be admissible in the event of any stoppage of work resulting in the contractor's workmen being rendered idle due to any reason any time.
- B.8.21 The contractor shall take all reasonable care to protect the materials and the work till such time the place/equipment has been taken over by BHEL/its customer.
- B.8.22 The contractor shall not stop work or abandon the site for whatsoever reason or dispute, excepting for force majeure conditions. All problems/disputes shall be separately discussed and settled without effecting the progress of work. Stoppage or abandonment of work, other than under force majeure conditions, shall be treated as breach of work of contract and dealt with accordingly.
- B.8.23 The contractor shall keep the area of work clean and shall remove debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of works, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.
- B.8.24 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/or as per instructions of the Engineers.
- B.8.25 The contractor shall furnish progress reports on work at regular intervals as required by the Engineer.

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

- B.9.1 All safety rules and codes applied by BHEL/its customer at site shall be observed by the contractor and his workmen without exception. The contractor shall be responsible for the safety of the equipment/materials and work to be performed by him and shall maintain all lights, fencing guards, signs etc. or other protections necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer, with a view to prevent pilferage, accidents, fire hazards etc. and suitable number of clerical staff, watch and ward, store keepers to take care of equipment, materials and construction tools and tackles shall be posted at site by the contractor till the completion of the work under this contract. The contractor shall arrange for such safety devices as are necessary for this type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per usual standards and practices.
- B.9.2 The contractor shall provide to its work force and ensure the use of required personal protective equipment as found necessary & as directed by the authorised BHEL officials in line with latest Amendments / Revisions of various Indian Standards.
- i) Safety helmets conforming to IS-2925 : 1984.
 - ii) Safety belts conforming to IS-3521 : 1983.
 - iii) Safety shoes conforming to IS-1989 : 1978.
 - iv) Eye and face protection devices conforming to IS-8520 : 1977 and IS-8940 : 1978.
 - v) Hand and body protection devices conforming to IS-2573 : 1975, IS-6994 : 1973, IS-8807 : 1978 and IS-8519 : 1977.
- B.9.3 All tools, tackles, fitting appliances, material handling equipment, scaffolds, cradles, safety nets, ladders, equipment, etc. used by the contractor (as per Annexure 'N') shall be of safe design and construction and maintained in good condition. However BHEL officials shall have the right to ban use of any of them or get them tested at their discretion.

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

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

- B.9.4 All electrical appliances including portable electric tools used by contractor shall have safe plugging system to source of power and be appropriately earthed.
- B.9.5 The contractor shall not use any hand lamp energised by electric power with supply voltage of more than 240 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 240 volts.
- B.9.6 Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in the relevant Government Acts, such as Petroleum Act, Explosive Act, Petroleum and Carbides of Calcium Manual of the Chief Controller of Explosives, Government of India etc. Prior approval of the authorised BHEL official at the site shall also be taken by the contractor in all such matters.
- B.9.7 The contractor shall arrange at his cost appropriate illumination as required at all work spots for safe working, when natural day light may not be adequate for clear visibility.
- B.9.8 In case of a fatal or disabling injury/accident to any person at construction sites pertaining to this work, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor & recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.
- B.9.9 In case of any damage to property due to lapse by the contractor, BHEL shall have the right to recover the cost of such damages from the payments due to the contractor.
- B.9.10 In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay

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from the payments due to the contractor, after notifying the contractor suitably and giving him opportunity to present his case.

- B.9.11 If contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorised BHEL official, BHEL shall have the right to take the corrective steps at the risk and cost of the contractor after giving appropriate notice indicating the steps that would be taken by BHEL.
- B.9.12 The contractor shall submit report of all accidents, fires, property damaged & dangerous occurrences connected with his area of work or caused due to his action/ inaction, to the authorised BHEL official immediately after such occurrence, but in any case not later than 12 hours of the occurrence.
- B.9.13 During the course of construction, alteration or repairs scrap lumbars with protruding nails, sharp edges etc. and all other debris including combustibles scrap shall be kept cleared from working areas, passage ways and stairs in and around site.
- B.9.14 Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally/ negligently dropped, struck or permitted to strike each other violently. When cylinders are transported by powered vehicles, they shall be secured in a vertical position.
- B.9.15 The contractor shall be responsible for the safe storage of his radioactive sources if same have been permitted to use.
- B.9.16 All contractor's supervisory personnel and sufficient number of workmen shall be trained for fire fighting and first aid duties and shall be assigned specific duties. Enough number of such trained personnel must be available during the tenure of the contract.

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- B.9.17 Contractor shall provide enough fire protecting equipment of the types & numbers at his office, stores, construction/erection site, other temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all times. Compliance of the above requirement under fire protection system at project site shall in no way relieve the contractor of any of his responsibilities & liabilities to fire accident occurring. In the event of fire safety measures being not to BHEL's satisfaction, BHEL shall have option to provide the same and recover the cost plus incidentals from contractor's bills and/or impose penalty as deemed fit by the Engineer.
- B.9.18 Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with BHEL Engineer at site.
- B.9.19 If safety record of the contractor in execution of the awarded job is to the satisfaction of Safety Department of BHEL, issue of an appropriate certificate to recognise the safety performance of the contractor may be considered by BHEL after completion of the job.
- B.10.0 **CONSEQUENCES OF CANCELLATION:**
- B.10.1 Whenever BHEL exercises its authority to terminate the contract/withdraw a portion of work, the work may be got completed by any other means at the contractor's risk and cost provided that in the event of the cost of completion (as certified by the Engineer which shall be final and binding on the contractor) being less than the contract value, the advantage shall accrue to BHEL. If the cost of completion exceeds the money due to the Contractor under the Contract, the Contractor shall either pay the excess amount demanded by BHEL or the same shall be recovered from the contractor. This will be in addition to the forfeiture of Security Deposit and recovery of liquidated damages as per relevant clauses.
- B.10.2 In case BHEL completes the work under the provisions of this clause, the cost of such completion to be taken into account for determining the excess cost to be charged to the contractor shall consist of cost of materials purchased and/or labour provided by BHEL with an addition of such percentage to cover supervision and establishment charges as may be decided by BHEL.

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B.11.0 INSURANCE:

- B.11.1 BHEL/its customer shall arrange for insuring the project materials/properties of BHEL/its customer covering the risks during transit, storage, construction, erection and commissioning.
- B.11.2 It shall be the sole responsibility of the Contractor to insure his workmen against risks of accident and injury while at work as required by the relevant rules and to pay compensation, if any, to them as per Workmen's Compensation Act. The Contractor shall also insure his staff against accidents. The work will be carried out in a protected area and all the rules and regulations of BHEL/its client in the project area which are in force from time to time will have to be followed by the contractor.
- B.11.3 If due to negligence and/or non-observance of safety and other precautions any accident/injury occurs to any other person/public, the contractor shall pay necessary compensation and other expenses, if so decided by the appropriate authority.
- B.11.4 It shall be the responsibility of the contractor to provide security and insurance claim related information/reports, FIRs etc. for the equipment/material belonging to BHEL/its customer and handed over to the contractor for transportation/erection/ construction till these are taken over by BHEL after erection/construction or are returned to BHEL/its customer's store.
- B.11.5 If due to Contractor's carelessness, negligence, non-observance of safety precautions, improper security arrangements or due to non-compliance of paper work needed for lodging insurance claim, damage to BHEL/its Customer's property and/or personnel should occur, and if BHEL is unable to recover its claim from the Insurance Company, the deficit will be recovered from the Contractor. **All losses arising out of theft of material from the contractor's store/erection site shall be recovered from the contractor irrespective of the insurance claims.**

B.12.0 STRIKES & LOCKOUTS:

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

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

B.13.0 FORCE MAJEURE:

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

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

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

B.14.0 GUARANTEE:

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

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B.15.0 ARBITRATION:

B.15.1

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

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

NOTE:

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

B.16.0 VARIATIONS AND VALUATIONS:

B.16.1 QUANTITIES:

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

B.16.2 VARIATIONS:

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

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- a) Increase or decrease the quantity of any work included in the contract.
- b) Omit any such work.
- c) Change the character or quality or kind of any such work.
- d) Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract but the value (if any) of all such variation shall be taken into account in ascertaining the amount of the Contract Price.
- e) Restrict the extent of work of any item covered under Clause E.10.0 of Section - E "Schedule of Equipment".

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

B.16.3 VALUATION OF VARIATIONS:

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

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

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B.16.4 POWER OF ENGINEER TO FIX RATES:

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

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ANNEXURE - M

PROGRAMME OF WORK

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

(SIGNATURE OF TENDERER)
WITH STAMP

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ANNEXURE - N

LIST OF TEST EQUIPMENTS TO BE ARRANGED BY ETC CONTRACTOR

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

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

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

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

Capacitance and tan Delta kit suitable for 12KV (Any reputed make)	1 Set
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H. Safety / protective means

- Protective earth rod suitable for 220Kv / 400 KV system having leakage current meter, 70MM² copper cables and C clamps (Any reputed make). 2 Nos
- Helmets and hand globes etc.

I. For PLCC Equipment:

- b) Digital time interval meter and frequency counter, 8 digits with frequency range 10 Hz to 10MHz.
- c) 200Hz to 620KHz Selective level meter.
- d) 200Hz to 620KHz Selective level generator.

Note:

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

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ANNEXURE - P

ACTIVITIES FOR TESTING AND COMMISSIONING BY ETC CONTRACTOR

1. Preparation of joint inspection records / observation by BHEL, BHEL customer and the contractor on the pending activities of erection holding for starting of testing and commissioning.
2. Issue of certificate for completion of erection activities to the satisfaction of BHEL customer.
3. Compilation of documents (scheme, cable schedules, FQP, technical literature, operation and maintenance manuals, technical reports, works test certificate for the equipments / components, and other relevant documents to expedite commissioning) in a systematic manner to present to customer/owner to meet the contractual requirement.
4. To expedite the testing activities contractor has to arrange the engineers and his staff and instruments at site for testing and commissioning of switchyard equipments as follows:
 - 4.1 Testing of individual relay, energy meter, transducer and meters for their satisfactory operation.
 - 4.2 Protection devices / relays will be tested with appropriate current and voltage injections.
 - 4.3 Individual control and protection panels testing for their satisfactory operation as per scheme.
 - 4.4 Individual CT, PT, CVT, Breaker, Transformer and Isolator LA, MB, Battery Charger etc. where ever possible to test them independently.
 - 4.5 Wiring check as per scheme and cable schedule preferably in the following sequences:
 - Between marshalling Kiosk in the yard to other yard equipments.
 - Between equipments in the yard.
 - Yard equipments to control room equipments.
 - Inter connection between control room equipments.
5. All cables to be properly glanded, identified and terminated suitably.
6. Cables should have proper / accurate cross reference ferruling and necessary cable tags for identifications as per recommendation by BHEL/ Customer.
7. Green marking in cable schedule and scheme after wiring check. Contractor to make also "As Built" scheme and cable schedule for submission to BHEL/Customer.
8. List of wiring mistakes, component damage and mal-operation of components.

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9. Successful completion of equipment level testing operative from local and remote and desired FQP filled up and approved by ultimate customer. Approval/acceptance on FQP results by customer has to be obtained by Contractor. For any technical clarifications, BHEL will only assist.
10. In case the contractor is finding difficulty to understand the technicalities to undertake testing and commissioning of a particular equipment, subsystem and system he has to inform BHEL in advance with in 2 months from the date of award of contract for necessary information and explanation.
11. For erection/commissioning of SF6 Circuit Breakers (If called for in BOQ), the services of experts +for supervision will be extended by BHEL free of cost. Contractor will provide adequate support by providing skilled manpower and tools & tackles. However the complete responsibility for erection and commissioning lies with subcontractor.
12. Contractor has to keep a senior and experienced person in the area of testing and commissioning associated with his skilled staff till charging and handing over of complete switchyard to the satisfaction of BHEL customer.
13. Contractor has to be well equipped at site with testing instruments and safety measures (like helmet and hand globes) while doing testing and commissioning.
14. Contractor will also carry out design validation tests as per BHEL / BHEL customer documents.
15. If the contractor fails to take up testing and commissioning work as per the requirement of contract or project requirement, then BHEL will be at liberty to hire services of third agency for this work at the risk and cost of subcontractor.
16. Testing of mandatory spares or any other spare (if required by customer / BHEL), cleaning and handing over to customer's stores is also included in the scope of this Tender Specification. The site Test Reports of these mandatory spares will also be generated by subcontractor in such a case.
17. In case contractor fails to arrange Test equipments as referred in Annexure 'N' (as per requirement of equipment covered in BOQ), BHEL will arrange the instruments at the risk and cost of contractor for providing such instruments.
18. Contractor has to repeat any tests free of cost, even if already conducted, whenever required to prove and check the healthiness of system before power flow, such tests could be primary injection and secondary injection in CT, CVT, meggering, and functional tests or any other tests as required by BHEL/customer.

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19. Oil processing/filtering in a transformer, CT and CVT shall also be repeated free of cost if required before charging and handing over of the switchyard to the owner in case BDV and PPM of oil is not satisfactory.
20. As isolator is a rotating equipment and its alignment is likely to get disturbed. Therefore contractor has to do alignment of isolators and measurement of contact resistance repeatedly free of cost as and when required till handing over of the station.
21. Commissioning means charging of total system in a sub-station and inter connected equipments by power flow. Accordingly the payment will be made to the contractor as per payment terms.
22. Contractor has to deploy adequate and experienced man power at site as per project requirement and advice of BHEL site in-charge. Non compliance of this requirement will be treated as indiscipline and non cooperation of the contractor. Accordingly BHEL will hire the man power as required at the risk and cost of the contractor after giving a single notice.
23. Based on site requirement, for the works not stipulated in the contract, the contractor has to provide assistance of skilled manpower with required tools and test instruments.
24. If any Expert services of manufacturer for commissioning supervision of special protection relays / numerical relays / equipment is felt necessary by the contractor, the same shall be arranged by the contractor themselves at their cost. Contractor shall provide testing & Commissioning, Engineer, electrician, other tools tackles and consumables for these equipments and for total system.

Any delay in arranging special testing & commissioning equipment and expert supervisor shall not entitle the contractor to any claim (idle labour, additional time etc.) whatsoever.
25. Any idle days of the expert supervisor at site due to reasons attributable to the contractor, due to lack of readiness in erection, delay in arranging of manpower, tools etc. shall be to contractor's account.

NOTES :-

- (1) Above is only an indicative list. Contractor has to mobilise and keep adequate competent commissioning staff at site to ensure that all mile stones & events and relevant commissioning activities are completed successfully in a scheduled time.
- (2) In case contractor is not finding competent and adequate staff with him, he can hire the commissioning services from out side agencies approved and accepted by BHEL. Contractor will furnish the details (experience, qualification) of all commissioning staff and the commissioning tools and instruments available with the contractor OR obtained on loan basis with in 60 days from the date of award of the work.

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ANNEXURE - Q

LIST OF TOOLS & TACKLES TO BE ARRANGED BY CONTRACTOR

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



- For cable laying.

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

IMPORTANT NOTE:

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

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SECTION-C

SPECIAL CONDITIONS OF **CONTRACT**

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SECTION - C

SPECIAL CONDITIONS OF THE CONTRACT

C.1.0 QUALIFICATION OF THE CONTRACTOR :

- C.1.1 The contractor must have the experience of execution of identical work in the past as specified in the tender documents and must have executed contracts of similar nature. The contractor must furnish enough evidence to establish his capacity in erection, testing and commissioning of similar equipments covered under this specification.
- C.1.2 The contractor should be able to obtain clearance from the Electrical Inspector/ State Authorities on completion of the installations. If required, the Contractor is supposed to obtain such clearances on part completion of the installation as required by BHEL / Owner time to time. Also, before the start of work the contractor should obtain the supervisory license from the concerned Electrical Authorities.
- C.1.3 The Contractor will have following certificates.
- a) Contractor electrical licence.
 - b) Supervisor competency certificates to deal with Electrical high voltage equipments for their installation and for their installation and testing.
- Such certificates from two persons of subcontractors representatives who will be posted at site will be required.
- C.1.4 The contractor should be aware of the local conditions and be well acquainted with the site.
- C.1.5 The contractor shall be preferred who has worked for State Electricity Boards/BHEL/Steel Authorities/Public Undertakings.
- C.1.6 The contractor should have a very good engineering background and capability of carrying out erection and commissioning work of large scale.

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

C.2.1

C.2.2

C.2.3

C.2.4

C.2.5

C.2.6

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

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C.2.7

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

C.2.8

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

C.3.0 **SECURITY DEPOSIT:**

C.3.1

C.3.2

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

C.3.3

C.3.4

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

The contractor should refer the clause A.17.7.

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

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C.4.0 PERFORMANCE GUARANTEE:

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

C.5.0 LD/PENALTY FOR DELAY IN EXECUTION:

C.5.1

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

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

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

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

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

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

- C.7.1 Watch and ward by authorised/licensed agency for the safe custody of the equipment shall be responsibility of the contractor.
- C.7.2 It is the responsibility of the contractor to dismantle and take away all the materials of his office accommodation as soon as the project is handed over to BHEL/Owner and clean the area off debris.

C.8.0 TESTING AND COMMISSIONING:

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

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- C.8.2 All the testing equipment required to carry out the site test for all the equipment or the erected equipment shall be calibrated and shall be arranged by the contractor at his own cost. However, necessary instruction and the guidelines will be given by BHEL/owner.
- In case Contractor is unable to provide the calibrated measuring and test instruments to the satisfaction of 'ENGINEER' then as per his own wisdom/ judgement can recommend a deduction of maximum limit up to 5% from the Contractor's bill. But this in no way relieves the Contractor from arranging the test & measuring instruments / equipment as required for completion of the 'PROJECT' without affecting the quality of work and meeting any Contractual obligation whatsoever.
- C.8.3 The contractor shall be completely responsible for the satisfactory erection and providing Test Equipment and skilled manpower for testing, commissioning of all equipment, notwithstanding the fact that he may be assisted by BHEL or its authorised representative.
- C.8.4 The installation of all electrical equipment shall be carried out only by an electrical contractor holding a valid License for carrying out installation work of the voltage classes involved, under the direct supervision of and by persons holding valid certificates of competency for the same voltage classes, issued or recognised by the State Government. Contractor shall submit the particulars of the License held by him.
- C.8.5 The contractor shall furnish to BHEL the names and particulars of certificates of competency of the supervisors and workmen to be engaged for carrying out installation work against this specifications.
- C.8.6 The work shall be executed in a workman like manner in accordance with the requirements specified in the General Specification of Electrical Equipment installation, testing and commissioning specifications. Copy of such specifications/ drawings will be given to successful bidder before starting the work.

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- C.8.7 All electrical work shall also comply with standard norms and practices adopted by the State Electricity Board. Site test reports shall be prepared and submitted by the contractor.
- C.8.8 Before charging the installation in part or full, this shall have to be approved by Statutory Govt. Authorities like Electrical Inspector, other concerned agency and the contractor has to arrange approval for the same as and when required by BHEL/Owner.
- C.8.9 Any feasible modification in the equipment or installation that may be demanded by Electrical Inspector shall have to be carried out by the contractor at no extra charges to BHEL. The contractor shall take all necessary steps to enable BHEL/Owner to get the installation approved by the above authorities & shall render all necessary assistance to BHEL/Owner in the matter.
- C.9.0 **COMPLETION OF CONTRACT:**
- C.9.1 All equipment, mountings, fittings accessories or apparatus which may not have been specifically mentioned but which are usual or necessary for completing the erection and commissioning work of system, shall be done by the contractor without any extra charges.
- C.10.0 **TRIAL OPERATION AND HANDING OVER:**
- C.10.1 On completion of erection of the equipment and before pre-commissioning tests of the equipment, each of the equipment shall be inspected by the BHEL/Owner for the correctness and completeness of the installation. Thereafter commissioning engineers shall carry out all pre-commissioning tests. The results of such pre-commissioning tests shall be signed jointly by the contractor's representative and BHEL/Owner.
- C.10.2 On conclusion of satisfactory pre-commissioning tests, the trial operation of the equipments shall start. The equipment shall be on trial operations during which period all necessary adjustments shall be made.

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- C.10.3 After completion of trial operation, the plant will be handed over to the owner, after the period to be specified by BHEL. On taking over the plant, the owner shall issue a certificate to that effect.
- C.10.4 BHEL/Owner shall be at liberty from time to time or at any time before the completion of the works to take possession and use any part of the completed works and in such case the contractor shall completely finish the said uncompleted part or parts of the works as and when the engineer shall direct whether before or after the respective prescribed time or extended time (if any) for the completion of the works and if required by the engineer while the owner is in possession of the said part or parts, of the site or works.
- C.10.5 If due to reason of any default on the part of Contractor, a taking over certificate has not been issued in respect of any portion of the works, within one month after the time for completion or extended time as the case may be, the Owner/BHEL shall be at liberty to use the works or any portion thereof in respect of which a taking over certificate has not been issued, provided that the works or the portion so used as aforesaid shall be reasonably capable of being used and that the Contractor shall be afforded the earliest opportunity of taking such steps as may be necessary to permit the issue of the taking over certificate.

C.11.0 **ADDITIONAL EXPENDITURE:**

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

C.12.0 **SPLITTING THE WORK:**

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

C.13.0 **SUPPLY OF MATERIAL:**

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

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

C.14.0 ELECTRICITY AND WATER:

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

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

- C.14.2 The contractor shall indicate in his offer the power load required by him along with the load details for which power is required.
- C.14.3 The owner shall not be responsible for any inconvenience caused due to any failure of lighting and power supply and no compensation for delay in works can be claimed by the contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
- C.14.4 The contractor should ensure that the work in critical areas is not held up in the event of lighting and power breakdown and for the same he should have some standby arrangement at his cost. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the contractor to step up the progress after restoration of electric supply so that over all progress of work is not affected. The contractor shall make proper arrangement of illumination at work place while working in late hours or in darkness.
- C.14.5 Unless stated otherwise in the scope of works, the contractor shall make his own adequate arrangement for procuring clear water to be used in the works.

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C.15.0 INSURANCE :

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

C.16.0 ESCALATION/PRICE VARIATION :

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

C.17.0 OVERRUN CHARGES:

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

C.18.0 CONSTRUCTION SCHEDULE:

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

C.19.0 HEAVY MATERIAL HANDLING EQUIPMENT:

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

C.20.0 CALIBRATED TEST INSTRUMENTS:

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

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- C.21.0 Contractor should maintain moisture free store.
- C.21.1 Illumination system in & around store should be maintained by the contractor.
- C.21.2 All the material stored in the open yard shall be covered by tarpaulins to be arranged by the contractor.
- C.22.0 **PROTECTION OF WORK :**
- C.22.1 Contractor shall effectively protect his work, equipment, material from theft, damage or tempering at his own expenses till the work is finally taken over by the BHEL/Owner.
- C.22.2 Finished work where required, shall be suitably covered to keep it clean and free from defacement or damage.
- C.22.3 Necessary fire protection arrangement is to be made by the contractor for store and place of work.
- C.23.0 **SAFETY MEASURES :**
- C.23.1 All safety rules and codes as applicable to work shall be followed without exception.
- C.23.2 All safety appliances and protective devices including safety belt, hand gloves, aprons, helmets, shield goggles etc. shall be provided by the contractor to his personnel. Also, the Contractor must follow BHEL Quality system to ensure safety in all activities of site work.
- C.24.0 **QUALITY RECORDS (FQPs, MATERIAL MANAGEMENT ETC.)**
- C.24.1 Contractor should follow field quality plan furnished by BHEL to ensure quality in all activities of work performed at site.
- C.24.2 The contractor shall have to maintain records pertaining to Material Verification on receipt at site as well as Daily Receipt Register, Stock Register as per the various quality systems of BHEL.

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- C.25.0 The contractor shall remove all scaffolding, ladders, temporary structures etc. erected by him during erection in order to leave place neat and clean to the satisfaction of the owner.
- C.26.0 All packing/items are to be checked immediately on receipt at site. Any shortages, damages are to be reported to BHEL within a week's time in writing.
- C.26.1 All parts shall be thoroughly cleaned, all rust removed and surface polished as required before erection of any equipment.
- C.26.2 Cleaned and polished parts shall be coated with anti-corrosive paints wherever necessary.
- C.27.0 After completion of work, reconciliation is to be done for all the material issued to the contractor. Balance materials are to be returned to BHEL/Owner.

C.28.0 **WORKING HOURS:**

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

C.29.0 **DIVISION OF WORK:**

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

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

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

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

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C.31.0 DISCREPANCIES AND ADJUSTMENT OF ERRORS

- C.31.1 The several documents forming the contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawings & figures dimensions in preference to scale & special conditions in preference to general conditions.
- C.31.2 In case of discrepancies between schedule of quantities, the specification and/or the drawings the following order of preference shall be observed.
- a) Description in Schedule of Quantities.
 - b) Special Conditions.
 - c) Drawings
 - d) Technical Specifications.
 - e) General Conditions of Contract.
- C.31.3 If there are varying or conflicting provisions made in any one document forming part of the contract, the Engineer shall be deciding authority with regard to the document.
- C.31.4 Any error in the description, quantity in schedule of quantities or any omission there from shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to the drawings and specifications or from any of his obligations under the contract.
- C.31.5 If on check there are found to be differences between the rates given by the contractor in words and figures or in the amount worked out by him in the schedule of quantities and general summary, the same shall be adjusted in accordance with the following rules. :
- a) In the event of discrepancies between description in words and figures quoted by tenderer, the description in words shall prevail.
 - b) In event of an error occurring in the amount column of schedule of quantities as a result of wrong extension of the unit rate and the quantity, the unit rate shall be regarded as firm and extension shall be amended on the basis of the rates.
 - c) All errors in totalling in the amount column and in carrying forward totals shall be corrected.

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

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

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SECTION-D

ERECTION CONDITIONS **OF CONTRACT**

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SECTION - D

ERECTION CONDITIONS OF CONTRACT

D.1.0 GENERAL:

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

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

D.2.0 REGULATION OF LOCAL AUTHORITIES AND STATUTES:

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

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

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

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D.3.0 OWNER'S LIEN ON EQUIPMENT :

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

D.4.0 RE-WORKS ETC. :

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

D.5.0 ACCESS TO SITE AND WORKS ON SITE :

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

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

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

D.6.0 CONTRACTOR'S SITE OFFICE ESTABLISHMENT:

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

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D.7.0 CO-OPERATION WITH OTHER CONTRACTORS:

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

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

D.8.0 DISCIPLINE OF WORKMEN:

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

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D.9.0 CONTRACTOR'S FIELD OPERATION:

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

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

D.10.0 PHOTOGRAPH AND PROGRESS REPORT:

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

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

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D.11.0 MANPOWER REPORT:

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

D.12.0 PROTECTION OF WORK:

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

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

D.13.0 EMPLOYMENT OF LABOUR:

- D.13.1 The Contractor will be expected to employ on the work only his regular skilled employees with experience of his particular work. No female labour shall be employed after darkness. No person below the age of eighteen years shall be employed.
- D.13.2 All travelling expenses including provision of all necessary transport to and fro for Site, lodging allowance and other payments to be Contractor's employees shall be the sole responsibility of the contractor.
- D.13.3 The hours of work on the Site shall be decided by the owner/BHEL and the Contractor shall adhere to it. Working hours will normally be eight (8) hours per day Monday through Saturday or depending upon the situation/ requirement.

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

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

D.14.0 FACILITIES TO BE PROVIDED BY OWNER:

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

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

D.15.0 FACILITIES TO BE PROVIDED BY THE CONTRACTOR:

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

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

D.15.2 COMMUNICATION:

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

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D.15.3 FIRST AID:

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

D.15.4 CLEANLINESS:

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

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

D.16.0 LINES AND GRADES:

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

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

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D.17.0 FIRE PROTECTION:

- D.17.1 The work procedures that are to be used during erection shall be those which minimise fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the site at least once each day. Fuels, oils and volatile or flammable materials shall be stored away from the construction and equipments and material storage and areas in safe containers. Untreated canvas paper, plastic or other flammable materials shall not at all be used at site for any other purpose unless otherwise specified, if any such materials are received with the equipment at the Site, the same shall be removed and replaced with acceptable materials before moving in to the construction area or storage.
- D.17.2 Similarly corrugated paper fabricated cartons etc., will not be permitted in the construction area either for storage or for handling of materials. All such materials used shall be of water proof and flame resistance type. All other materials such as working drawings, plants etc. which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.
- D.17.3 All the contractors supervisory personnel and sufficient number of workers shall be trained for fire-fighting and assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.
- D.17.4 The contractor shall provide enough fire protection equipment of the types and number for the ware-houses, office, temporary structures, labour colony area etc., access to such fire protection equipment shall be easy and kept all times.

D.18.0 SECURITY:

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

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D.19.0 CONTRACTOR'S AREA LIMITS:

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

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

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

D.21.0 PRE-COMMISSIONING TRIALS AND INITIAL OPERATIONS:

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

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D.22.0 MATERIAL HANDLING AND STORAGE:

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

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

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

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

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

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

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- D.22.5 All electrical panels, control gears, motors and such other devices shall be properly dried by heating before they are installed and energised. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotation parts if any, in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.
- D.22.6 All the electrical equipment, such as motors, transformers etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and record for such measured insulation values maintained by the contractor. Such records shall be open for inspection by the Owner/BHEL.
- D.22.7 The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before the equipments are installed.
- D.22.8 The consumable and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.
- D.22.9 All the materials stored in the open or dusty location must be covered with suitable weather proof & flame proof covering materials wherever applicable.
- D.22.10 If the materials belonging to the contractor are stored in areas other than these earmarked for him, the Owner/BHEL will have the right to get it removed to the area earmarked for the contractor at the contractor's cost.

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D.22.12 STORAGE INSTRUCTION FOR GAS FILLED EQUIPMENTS:

- D.22.12.1 All transformers despatched to site are fitted with Nitrogen cylinder in the tank to maintain positive pressure. It will be the responsibility of the contractor to maintain the pressure and replace the empty Nitrogen cylinder with Nitrogen filled cylinder of required purity at his own cost whenever such cylinders are become empty. Contractor should also maintain the periodic record of the pressure of Nitrogen in the transformer in a register for this purpose.
- D.22.12.2 For all other gas filled equipments, like CTs, VTs, CVTs etc. the contractor should also maintain the gas pressure & if it falls below the required value, contractor should refill the leaked gas of required purity at his own cost.

D.23.0 CONSTRUCTION AND ARRANGEMENTS:

- D.23.1 The field activities of the contractors working at site, will be coordinated by BHEL and BHEL decision shall be final in resolving any dispute or conflicts between the contractor and other contractor's and tradesmen of the BHEL regarding scheduling and coordination of work. Such decisions shall not be cause for extra compensation for time to the contractor.
- D.23.2 The Owner/Consultant shall hold weekly meetings of all the contractors working at the site at a time and a place so designated. The contractor along with BHEL shall attend such meetings and take notes of discussions during the meeting and the decisions of the Owner/BHEL/Consultant shall be strictly adhered to in performing his works. In addition to the above weekly meetings, the Owner/Consultant/BHEL may call for other meetings either with individual contractors or with selected number of contractors and in such a case the contractor, if called will also attend such meetings with BHEL.
- D.23.3 Time is the essence of the contract & the contractor shall be responsible for performance of his work in accordance with the specified construction schedule. If at any time the contractor is falling behind the schedule, he shall take necessary action to make good for such delay by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the BHEL satisfying them that his action will compensate for the delay. The contractor shall not be allowed any extra compensation for such action.

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

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

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

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

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

- D.25.1 The contractor shall bring to site all equipments, components, parts, materials, including construction equipment, tools & tackles for the purpose of the works under intimation to the owner/BHEL. All such goods shall, from the time of there being brought to site but may be used for the purpose of the works only and shall not on any account be removed or taken away by the contractor without the written permission of the BHEL.
- D.25.2 After the completion of the works the contractor shall remove from the site under the direction of the BHEL the material such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission of BHEL. If the contractor fails to remove such materials within fifteen (15) days of issue of a notice by the BHEL to do so, then BHEL shall have the liberty to dispose/remove such materials and expanses incurred by BHEL in this regard will be recovered from the Contractor.

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

- D.26.1 The contractor shall be responsible for any damage resulting from his operation. He shall also be responsible for protection of all persons including members of public and employees of the Owner/BHEL and the employees of other contractors and subcontractors building, other plants and equipments and utilities either above or below the ground.
- D.26.2 The contractor will ensure provisions of necessary safety equipments such as barriers, sign-boards, warning lights and alarm etc. to provide adequate protection to persons and property. The contractor shall be responsible to give reasonable notice to Owner/BHEL of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his work shall make all necessary arrangements with such owners related to removal and or replacement or protection of such property and utilities.

D.27.0 PAINTING:

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

D.28.0 PROTECTION OF MONUMENTS AND REFERENCE POINTS:

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

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D.29.0 WORK AND SAFETY REGULATIONS:

- D.29.1 The contractor shall ensure the safety of all the workmen, materials, and equipment either belonging to him or to others working at site.
- D.29.2 The contractor will notify the BHEL office of his intention to bring on to site any equipment or any container with liquid or gases, fuel or other substances which may create hazards. BHEL shall have the right to prescribe the conditions under which such equipment or container may be handled and used during the performance of the works and the contractor shall strictly adhere to such instructions. BHEL shall have strictly the right to inspect any construction plant and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition shall be entertained by BHEL.
- D.29.3 Where it is necessary to provide and/or store petroleum products or petroleum mixtures & explosive, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act, 1934. Explosively Act, 1948 and petroleum and carbide of calcium manual published by the Chief Inspector Of Explosive of India. All such storage shall have prior approval of BHEL in case any approval are necessary from the Chief Inspector of Explosive of any statutory authorities, the contractor shall be responsible for obtaining the same.
- D.29.4 The contractor shall be responsible for the safe storage of his & his sub-contractor's radio-active source if any.

D.30.0 ELECTRICAL SAFETY REGULATIONS:

- D.30.1 In no circumstances will the contractor interfere with fuses and Electrical Equipment belonging to BHEL/Owner or to the other contractors.
- D.30.2 Before the contractor connects any electrical appliances to any plug or sockets belonging to the other contractor or Owner, he shall:
- (a) Satisfy the Owner/BHEL that the appliances are in good working conditions.
 - (b) Inform the Owner/BHEL of the maximum current, relating, voltage etc. of the appliances.
 - (c) Obtain permission of the Owner detailing the sockets to which the appliances may be connected.

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- D.30.3 The BHEL will not grant permission to the contractor until he satisfies that:
- (a) The appliance is in good conditions and fitted with suitable plug.
 - (b) The appliance is fitted with a suitable cable having proper earthing provisions.
- D.30.4 No cable in use will be disturbed by the contractor without prior permission. No weight of any description will be imposed on any such cable and no ladder or similar equipment will rest against or attached to it.
- D.30.5 No work shall be carried out on any live equipment. The equipment must be made safe by the BHEL/Owner and a permit to work issued before any work is carried out.
- D.30.6 The contractor shall employ the necessary number of qualified full time electrician to maintain his temporary electrical installation.
- D.31.0 **CONSUMABLES:**
- The contractor shall make arrangements for an adequate inventory at site of necessary consumable prior to erection so that the requirements of the same will not come in the way of timely completion of the works under the contract.
- D.32.0 **MILD STEEL AND ALUMINIUM WELDING & OTHER SPECIAL PROCESSES :**
- D.32.1 Only an approved and qualified welder shall be employed by the contractor. The welder will be subjected to pre-qualification test by Owner/BHEL.
- D.32.2 The Contractor shall ensure that personnel employed for doing other special processes like tube/pipe bending etc. are having proper experience and are qualified for doing such work.
- D.32.3 Erection of Aluminium tubular bus bar shall include cutting, bending, aluminium welding with sleeves (sleeves supplied by BHEL), Radiographic testing and D.P test of 100% welded joints, fixing corona end bells etc to complete.

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- D.32.4 For MS welding, red lead paint shall be applied followed by aluminium paint and bitumen after welding. For GS welding , two coats of cold galvanising anti-corrosive paint shall be applied after welding. In case any special process is indicated in customer's specification, then the same shall be applicable.
- D.32.5 10% welded joints in earthing shall be tested for Dye penetration test.

SECTION – E

SCOPE OF WORK AND **COMPLETION** **SCHEDULE**

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SECTION - E

SCOPE OF WORK AND COMPLETION SCHEDULE

E.1.0 SCOPE OF WORK :

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

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

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

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

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

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

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

Temporary lighting in stores & construction area wherever required.

Safety / Security of equipments / materials.

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

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

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

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

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

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

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

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

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

All Equipment fixing hardware shall be arranged by BHEL.

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

- E.1.7 Maintenance of switchyard and associated equipment till handing over to the owner, any other activity necessary for completion of the job but not specifically mentioned in this specification.
- E.1.8 Unloading, shifting, storing, verification, preservation during storage and handing over of spare items/maintenance equipment to Customer/Owner.
- E.1.9 Reconciliation and shifting of all the balance excess material and scrap material to BHEL store or handover in customer store, as the case may be.

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

E.2.0 ERECTION, TESTING & COMMISSIONING REQUIREMENTS :

- E.2.1 All the switchyard equipment shall be erected, installed, tested and commissioned by the contractor to the satisfaction of BHEL/Owner adhering to the latest national standard and codes. Some of the Reference standards are given below which are normally applicable for Switchyard work. ETC activity of all other equipment to be done as per relevant standards.
- a) IS : 10118-1982 Code of practice for selection, installation and maintenance of switchgear & control gear.
 - b) IS : 10028-1985 Code of practice for installation and maintenance of transformer.
 - c) IS : 732-1963 Code of practice for electrical wiring.
 - d) IS : 3043-1963 Code of practice for earthing.
 - e) IS : 2309-1989 Code of practice for the protection of building and allied structure against lightning.
 - f) IS : 1646-1982 Code of practice for fire safety of building (General) Electrical installations.
- E.2.2 All electrical equipment and installations shall also conform to the latest Indian Electricity rules as regards safety, earthing and other essential provisions specified therein for insulation and operation of electric plants.

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- E.2.3 Earthing system, earth connections, testing of earthing system and connection, lightning protection system, electrical clearance and safety shall be strictly followed as per the national specifications which will be given to the successful bidder.
- E.2.4 The schedule of equipment indicates the quantity of the equipment and these will be procured by BHEL and are to be erected by the contractor. The contractor has to erect, test all equipment for system commissioning and putting the same into operation. The trial run of individual equipment and final commissioning upto the handing over of the system to the customer of BHEL is the responsibility of the contractor.
- Contractor will have to provide necessary support i.e.. suitable manpower, common tools, conventional testing instruments as per Annexure 'N' and other assistance as required by BHEL wherever expert services of any equipment are arranged by BHEL viz.. SF6 circuit breakers.
- E.2.5 All equipments, material and accessories provided by the contractor shall conform to the requirements of the relevant Indian standard or International standard.
- E.3.0 **METHOD OF WORKMANSHIP & QUALITY OF WORK:**
- E.3.1 Workmanship will be in accordance with the best engineering practices to ensure satisfactory performances and service life.
- E.3.2 All works shall be installed in a first class manner with technical skill in the trade involved to achieve quality of work of high standard. BHEL site supervisor's comments regarding quality of work should be taken care by the contractor.
- E.3.3 The erection work shall be supervised by the competent supervisor holding supervisory license by the state or central Government or statutory licensing authority, as the case may be.
- E.3.4 The installation shall be carried out in such a manner not to obstruct access to the other equipment installed or likely to be installed in the vicinity.

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

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

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

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

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

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

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

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

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- E.4.7 All equipments and accessories shall be installed strictly in accordance with the manufacturer's instructions / drawings. Equipment supplied in sections or in dismantled conditions shall be re-assembled at site with all associated accessories as per manufacturer's instructions.
- E.4.8 If the services of BHEL engineers, suppliers, and / or of any equipment manufacturers are required by the contractor at any stage of work, it will be made available on chargeable basis at existing rates prevailing at that time.
- E.4.9 All consumable items required to carry out welding, brazing, soldering etc. for the erection and commissioning is included in the offer of contractor and shortages in hardware (due to careless / negligent handling at site) to be made up free of cost by the contractor. The quality of such replenishment shall be at par with main supply and to be acceptable to BHEL / Owner.
- E.4.10 The successful contractor should note that after execution of work they will send marked up drawings "as erected" drawings to Project Manager at site for preparation of firm "AS BUILT" drawings. "AS BUILT" drawings will bear the signature of Project Manager of BHEL and Contractor's representative.
- E.4.11 **OIL FILTRATION (IN CASE OF TRANSFORMERS COVERED IN BOQ):**

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

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

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E.5.0 TESTING AND COMMISSIONING OF EQUIPMENT:

- E.5.1 The testing of all electrical equipment as well as the system as a whole shall be carried out to ensure that the equipment and its components are in satisfactory condition and will successfully perform its functional operation. All required tests shall be carried out by the contractor using his own instruments, testing equipments as well as qualified testing personnel. The tests on power transformer (if covered in BOQ) shall include winding resistance, tan-delta, PPM of moisture, acidity in oil. For SF-6 Circuit Breaker (if covered in BOQ) closing and tripping timing test shall also be carried out in addition to other routine tests.
- E.5.2 At site all equipments shall be energised only after certification by the personnel performing the test that the equipment is ready for energising and with the concurrence of BHEL / Owner.

E.6.0 PREPARATION FOR COMMISSIONING:

- E.6.1 After completion of the installation at site and for the preparation of system commissioning the contractor shall carry out checking and testing of all equipment and installation in accordance with the agreed standards, codes of practices of Indian Standards Institutions and specific instruction furnished by the particular equipments suppliers as well as the Owner.
- E.6.2 Required checking to be made on all equipment and installation at site. This shall include but not limited to the following:
- a) Physical inspection for removal of any foreign bodies external defects such as damaged insulators, loose connecting bolts, loose foundation bolts etc.
 - b) Check for grease insulating / lubricating oil leakage and its proper level / quantity.
 - c) Check for free movement of mechanism of the circuit breaker / isolator and rotating parts of other rotating machine and devices.
 - d) Check for tightness of all the cables, busbars as well as earth connection in the main earthing net work.
 - e) Check for clearance of live busbar and conductors from the metal enclosures.
 - f) Continuity check in case of power and control cables.

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- g) Checking of all mechanical and electrical interlocks, including tripping of breakers using manual operation of relay.
 - h) Checking of alarm and annunciation circuits by manual actuation of relevant relays like buchholz relay in case of transformer.
 - i) Check and calibrate devices requiring field adjustments / calibration like adjustment of relay setting etc.
 - j) Check proper connection to earth-mat work of all non current carrying parts of equipments & installation.
- E.6.3 All the measuring and testing instruments will be arranged by the contractor and while submitting his quotation he shall furnish list of testing equipments which are readily available with him and also which can be procured by him from outside agency for the purpose of testing and commissioning.
- E.7.0 **MINOR CIVIL WORK:**
- E.7.1 Minor civil works including secondary grouting/under pinning of structure i.e. filling the gap between structure and foundation after levelling, alignment shall be done by the contractor at no extra cost. This shall also include necessary materials required for doing the work.
- E.7.2 Minor civil works of final / secondary grouting of structures, towers equipment has to be arranged by the contractor and the rate for the same should be included in respective erection. Final / secondary grouting means filling the gap between the structure and foundation after levelling, alignment etc.
- E.7.3 Minor civil work shall also include fixing of foundation bolts for radiator / cooling oil pump etc. Foundation bolts for such work shall however be arranged by BHEL.

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E.8.0 PRICE SCHEDULE

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

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

E.9.0 START OF WORK AND COMPLETION SCHEDULE

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

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

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

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

E.10.0 SCHEDULE OF EQUIPMENT:

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

ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC WORKS

The following terms and conditions shall form a part of the tender document. If any discrepancies found between below mentioned clauses and clauses in the Conditions of Contract for Erection Works, DOC. NO. – TB-ETC-GCC, REV.-02, dated 20th JUNE, 2005, the clauses mentioned in this annexure shall prevail.

A. Condition of Contract for Erection works (DOC. NO. – TB-ETC-GCC, REV.-02, 20th June, 2005):

A. 1.0: GENERAL INSTRUCTION

1.1 **All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof.** The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages.

1.2. Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., tenderer shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non-compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.

A.2.0 PROCEDURE FOR SUBMISSION OF SEALED TENDERS

A.2.1 Bidders may please refer CI no. 2 to CI no. 4 of the Notice inviting tender.

A.2.2 The tenders received after the specified time of their submission shall be treated as 'Late Tenders' and shall not be considered under any circumstances.

A.2.3 Tenders shall be opened by the officers concerned of BHEL at the time, date and venue as specified in the tender enquiry. Tenderer or their authorized representative may witness the bid opening.

A.2.4 The tenderer shall closely pursue all the clauses, specifications and drawings indicated in the Tender Documents before quoting. Should the tenderer have any doubt about the meaning of any portion of the Tender Specifications or find discrepancies/omission in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, scope of work etc. he shall at once contact the authority inviting the tender for clarification before the submission of the tender.

A.2.5 Before submission of offer, the tenderers are advised to inspect the work & the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, sourcing of material and labour, means of transport and access to site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge on any of these conditions/ resources.

- A.2.6 Tenderer must fill up all the schedules and furnish all the required information as per the instructions given in various sections of the tender specification. Each and every page of the Tender Specification must be SIGNED AND SUBMITTED ALONG WITH THE OFFER by the Tenderer in token of complete acceptance thereof the information furnished shall be complete by itself.
- A.2.7 The tenderer shall quote the rates in English Language and international numerals. Total price offered should be entered in figures as well as in words. For the purpose of the tender, the metric system of units shall be used.
- A.2.8 **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.3.0 ADJUSTMENT PRICE DISCREPANCY (IES): - Not Applicable being e procurement.

A.4.0 EVALUATION OF TECHNICAL BIDS

- 4.1 Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre-Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer.
- 4.2 In case the same qualifying experience is claimed by more than one bidder due to subletting of work by main contractor to subcontractor (s) then following conditions shall be applicable.
- a) For labour + consumable contract without material and T&P:
Benefit of work experience shall be given to the subcontractor who has actually executed job and not to the contractor offloaded down the line.
 - b) For contract with complete scope i.e. with materials, T&P, labour and consumable:
 - i) Benefit of work experience shall be given to the subcontractor who has actually executed job and not to the contractor offloaded down the line.
 - ii) If the contractor offloads the labour and/or T&P portion only, benefit of work experience shall be given to the main contractor and not to the subcontractor who has executed only as labour supply contractor

The bidder's qualification shall be subject to submission of documentary proof. BHEL reserves the right to ask for further proofs including submission of TDS certificates/ for the said job

- 4.3 In case the qualifying experience is claimed by private organizations based on Work Order and completion certificates from another private organization, BHEL reserves the right to ask for further proofs including submission of TDS certificates/ form 26AS /bills for the said job.
- 4.4 Credentials of all the bidders participating in open tender will be scrutinized thoroughly by the nominated committee w.r.t. the pre-qualifying requirement for the tender.
- 4.5 Details of qualifying work(s) executed by the bidder will be forwarded to the principle employer for verification of the work with respect to completion, commencement & completion date, scope and value of the work executed. Performance feedback of the bidder will also be sought from the principle employer.
- 4.6 BHEL may conduct onsite verification of at least one of the qualifying works to verify completion of the work and evaluate capability and performance of the bidder.
- 4.7 The bidder representative may be called for the discussion with the committee. His originals may be verified by the committee. In addition to above their organization chart and detailed list of manpower, tools & plants and technical capability may be discussed and ascertained by the committee.

5.0 **EVALUATION OF PRICE BIDS**

- 5.1 Price Bids of unqualified bidders shall not be opened.
- 5.2 The offers will be evaluated on the basis of total price basis (refer "BILL OF QUANTITY AND PRICE SCHEDULE) as shown in the price bid.
- 5.3 Reasons for rejection of the bid shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unconditional acceptance of LOI /LOA from the successful bidder
- 5.4 In case of electronic Reverse Auction, the unqualified bidders shall not be allowed to participate in reverse auction.

A.6.0 DOCUMENTS TO BE ENCLOSED:

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

- 6.1 Tenders shall be signed by persons duly authorized/empowered to do so. An attested copy of the Power of Attorney to be submitted in all cases except where the sole proprietor is the signatory to the tender documents

6.2 **PERMANENT ACCOUNT NUMBER:**

Certified copies of Permanent Account Numbers as allotted by Income Tax Department for the Company / Firm / Individual Partners, etc. shall be furnished along with tender.

6.3 **AUDITED BALANCE SHEET AND INCOME TAX RETURN:**

Copy of Audited Balance sheets and income tax return for last three financial years (financial years as specified in PQR)

6.4 SOLVENCY CERTIFICATE:

If asked in NIT, bidder should submit solvency certificate (not older than 12 months from date of tender notification) issued by any scheduled bank.

6.5 DOCUMENT RELATED TO INCORPORATION OF BUSINESS ENTITY:

6.5.1 IN CASE OF INDIVIDUAL TENDERER:

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

6.5.2 IN CASE OF PARTNERSHIP FIRMS:

The names of all the partners with address. A copy of the partnership deed/instrument of partnership duly certified by the Notary shall be enclosed.

6.5.3 IN CASE OF COMPANIES:

Date & place of registration including date of commencement certificate in case of Public Companies and the nature of business carried on by the company. Certified copies of Memorandum and Articles of Association are also to be furnished.

6.6 Offer forwarding letter over the letterhead

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

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

6.9 GST Registration certificate

All the data required to be enclosed with the tender need to be furnished neatly typed, signed & stamped in the given formats only (in the form of separate sheets) failing which the tender may be considered as incomplete and is liable for rejection. Documentary proof wherever necessary also need to be enclosed.

A.7.0 VALIDITY OF OFFER

The rates in the Tender shall be kept valid for acceptance for a minimum period of **Four Months** from latest due date of offer submission (including extension(s), if any). In case BHEL (Bharat Heavy Electricals Limited) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderer.

A.8.0 REJECTION OF TENDER & OTHER CONDITIONS:

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

(a) To reject any or all of the tenders.

(b) To split up the work amongst two or more Tenderer as per NIT

(c) To award the work in part as per NIT

(d) In either of the contingencies stated in (b) and (c) above to modify the time for completion suitably.

- 8.2 Conditional tenders, unsolicited tenders, containing abnormally low/ unworkable rates & amounts, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc. are liable to be rejected.
- 8.3. Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold / banning / delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry / Commissions of Govt. of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule in line with 'NIT'. The decision of BHEL will be final in this regard.
- 8.4 In case of any adverse information is received concerning performance, capability or conduct of the tenderer after issue of tender enquiry or opening of tender or award of work, BHEL reserves the right to reject the offer at any stage as deemed fit.
- 8.5 Offers with inadequate Tools & Plants, Manpower Deployment Plan, and Method Statement are liable for rejection.
- 8.6 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at its discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at its discretion unless the firm retains its character.
- 8.7 BHEL will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. BHEL may, however, recognise such Power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.
- 8.8 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract, if awarded, and forfeit the Earnest Money/Security Deposit/any other moneys due.
- 8.9 Canvassing in any form in connection with the tender is strictly prohibited and the tenders submitted by the tenderer who resorts to canvassing are liable to be rejected.
- 8.10 In case the Proprietor, Partner or Director of the Company / Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting tender shall be informed to the fact as per specified format along with the offer, failing this, BHEL may, at its sole discretion reject the tender or cancel the contract and forfeit the Earnest Money/ Security Deposit.
- 8.11 The successful tenderer should not sub-contract the part or complete work detailed in the tender specifications without written permission of BHEL's Site In charge/ Sector Head. For this the contractor shall submit request application to site in charge supported by credentials (financial and technical) and resource mobilisation schedule of such sub-contractor. Such request is to be considered in consultation with end user/ultimate customer (if applicable) and subject to satisfactory credentials, fund flow arrangement between them, HSE and other contractual and statutory obligations. The tenderer is solely responsible to BHEL for the work awarded to him.
- 8.12 The Tender submitted by a tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and

late tenders shall be returned to the bidders.

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

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

A.9.0 NO DEVIATIONS ARE ACCEPTABLE: -

Offers with deviations are likely to be rejected. However, if the bidder insists on any technical or commercial deviations from the specifications and / or tender conditions, **the price implication, if any, of withdrawing the deviations must be submitted along with the price bid in a separate sealed envelope super-scribed “PRICE IMPLICATION FOR WITHDRAWAL OF DEVIATIONS”**. No price implication for withdrawal of deviation shall be accepted at a later date, after opening of technical bid.

A.10.0 Consortium/ JV bidding is not allowed under this NIT.

B. EARNEST MONEY DEPOSIT

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

1. Mode of EMD deposit:

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

Mode of EMD deposit:

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

- i) Cash deposit as permissible under the extant Income Tax Act (before tender opening),
- ii) Electronic Fund Transfer credited in BHEL account (before tender opening). Details of BHEL account mentioned in tender document.
- iii) Banker's cheque/Pay order/Demand Draft, in favour of 'BHEL' and payable at New Delhi (Along with offer)
- iv) Fixed Deposit Receipt (FDR) issued by schedule Banks/Public Finance Institutions as defined in the companies ACT (FDR should be in the name of the contractor, a/c BHEL)
- v) Insurance Surety Bonds

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

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

2. Forfeiture of EMD

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

- i) After opening the tender and within the offer validity period, the bidder revokes his tender or makes any modification in his tender which is not acceptable to BHEL.
 - ii) The contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/contract.
3. EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provision of extant "Guidelines on Suspension of business dealing with Supplier/contractors" and forfeited/ released based on the action as determined under these guidelines.
 4. In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after award of work.
 5. EMD shall not carry any interest.
 6. EMD of successful bidder shall be retained as part of Security Deposit.
 7. Bidders may please note that "One Time EMD" provision stands deleted. Hence, bidders who have deposited Rs. 2 Lakh as 'One Time EMD' with BHEL are also required to submit the requisite amount of EMD.
 8. **No MSE benefits shall be given to MSEs bidder for WORKS CONTRACT. Please refer clause no. O (facilities provided to MSEs) for detail.**

C. SECURITY DEPOSIT

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

1. Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work. **The total amount of Security Deposit will be 5% of the Contract Value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.**

2. Mode of Security deposit:

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

"Bidders agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of Performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder.

Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT / Contract, from the bills along with due interest".

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

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

- ii) Local cheques of scheduled banks (subject to realization) / Pay Order / Demand Draft / Electronic Fund Transfer, in favour of BHEL.
- iii) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats enclosed with general conditions of contract.
- iv) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL and duly discharged on the back.
- v) Securities available from Indian Post Offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed/hypothecated/pledged, as applicable, in favour of BHEL and duly discharged on the back).
- vi) Insurance Surety Bonds

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

3. Submission of Security Deposit:

- i) At least 50 % of the required Security Deposit, including the EMD, shall be submitted before start of work. Balance of the Security Deposit can be submitted by way of deduction of 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.
 - ii) In case of delay in submission of performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder
 - iii) If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or it shall be recovered from payment/s due to the Contractor.
 - iv) The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, at the discretion of BHEL.
4. The BG shall be submitted only through the Banker. Along with the BG, the Bank shall also furnish a letter of confirmation (in the prescribed formats enclosed with general conditions of contract).
5. The validity of the Bank Guarantee furnished towards Security Deposit shall be up to three months more than the period of completion of work as stipulated in the LOI and the same will be kept valid by proper renewal till the completion of the work.
6. BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the contractor's failure to fulfil any of the contractual obligations or in the event of termination of contract as per terms and conditions of the contract. BHEL reserves the right to set off the Security Deposit, against any claims of any other contracts with BHEL.

7. **Conditions for acceptance of bank guarantees**

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

Sl. No.	Name of Bank	Sl. No.	Name of Bank
1	State Bank of India	11	Punjab National Bank
2	Canara Bank	12	Union Bank of India
3	IDBI Bank Limited	13	Yes Bank Limited
4	ICICI Bank Limited	14	RBL Bank Ltd.
5	HDFC Bank Limited	15	Standard Chartered Bank
6	Axis Bank	16	Indian Overseas Bank
7	IndusInd Bank Limited	17	Kotak Mahindra Bank Limited
8	Bank of Baroda	18	Federal Bank Limited
9	Exim Bank	19	Hongkong and Shanghai Banking Corporation Ltd
10	Indian Bank		

Bank Guarantees from Banks outside BHEL's consortium shall be as below:

The Bank Guarantees of all Public sector banks can be accepted (in addition to consortium banks)

The Bank Guarantees of Co-operative banks shall not be accepted.

Bank Guarantees of other than consortium bank and public sector bank can be accepted subject to an overall exposure limit (at New Delhi) of Rs. 10 crores for banks with net worth of more than Rs. 500 crores as on last balance sheet date and Rs 5 crores for banks with net worth between Rs. 350 to Rs 500 crores (A certificate and copy of latest Balance Sheet to be given by the Bank at the time of submission of Bank Guarantees).

In case of private sector banks, a clause to be incorporated in the text of Bank Guarantee that it can be enforceable by being presented at any branch of the bank.

In case of foreign vendors, the bank guarantees issued by foreign banks may be confirmed by our consortium bank in India.

In case of Bank Guarantees given by Non-Consortium banks (Private sector or Public sector), the Bank Guarantees are to be enforceable in New Delhi or the town/ city in which the sector office is located.

8. **RETURN OF SECURITY DEPOSIT:**

If the contractor duly performs and completes the work in all respects to the entire satisfaction of BHEL and presents an absolute "No demand certificate", returns properties belonging to BHEL, taken, borrowed or hired by him for carrying out the said works, and furnishes performance bond BG in the prescribed proforma, Security Deposit will be released to the contractor after deducting all costs, expenses and other amounts that are to be paid to BHEL under this contract or other contracts entered into with the contractor.

It may be noted that in no case the Security Deposit shall be refunded/released prior to passing of final bill.

D. Bank Account Details for submission of EMD/ Security Deposit through electronic fund transfer mode.

NAME OF THE COMPANY	BHARAT HEAVY ELECTRICALS LTD
ADDRESS OF THE COMPANY	TRANSMISSION BUSINESS GROUP, PLOT NO. 25, SECTOR- 16A, NOIDA – 201301 (U.P.)
NAME OF BANK	STATE BANK OF INDIA
NAME OF BANK BRANCH	CAG-II NEW DELHI (17313)
CITY	NEW DELHI
ACCOUNT NUMBER	00000030206227732
ACCOUNT TYPE	CASH CREDIT
IFSC CODE	SBIN0017313

E. Payment terms: Clause No. C.2.0 stands deleted. Now this clause shall be read as below.

(Description of work in this section is made for payment purpose only and the scope is not limited to the activities mentioned below. Please refer technical documents for complete scope of work)

1. No Mobilization Advance shall be paid.
2. **For BOQ items - Complete scope of work (Category-A)**
 - 2.1. 10% of the contract item price on the monthly progressive bills on pro rata basis for receipt, material including arranging crane for unloading, maintaining proper records of receipt & storage in Field Quality Plans (FQPs) and as certified by BHEL Engineer. In case of power transformer/ reactors, 5% amount shall be paid after unloading and 5% after dragging main tank in position on foundation. The sub-items mentioned in transformer/ reactor shall be consider for payment with main item.
 - 2.2. 60% of the contract item price on the monthly progressive bills on pro rata basis after arranging necessary calibrated tools/tackles required for erection, submitting calibration reports, qualification/experience certificates of welder/Electrician/other staff, levelling, alignment, tightening and completion of erection including maintaining proper records of installation in FQPs and as certified by BHEL, Engineer.
 - 2.3. 10% of the contract item price on the monthly progressive bills on pro rata basis on arranging calibrated testing equipment, submission of calibration reports, testing of equipment including maintaining proper records of testing in FQPs and as certified by BHEL, Engineer. BOQ items, which are not required to be tested as per FQP, shall be qualified for release of payment on prorata basis after completion of testing of all equipment's of corresponding bay (As per SLD/ layout)
 - 2.4. 10% of the contract item price after completion of satisfactory commissioning and submission of complete records of erection/testing/commissioning /charging protocol as per FQPs for the corresponding bay.
 - 2.5. Last 10% of the contract item price after all test reports as per contract are jointly witnessed and signed by BHEL/customer, "As Built" changes are incorporated in relevant drawings, material reconciliation and substation is handed over to the Owner / Customer. If the contract is for more than one sub-station, then the same will be released after successful handing over of each sub-station. If for any reason, the handing over is delayed for reasons beyond the control of the contractor, in such case this payment will be released against commissioning certificate issued by the BHEL / customer and against submission of final bill of individual substation.
3. **For BOQ items: - (Supply in contractor's scope) (Category-B)**
 - 3.1. 80% of the contract item price on the monthly progressive bills on prorata basis after supply, receipt of the material at site, unloading, proper storage and as certified by site in charge.
 - 3.2. 10% of the contract item price on the monthly progressive bills on prorata basis after material erection as certified by BHEL site In-charge on prorata basis after erection.
 - 3.3. Last 10% payment shall be released as per E.2.5 above.

4. For BOQ items: - (Only For unloading & storage) (Category-C)

- 4.1. 30% of the contract item price on the monthly progressive bills on prorated basis after receipt of the material at site, unloading, proper storage and as certified by site in charge.
- 4.2. 60% of the contract item price on the monthly progressive bills on prorated basis after handing over to Customer and as certified by BHEL site In-charge.
- 4.3. Last 10% payment shall be released as per E.2.5 above.

5. For BOQ item: - (Watch & Ward- Material Security) (Category-D)

- 5.1. 100% of the contract item price on the monthly progressive bills on pro rata basis towards watch & ward against submission of invoice and on certification of engineer incharge of BHEL.

The summary of Payment terms (Category wise as described in Clause. E above) has been tabulated as follows for ETC works of Sikar and Khetri site;

Sl. No.	BOQ item Category	Sikar Site	Khetri Site
01.	Category-A (Complete scope of work)	All BOQ items except Item No- 68-73,96-107,116,121-130	All BOQ items except Item No- 12,16-17,19, 49-54,76-87,93,95,98-103, and 104
02.	Category-B (Supply in contractor's scope)	BOQ item Nos- 68-73,96-107,116,121-126	BOQ item Nos- 12,16-17,19, 49-54,76-87,93,95,98-103
03.	Category-C (Only For unloading & storage)	BOQ item no-127-129	Not Applicable
04.	Category-D (Watch & Ward- Material Security)	BOQ item No- 130	BOQ item No- 104

F. Overall Quantity variation-

The individual quantity can vary to any extent or may be deleted for which no compensation will be payable to the contractor and **the rates will remain firm**. Also, the rate of each item remains firm as long as the variation in the total value of work executed under the contract including extra items if any remains within plus/minus 30 percent of the contract value. In case the actual value of executed work including extra work on completion of work becomes less than 70% of the basic/original contract value then the following method shall be adopted.

The actual executed value shall be raised by 7 % (For arriving at the final payment against work executed) subject to the condition that total value of work executed plus increase by 7% as above shall be limited to 70% of the basic/original contract value. The rate quoted shall be firm irrespective of any upward variation in the contract price.

G. OVER RUN COMPENSATION:

Not applicable

H. Clause No. C.30.0 "INCOME TAX/SALES TAX/WORKS TAX/VAT" stands deleted. Now this clause shall be read as below.

1. All taxes (except GST), duties, charges, royalties, cess and any other levies by Central/ State/local authorities for the execution of the contract shall be borne by the contractor and shall not be payable extra. Any increase of the same at any stage during execution of the contract shall be borne by the contractor. Quoted price of the same shall be inclusive of all such requirements.
2. Contractors have to make their own arrangement at their cost for completing the formalities, if required with relevant taxation authorities, for bringing their material, plant and machinery at

site for the execution of the contract. Road permits / way bill, if required shall be arranged by the contractor.

3. The Contractor is responsible to furnish documentary evidence towards GST Registration of the State wherein the site is located or any other documents as per GST Act which may be required from time to time. BHEL will not be held to be responsible for any non-compliance of the Contractor in respect of GST laws as framed from time to time.
4. Goods and Service Tax (GST) will be reimbursed to the Contractor subject to the following conditions: -
 - I. Submission of valid GST Compliant Tax Invoice as per the GST Invoice Rules.
 - II. The Invoice raised by the Contractor should indicate the BHEL GST Registration Number.)
 - III. Contractor declaring such invoice in GSTR-1 and the same should be available to BHEL in the form GSTR -2A/ 2B electronically through GST portal
 - IV. Confirmation of payment of GST thereon by contractor on GST portal.
5. The GST amount shall get reflected within prescribed time limit in the GSTN for BHEL to avail the input credit. If the GST Credit is reversed/ denied/ delayed to BHEL due to non-receipt/delayed receipt of Services and/or tax invoice or due to expiry of timeline prescribed in GST law or due to any other factor for availing such Input Tax Credit (ITC) or for any other reason arising out of the act directly attributable to the Contractor, GST amount shall be recoverable from Contractor from any dues payable to the Contractor along with any interest levied/ leviable on BHEL.
6. Statutory variation, if any, on account of GST will be payable by BHEL at actuals on submission of documentary evidence.
7. TDS under Income Tax Act/ GST Act shall be deducted as per applicable rates unless Exemption certificate, if applicable, from the appropriate Authority is furnished to BHEL along with the Invoice.

8. New Taxes & duties (Introduced after tender opening date):

If any new tax or duty is levied by the Central/State Government/Municipality/Local Authority and becomes directly applicable on items specified in the Bill of Quantities, full reimbursement shall be made subject to submission of documentation as per statute.

I. BOCW (TAXES, DUTIES & LEVIES):

BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.

1. In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under: -
 - 1.1. It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a licence to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of licence / permission to BHEL within a period of one month from the date of award of contract.
 - 1.2. It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on gross payment made for value of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.
 - 1.3. It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.

- 1.4. It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.
- 1.5. The contractor shall, however ensure before deposit of any BOCW cess, that customer is not depositing the same in order to avoid excess deposit of cess.
- 1.6. The contractor shall bear cost of BOCW cess either by way of deposit or through recovery by BHEL in case the same is deposited by the customer.
- 1.7. In case of failure in above mentioned compliances, BOCW Cess @ 1% as well as applicable penalty as specified in BOCW Act/Rules shall be deducted from the contractor

J. DELAY AND EXTENSION OF TIME:

1. If, in the opinion of the Engineer, the work is delayed
 - (i) by reason of abnormally bad weather, or
 - (ii) by reason of serious loss or damage by fire, or
 - (iii) by reason of civil commotion, local combination of workmen, strike or lockout, affecting any of the trades employed on the work, or
 - (iv) by delay on the part of the agency or tradesman engaged by the BHEL in executing work not forming part of the contract, or
 - (v) By reason of any other cause which in the absolute discretion of the Engineer is beyond the contractor's control, then in any such case, the Engineer (or higher authority) may make fair and reasonable extension in the completion dates of the individual items of work of the contract as whole. Such extension which will be communicated to the contractor by the Engineer in writing shall be final and binding on the contractor. No other claim in this respect for compensation, idle labour or otherwise howsoever is admissible. Upon the happening of any such event causing delay the contractor shall immediately give notice thereof in writing to the Engineer but shall nevertheless use constantly his best endeavour to prevent or make good the delay and shall do all that may reasonably be required to the satisfaction of the Engineer to proceed with the work.
2. In case of delay in completion of work BHEL reserve the right to grant time extension under the following options depending upon the performance of the vendor:
 - a) Time extension without levy of LD in case it is found that delay is not attributable to the vendor
 - b) Time extension with deduction of applicable LD in line with Liquidity Damage clause if the delay is solely attributable to the vendor.
 - c) In case facts of delay is not settled, BHEL reserve the right to grant provisional time extension for delay in completion of total work or part thereof and running/ interim payments to the vendor will be released without deduction of LD subject to submission of additional Bank guarantee equivalent to maximum LD amount valid till completion of work under their scope and grant of final time extension.

During provisional time extension period ORC/ PVC shall not be payable to the contractor. The Final Delay analysis shall be prepared on completion of the work. In case of delay is not attributable to contractor as per final delay analysis the ORC/ PVC shall be released along with the final bill without any interest charges attributable to BHEL.

In case of delay attributable to contractor, LD shall be deducted for that period in line with clause "Compensation/ LD/ Penalty for delay in execution" of conditions of contract and balance ORC/ PVC (if any) shall be released along with the final bill without any interest charges attributable to BHEL.

K. LD / PENALTY FOR DELAY IN EXECUTION:

The Clause No. C.5.0 “LD / Penalty for delay in execution” of Conditions of contract for ETC works stands deleted. Now the modified clause shall be read as below:

In case the contractor fails to complete the project within the time specified in the tender specification or any extension thereof subject to force majeure condition, the contractor shall be liable to pay by way of LD/Penalty a sum equal to the half percent of the contract price, per calendar week or part thereof by which the commissioning of the project is delayed, subject to ceiling of 10 % of the contract price. Once the maximum limit of delay is reached (i.e. 20 week of delay) BHEL may consider termination of the contract and forfeit the Security deposit without prejudice to the other remedies under the contract.

Amended/ revised contract value (excluding Extra Works, Supplementary /Additional Items) shall be considered for calculating LD/ penalty.

L. RIGHTS OF BHEL: - The Clause No. B.7.0 “RIGHTS of BHEL” of Conditions of contract for ETC works stands deleted. Now the modified clause shall be read as below: -

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation

1. To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL’s commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL’s obligation to its customer.
In case of inadequate manpower deployed by the contractor, BHEL reserves the right to deploy additional manpower through any other agency for expediting activities in the interest of the project.
Supplied manpower shall be put on job by the contractor and payments and other statutory compliances related to manpower shall be the contractor’s responsibility. In case of contractor’s failure to fulfill his obligations in respect of such manpower, BHEL reserves the right to take necessary action as per contract conditions.

2. Breach of Contract, Remedies and Termination

- 2.1. BHEL shall terminate the contract after due notice of a period of 14 days’ in any of the following cases, which if not rectified/ improved within the time period mentioned in the notice, then, ‘Breach of Contract’ will be considered to have been established:
 - i) Contractor’s poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
 - ii) Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
 - iii) Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.
 - iv) Repeated failure of contractor in deploying the required resources, to comply the statutory requirements etc. even after given by BHEL in writing.
 - v) Strike or Lockout declared is not settled within a period of one month.
 - vi) Termination of Contract on account of any other reason (s) attributable to Contractor.

- vii) Assignment, transfer, subletting of Contract without BHEL's written permission.
- viii) Non-compliance to any contractual condition or any other default attributable to Contractor.

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

LD against delay in executed work shall be calculated in line with respective clause of Liquidated Damages of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

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

- i) Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
- ii) Let the value of executed work till the time of termination of contract = X
- iii) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
- iv) Delay in executed work attributable to contractor i.e. $T2 = [1 - (X/Y)] \times T1$
- v) LD shall be calculated in line with LD clause (clause C-25.0) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.2 Remedies in case of Breach of Contract is established:

In case of breach of contract is committed under Clause L.2.1, amount equivalent to 10% of contract value shall be recovered in case of termination of contract by BHEL due to breach of contract by the contractor. This amount shall be recovered from 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, etc. with BHEL) or legal remedies shall be pursued.

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. Sequence of recovery to be made in case of breach of contract is established, is as below:

- (a) In case the value of Security Deposit & Retention Amount, available for the Contract, is less than 10% of the Contract Value, the balance amount shall be recovered from dues available in the form of Bills payable to contractor against the same contract etc.
- (b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
- (c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
 - i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.
 - ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
 - iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

Note:

- 1) In addition to above, levy of liquidated damages, debarment, termination, short-closure etc. shall be applied as per provisions of the contract.
 - 2) If tendering is done for the balance work, the defaulted contractor shall not be eligible for either executing the balance work or to participate in the tender(s) for executing the balance work. Defaulted Contractor will include:
 - a) In case defaulted contractor is The Sole Proprietorship Firm, any Sole Proprietorship Firm owned by same Sole Proprietor.
 - b) In case defaulted contractor is The Partnership Firm, any firm comprising of same partners/ some of the same partners (but not including any new partner); or sole proprietorship firm owned by any partner(s) as a sole proprietor.
- 2.3 In case Contractor fails to deploy the resources as per requirement informed by BHEL in writing to expedite the work, BHEL can deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC, if applicable.
- 2.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.
- 2.5 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfill any of his obligations. BHEL shall levy overheads of 5% on all such payments along with interest as defined elsewhere in the GCC.
- 2.6 While every endeavor will be made by BHEL to this end, they (BHEL) cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.
- 2.7 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 monthsIn 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 L.2. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.
- 2.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts etc. due to which inordinate discontinuity of work is anticipated, BHEL on its own or contractor's request at its discretion may consider to short close the contract in any of the following cases:
 - a) The balance works (including but not limited to Trial Operation, PG Test etc.) are minor vis a vis the scope of work envisaged as per the contract.

b) There has been no significant work in past 6 months OR no significant work is expected in next 6 months (example in Hydro projects or in projects where work has stopped due to reasons beyond the control of BHEL).

c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shut down or on other facilities of customer or any other such reasons not attributable to the contractor.

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work (or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test etc.) as decided by BHEL, shall however be reduced from the final contract value.

Note: The Contractor shall not be eligible for any compensation on account of Quantity Variation arising out of short-closure of contract as per clause no. 2.8 (b) above.

M. FORCE MAJEURE:

The following shall amount to force majeure conditions:

- N.1. Acts of God, Act of any Government, war, sabotage, riots, civil commotion, Police action, revolution, flood, fire cyclone, earthquake, epidemic and other similar causes over which the vendor has no control.
- N.2. If the vendor suffers delay in the due execution of the contract, due to delays caused by force majeure conditions, as defined above, the agreed time of completion of the work covered by this contract may be extended by a reasonable period of time in consultation and after agreement of BHEL's clients/owner, provided that on the occurrence of any such contingency, the Vendor immediately reports to BHEL in writing the causes of delay. The Vendor shall not be eligible for any compensation on this account.

N. SETTLEMENT OF DISPUTE

If any dispute or difference of any kind whatsoever shall arise between BHEL and the Contractor, 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 for resolution by the 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 contractor 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 contractor being dissatisfied with any such decision or if amicable settlement cannot be reached then all such disputed issues shall be resolved through Conciliation as per **Model Conciliation Clause for Conducting Conciliation Proceedings Under the BHEL Conciliation Scheme, 2018"**

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 **Model Conciliation Clause for Conducting Conciliation Proceedings Under the BHEL Conciliation Scheme, 2018** to GCC- "Procedure for conduct of conciliation proceedings" (as available in www.bhel.com).

Model Conciliation Clause for Conducting Conciliation Proceedings Under the BHEL Conciliation Scheme, 2018

The Parties the if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which terms shall means and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract or the Memorandum of Understanding (delete whichever is inapplicable), which the parties unable to settle mutually), arise inter-se the Parties, the same may, be refereed by either party to conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

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

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Annexure-A to this GCC.

The Annexure-A together with it's appendices will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in these GCC."

ARBITRATION:

Any Dispute which is not resolved amicably by conciliation, as provided in **Model Conciliation Clause for Conducting Conciliation Proceedings Under the BHEL Conciliation Scheme, 2018**, shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with Arbitration & Conciliation Act, 1996

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 **Model Conciliation Clause for Conducting Conciliation Proceedings Under the BHEL Conciliation Scheme, 2018** or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or. in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute to be adjudicated by Sole Arbitrator to be appointed by mutual consent of the parties from among the List of empanelled Arbitrators maintained by BHEL, in the following manner:

- a) 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'). The Notice shall be addressed to the Head of the UNIT/ Power Sector Region, BHEL, 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.

- b)** BHEL, shall within 60 days from the receipt of such notice shall send a panel of at least three arbitrators from among its empanelled arbitrators or otherwise to the Contractor for choosing one among them for such appointment, within 15 days from the date of receipt of the Panel of Arbitrators from BHEL.
- c)** Upon receipt of the consent from the Contractor, Head of the UNIT/Power Sector Region, BHEL shall appoint the sole arbitrator as short listed by the Contractor, within 15 days from the receipt of such nomination. Notice to the Parties of the constitution of the arbitral tribunal shall be issued by BHEL.
- d)** In case, the contractor fails to inform its choice of name for appointment of sole arbitrator from the panel of at least three arbitrators sent by BHEL or no response is received from the contractor, within 15 days from the date of receipt of the Panel of Arbitrators from BHEL, Head of the UNIT/ Power Sector Region, BHEL shall appoint the sole arbitrator from among the three names sent to the contractor earlier.
- e)** If the Arbitrator so appointed dies, resigns, becomes incapacitated or withdraws for any reason from the proceedings or his mandate is terminated by the Court, it shall be lawful for Head of the UNIT/Power Sector Region, BHEL to appoint another person in his place in the same manner as aforesaid. Such person shall proceed with the reference from the stage where his predecessor had left.
- f)** The Claimant shall be responsible for making all necessary arrangements for the travel/ stay of the Arbitrator including venue of arbitration, hearings and other incidental expenses. It is also term of the contract that the claimant shall bear the arbitrator fee, administrative expenses and cost for the claims and the Respondent shall bear the arbitrator fee, administrative expenses and cost for the counter claims.
- g)** If after commencement of the Arbitration proceedings, the parties agree to settle the dispute mutually or refer the dispute to mediation or Conciliation, the arbitrator shall put the proceedings in abeyance until such period as requested by the parties. Where the proceedings are put in abeyance or terminated on account of mutual settlement of dispute by the parties, the fees payable to the arbitrator shall be determined as under: i. 40% of the fees if the Pleadings are complete. ii. 60% of the fees if the Hearing has commenced. iii. 80% of the fees if the Hearing is concluded but the Award is yet to be passed. g. Each party shall pay its share of arbitrator's fees in stages as under or as per the directions of Arbitrator:
 - i. 40 % of the fees on Completion of Pleadings.
 - ii. 40% of the fees on Conclusion of the Final Hearing.
 - iii. 20% at the time when arbitrator notifies the date of final award.
- h)** The seat and venue of Arbitration shall be New Delhi.
- i)** The Arbitrator shall give reasoned and speaking award and it shall be final and binding on the parties.
- j)** Arbitrator shall be paid fees as per the Fee Schedule (presently Fourth Schedule) provided in 'The Arbitration and Conciliation Act, 1996' as amended from time to time.
- k)** 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.
- l)** Notwithstanding any reference to the Independent Engineer or Mediation 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.

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.

O. 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.**

P. 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.

Q. SUSPENSION OF BUSINESS DEALINGS

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

R. 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.

S. MEASUREMENT OF WORK AND MODE OF PAYMENT:

- a) All payments due to the contractors shall be made by e-mode only, unless otherwise found operationally difficult for reasons to be recorded in writing.
- b) For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be

relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

- c) These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book by BHEL Engineers and signed by both the parties.
- d) These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.
- e) Based on the above quantities, contractor shall prepare the bills, along with statutory documents, in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.
- f) All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.
- g) Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.
- h) The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.
- i) The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/ used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.
- j) If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.
- k) Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.
- l) Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

T. 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.

U. PROGRESSIVE PAYMENT/ FINAL PAYMENT:

1. Running Account Bills (RA Bills)

- i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).
- ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents.
- iii) Recoveries on account of electricity, water, statutory deductions etc. are made as per terms of contract.
- iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to redo the work according to the required specifications, without any extra cost.
- v) The contractor shall submit his monthly RA bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month.
- vi) Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract
- vii) Release of payment in each running bill including ORC Bills where ever applicable will be as per stages of progressive pro rata payments.
- viii) The contractor will be eligible for payment of RA Bills within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile.
All documents like HR Clearance, Quality and Safety Compliances etc. required for processing the RA Bills should be submitted along with RA Bills.
- ix) BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats.
- x) **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.**
- xi) Note: BHEL may also choose to release payment by other alternative modes as applicable.
- xii) **Documents required for RA Bill:**
 - a) GST Complied Invoice of the work done as per approved BOQ.
 - b) Jointly signed Measurement sheet, WAM -6 for RA Bill.
 - c) Material Reconciliation statement
 - d) Test Report of the material as per FQP
 - e) Power of Attorney before submission of Bill.
 - f) Validity of Bank Guarantees as applicable under the contract.
 - g) HR compliance documents:
 - 1) Labour Payment Certificate, Wages payment sheet
 - 2) Proof of PF, ESI, WC contribution submission
 - 3) Proof of Bonus payment as per Bonus Act if applicable.

h) Any other documents as per customer requirement/statutory requirement.

Note :

BHEL Site in charge has to certify that all the above required documents have been received and verified and documents sl no. a) to d) duly verified are to be sent to Finance along with RA bills.

2. Final Bill:

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope, material reconciliation, removal of temporary structures, return of scrap/surplus material of BHEL. BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL.

2.1. Documents required for Final Bill:

- a) GST Complied Invoice of the work done as per approved BOQ.
- b) Jointly signed Measurement sheet, WAM -7, WAM-10 format (if Applicable).
- c) Valid Bank Guarantees as applicable under the contract.
- d) Labour Payment Certificate (if applicable)
- e) 'No claim' certificate from the contractor.
- f) Deviation statement showing the Executed quantities and quantities as per the contract.
- g) Submission of Test reports as per FQP (if applicable)
- h) Material Reconciliation statement duly approved by BHEL
- i) HR compliance documents:
 - i) Labour Payment Certificate, Wages payment sheet
 - ii) Proof of PF, ESI, WC contribution submission
 - iii) Proof of Bonus payment as per Bonus Act if applicable.
- j) Submission of As Built Drawings (if applicable)
- k) Compliance report from BHEL/Customer for completion of punch points
- l) Final Delay Analysis.
- m) Any other documents as per customer requirement/statutory requirement.

Note :

BHEL Site incharge has to certify that all the above required documents have been received and verified and document sl no. a) to f) duly verified are to be sent to Finance alongwith Completion certificate.

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 to⁵
- c) Unless the Bank is served a written claim or demand on or before⁶ 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.

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
Running Account Bill
(Para 4.3.1 of Works Accounts Manual)

Name of the Contractor

Name of the Work:

Sanctioned Estimate:

Code No.:

Contract Agreement No.:

Dated:

Division:

Date of written order to
commence the Work:

Date of commencement
of work:

Due date of completion as per
agreement

Date of approval of Competent Authority for time extension as applicable
(copy to be enclosed).

Departmental Bill No.

Date:

Sub-Division:

Period of work covered in this
bill:

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item No. of work	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity executed since last RA bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										
1	2	3	4	5	6	7	8	9	10	11	12	13

** 1. Whenever payment is made on adhoc basis without actual measurements the amount in whole rupees should be entered in columns 1 to 3 only and not in columns 7 to 12

2. Whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total upto date in column 3 may become nil.

Total value of work done upto date (A) -----

Deduct value of work shown on the last Running Account Bill (B) -----

Net value of work done since last Running Account Bill (C) -----

Rupees (in words) Only

Note :
Wherever adhoc payments to contractors against running bills are made in accordance with the extant Works Policy, the amount so paid shall be adjusted.

II. MEMORANDUM OF PAYMENTS

		I	II
1.	Total value of work actually measured as per Account No. I, Column 10	(A) -----	-----
2.	Total upto date adhoc payment for work covered by approximate or plan measurements as per Account I, Col. 3	(B) -----	-----
4.	Total upto date payments [(A)+(B)]	(C) -----	-----
	Total amount of payments already made as per entry (D) of last Running Account Bill No. dated forwarded to the Accounts Department on	(D) -----	-----
6.	Balance [(C) - (D)]		-----
7.	Payments now to be made:	-----	
	a) by cash / cheque	-----	
	b) by deduction for value of materials supplied by BHEL vide Annexure A attached	-----	
	c) by deduction for hire of tools and plant vide Annexure B attached	-----	
	d) by deduction for other charges vide Annexure C attached	-----	
	e) by deduction on account of security deposit	-----	
	f) by deduction on account of Income Tax	-----	-----

Note : Amounts relating to items 4 to 6 above should be entered in column II and those relating to item 7 in column I. The amount shown against item 6 and the total of item 7 should agree with each other.

III. CERTIFICATE OF THE ENGINEER IN CHARGE

1	The measurements on which the entries in column 7 to 12 of Part I of this Bill (Account of work executed) are based were made by ----- and are reorded at pages - ----- of Measurement Book No. ----- (Name and Designation)
2	Certified that the methods of measurement are correct and the work has been carried out in accordance with the terms and conditions, schedules, specifications and drawings etc. forming part of the contract agreement, subject to deviations included in the deviation statement (Annexure D)
3	Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 10 of Part I, some work has actually been done in connection with several items and the value of the such work is, in no case, less than the adhoc payments as per column 3 of Part I, made or proposed to be made, for the convenience of the contractor in anticipation of, and subject to the results of, detailed measurement which will be made as soon as possible.
4	Certified that measurements by Engineer-incharge and test check of prescribed percentage of measurements by the concerned superior authorities has been carried out.
5	Certified that there are no pending recoveries from the contractor on account of chargeable items (e.g T&P, consumables, material, etc.) issued either by BHEL or by the customer and other recoveries like power, water, quarter, tax liability towards declaration forms etc.
6	Certified that with regard to the free issues, regular reconciliation is being done, completed upto ----- and there are no recoveries pending from the contractor on account of such issues in excess of requirement for execution of work as per contract.
7	Certified that there is no pending recovery for damaged material issued free of cost.
8	Certified that the contractor has fulfilled all the requirements as per contract with reference to statutory obligations (PF, ESI, Minimum Wages, BOCW, Insurance etc.), support services such as service manpower, computer system , T&P etc

Signature of Contractor

Date:

Signature of Engineer in Charge

Designation:

Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

1	Certified that the measurements have been check measured to the prescribed extent by at site and also by the undersigned and the relevant entries have been initialed in the Measurement Book. (vide pages) (Name and Designation)
2	Certified that all the measurements recorded in the measurement book have been correctly billed for
3	Certified that all recoverable amounts in respect of materials tools and plant etc. and other charges have been correctly made vide annexures A to C attached.

Certified for payment * of Rs. (Rupees only)

* Here specify the net amount payable.

Date:

Signature of Senior Engineer

V. ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Accounts Bill No. dated

Entered in Journal Book vide entry No. dated

Passed for Rs.

Less Deductions Rs.

Net amount payable Rs.

(Rupees only)

Payable to Shri / M/s by cheque / cash

Entered in Contractors ledger No. Page

Estimate No :

Debit

Credit

(Gross amount)

(Deductions)

Name of Work :

Account code head

Total

Code No.:

ALLOCATION

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

ANNEXURE A

Statement showing details of materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued		Quantity actually incorporated in the work	Balance quantity with contractor		If recoverable from the contractor				
				Free	Chargeable		Free	Chargeable	Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Total

Certified that (balance quantity of free issue material as per Col. 8 above) is physically available with the Contractor.

Signature of Contractor

Date:

Signature of Engineer in Charge

Date:

Signature of Senior Engineer

Date:

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s..... in respect of Contract Agreement No.....Dated.....

Sl. No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance Recovered now	Remarks
1	2	3	4	5	6	7	8

TOTAL

Signature of Contractor

Date :

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date:

ANNEXURE C

Form WAM 6 (Contd.)

Statement showing details of other recoveries to be made from the contractor Shri/M/s-----in respect of contract Agreement No.Dated

S. No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered up to previous bill	Amount now recovered	Remarks
1	2	3	4	5	6	7	8	9
1	Water charges							
2	Electricity charges							
3	Seignorage charges							
4	Medical charges							
5	Cost of empty gunny bags and empty containers not returned							
6								
7								
8								

TOTAL

--	--	--

Signature of Contractor

Date :

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date:

ANNEXURE D
DEVIATION STATEMENT

Name of the Contractor:

Contract Agreement No

Name of Work:

Date:

S. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Amount further anticipated	Total Amount anticipated on completion	Difference		Reason for deviation with authority, if any
													Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date :

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
.....And Final Bill
(Para 4.3.2 of Works Accounts Manual)

Departmental Bill No:

Date:

Name of the Contractor:

Name of the Work:

Division:

Date of Written order to commence the work:

Sub-Division:

Sanctioned Estimate:

Contract Agreement/ Work Order No:

Date of actual completion of the work:

Date of commencement of the Work:

Dated:

Due date of completion as per Agreement:

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item no. of the agreement / work order	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										

1	2	3	4	5	6	7	8	9	10	11	12	13
---	---	---	---	---	---	---	---	---	----	----	----	----

** Whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total upto date in column 3 may become nil.

Total value of work done upto date	(A)	-----
Deduct value of work shown on the last Running Account Bill	(B)	-----
Net value of work done since last Running Account Bill	(C)	-----
Rupees (in words) Only		

II. MEMORANDUM OF PAYMENTS

1	Total value of work actually measured as per Account No. I column 10	(A)	-----
2	Deduct amount of payments already made as per last running account bill No. dated	(B)	-----
3	Payment now to be made [(A) - (B)]	(C)	-----
4	Deduct amounts recoverable from the contractor on account of :		
	a) Materials supplied by BHEL vide Annexure A attached	-----	
	b) Hire of tools and plant vide Annexure B attached	-----	
	c) Other charges vide Annexure C attached	-----	
	d) Income Tax	-----	
	Total Deductions	=====	-----
5	Balance		-----
6	Refunds of Security Deposit		-----
7	Net amount to be paid to the contractor		-----
	Net value Rupees (in words) Only

I/ We hereby certify that I/We have performed the work as per the terms and conditions of Contract Agreement/Work Order No.....Dated.....for which payment is claimed as above and that I/We have no further claim under this agreement/work order.

Signature of the Contractor

Date:

III CERTIFICATE OF THE ENGINEER IN CHARGE

1. The measurements on which the entries in columns 7 to 11 of Part I of this bill (Account of work executed) are based were made by.....
.....are recorded at pages.....of measurement book No.....(Name and Designation)
2. A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.

Date:

Signature of Engineer incharge

Designation:

IV CERTIFICATE OF THE SENIOR ENGINEER

1. Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and conditions, schedules, specifications and drawings etc., forming part of the contract agreement, subject to the deviations noted in Deviation Statement (Annexure D).
2. Certified that the measurements have been check measured to the prescribed extent by..... and by the undersigned at site and the relevant entries have been initiated in the measurement book (vide pages.....) (Name and Designation)
3. Certified that the methods of measurement are correct.
4. Certified that the measurements have been technically checked with reference to contract drawings, deviations etc.
5. Certified that the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.
6. Certified that all recoverable amounts in respect of stores, tools and plant, water, electricity charges etc. have been correctly made vide Annexures A to C and that there are no other demands outstanding against the contractor on this contract.
7. Certified that the issues of all stores as per statement attached (whether charged to the contractor or direct to the work) have been technically checked and represent fair and reasonable issues for the items of work executed vide Annexure E.
8. Certified that all statutory requirements including PF, ESI, Minimum wages, Insurance, GST, BOCW, etc. are complied with by the Contractor. This should be duly backed by the relevant documents.

Certified for payment of * Rs.....(Rupees.....only).

*Here specify the net amount payable

Signature of Senior Engineer

Date

IV ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Passed for.....Rs.....
Less Deductions.....Rs.....
Net Amount Payable.....Rs.....
(Rupees.....only)

Account code head	Debit	Credit
	(Gross Amount)	(Deductions)
TOTAL		

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

ANNEXURE A
Part I

Statement showing details of materials issued to the contractor Shri / M/S.....in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement.

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from t he Contractor				
							Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

Total

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE A
Part II

Statement showing details of materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and not covered by the agreement

Sl.No	Stores Issue Voucher No.and Date	Issue Voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
-------	----------------------------------	--	--	-----------------	--	------------	--------------------	-------------------------------------	-----------------------	---------

1	2	3	4	5	6	7	8	9	10	11
---	---	---	---	---	---	---	---	---	----	----

TOTAL
Add Departmental Charges
Add GST (Wherever applicable)

GRAND TOTAL

Signature of Contractor
Date:

Signature of Engineer-in-Charge
Date:

Signature of Senior Engineer
Date:

Note: Cost of materials recovered in this bill should be shown against item 4 (a) of the memorandum of payments. The amounts of taxes and departmental charges recovered in this bill should be incorporated in Annexure C.

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri /M/S.....in respect of contract Agreement / Work Order No.....Dated.....

Sl.No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8

TOTAL

Signature of Contractor

Date

Signature of Engineer-in-Charge

Date

Signature of Senior Engineer

Date

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s..... In respect of Contract Agreement / Work Order No.....Dated.....

Sl.No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered upto previous bill	Amount now recovered	Remarks
1	2	3	4	5	6	7	8	9
1	Water charges							
2	Electricity charges							
3	Medical charges							
4	Cost of empty gunny bags and empty containers not returned							
5								
6								
7								

TOTAL

Signature of Contractor

Date

Signature of Engineer in Charge

Date

Signature of Senior Engineer

Date

Form WAM 7 (Contd.)

ANNEXURE D
DEVIATION STATEMENT

Name of the Contractor:

Contract Agreement/Work Order No.

Name of the Work:

Date:

SL. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Difference		Reason for the deviation with authority, if any
									Excess	Savings	

1	2	3	4	5	6	7	8	9	10	11	12

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

ANNEXURE E

Statement showing the consumption of materials issued to the contractor Shri/M/s..... in respect of Contract Agreement / Work Order No.....Dated.....

Name of the Work:

ON RECOVERY BASIS

SL. No.	Description of material	Unit	Quantity actually issued	Quantity actually incorporated in the work	Balance	Particulars of disposal of balance	Quantity to be issued as per approved data for work actually done	Variation in consumption (difference between colum 5 & 8)		Rate chargeable for excess/short consumption, if any	Amount Recoverable for excess/short consumption, including materials not returned, if any	Remarks
								More	Less			

1	Cement											
2	Bricks											
3	Wood											
4	Asbestos Sheet											
5	Iron Material											
6												
7												

Signature of Contractor

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

Date:

Note

1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 & 6 respectively of Annexure A (Part I and II)

2. Data statement of theoretical consumption should be attached in support of quantity specified in column 8.

ANNEXURE F

Form WAM 7 (Contd.)

Statement showing details of materials issued to the contractor Shri/M/s..... in respect of Contract Agreement / Work Order No.....dated.....

Name of the Work:

FREE OF COST											
Sl.No	Stores Issue Voucher No.	Description of material	Unit	Quantity issued	Quantity required as per data	Quantity consumed in the work	Balance (if any)	Nature of disposal for the balance	Rate chargeable for material not returned	Amount recoverable for material not returned	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE G
QUESTIONNAIRE TO BE ANSWERED BY THE ENGINEER IN CHARGE AND SENIOR ENGINEER
(Correct particulars and answers to be recorded)

1. Name of the Work:
2. Name of the Contractor:
3. Date of commencement of the Work:
4. Contract agreement /Work Order No. and date:
5. Reference to the supplementary Agreement No. if any:
6. Whether administrative approval and technical sanction has been accorded by the competent authority? If so, cite reference?
7. Whether sanction of the competent authority and financial concurrence of the Finance Department for award of the work has been accorded? If so, cite reference.
8. Whether the work has been completed in time? If not whether penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Finance Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter No. and date granting the extension of time should be given).
9. (a) Whether the rates allowed in the bill have been checked with the contract agreement?
 (b) Whether the rates for extra/supplemental items have been approved by the competent authority and the sanction communicated to the Finance Department together with rate analysis? If so, cite reference
10. Whether deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.
11. Whether the rates of recovery of stores issued to the contractor which are not provided for in the contract agreement have been settled in consultation with Finance?
12. Whether discrepancies pointed out by the Finance department in the stores statement have been reconciled and accepted by the Finance Department?
13. Whether materials issued to the contractor in excess of the theoretical requirements have been returned to the Stores department and the No. and date of such returned stores vouchers have been shown in Stores statement? If not, whether the cost of such excess materials has been recovered at the prescribed rate? Whether consumption statements in respect of materials chargeable to the work have been attached to the bill?
14. Whether consumption of materials shown has been technically checked by Senior Engineer?
15. Whether materials issued and used in the work is not less than that required for consumption in work according to our specifications? If consumption is less, whether necessary recovery has been made in the bill?
16. Whether measurements have been checked by the Engineer and Senior Engineer to the extent required and certificates of check recorded in the measurement books?
17. Whether contractor has signed the bill and the measurement books without reservations? If not, whether reasons have been intimated to the Finance Department?
18. Whether arithmetical calculations have been checked and certificate recorded in the measurement books by a person other than the one who calculated initially?
19. Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulars.
20. Whether all advance payments on running accounts have been recovered?
21. Whether all the recoveries due for services given to the contractor like rent of accommodation, water charges, electricity charges have been recovered and whether payments made by the company on behalf of the contractor have been adjusted?
22. Whether the files containing abstracts from measurement books/standard measurement books have been completed/updated?
23. Whether hire charges for tools & plant have been recovered and the statement of hire charges with full details attached?
24. Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer Incharge/Senior Engineer and whether recoveries have been made for defective works, if any?
25. Whether all corrections in the bill/measurement books etc. have been neatly made and attested and there are no overwriting?
26. Whether final measurements have been taken as soon as possible after completion of the work and the certificate of completion issued? If not, whether reasons for delay have been recorded and communicated to finance department?
27. In respect of quantities reduced in the final bill as compared to the running payment, whether adequate reasons have been recorded and communicated to finance department?
28. Whether the expenditure has been classified correctly according to heads of account recorded in the sanctioned estimate?
29. Whether the work has been completed within the estimated cost? If not, what is the percentage of excess over the sanctioned estimate/ administrative approval? In case the excess is beyond the competency of the Senior Engineer, what action has been taken for obtaining the approval of the authority competent to sanction the excess?
30. (a) If the contractor has furnished bank guarantee in lieu of cash security deposit towards proper execution of works and guarantee against defects during the maintenance period, whether the period of currency of the bank guarantee covers the entire maintenance period?
 (b) If not whether security deposit has been proposed to be recovered from the final bill?
31. Whether all the previous audit objections raised on running account bills have been settled? If so, cite references.

Signature of Engineer in Charge
 Date:

Signature of Senior Engineer
 Date:

**ANNEXURE TO MODEL CONCILIATION CLAUSE FOR CONDUCT OF
CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018**

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:
2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings.
3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL.
5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.
7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within

15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.

8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.
9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.
12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.

14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.
15. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
16. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
17. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
18. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
19. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.
20. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall

however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.

21. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.
22. The proceedings of Conciliation under this Scheme may be terminated as follows:
- On the date of signing of the Settlement agreement by the Parties; or,
 - 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,
 - 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,
 - 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.
 - 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
		<p>In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator)</p> <p>In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator)</p> <p>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.</p>
3	Secretarial expenses	<p>Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC.</p> <p>Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC</p>
4	<p>Travel and transportation and stay at outstation</p> <p>i) Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)</p>	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 PARTNERS FOR 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 Claim(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.*

ANNEXURE-I

Name of Work: Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1.765kV AIS Switchyard at PGCIL Sikar project

2.765kV AIS Switchyard at PGCIL Khetri project in Rajasthan.

Tender Spec. No. :TBSM/SIKAR-KHETRI/ETC/TENDER/24-25, Date: 27.09.2024

SI No.	Description	Amount
1	Total amount as per the rates in BOQ for "Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements etc." For 765 kV Sikar Substation- (Annexure-A)	₹ 2,00,57,090.42
2	Total amount as per the rates in BOQ for " Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements etc."- For 765kV Khetri Substation- (Annexure-B)	₹ 63,37,669.72
3	Total Amount Rs. for SI No. 1 & 2 (Excluding GST)	₹ 2,63,94,760.00

Total Amount in words :- (Rupees Two Crore Sixty-Three Lakhs Ninety-Four Thousand Seven Hundred Sixty Only)

(ANNEXURE-A)**BILL OF QUANTITY CUM PRICE SCHEDULE**

Name of Project: Extension of 765kV substation at Sikar					
Name of Work: Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for 765kV AIS Switchyard at PGCIL Sikar project in Rajasthan					
Tender Spec. No. :TBSM/SIKAR-KHETRI/ETC/TENDER/24-25, Date: 27.09.2024					
S. No.	Description of Item	Quantity	Unit	Unit Rate (Excl. GST)	Amount (Excl. GST)
OUTDOOR YARD EQUIPMENT					
1	765kV, 3150A, 3-Phase SF6 Circuit Breaker WITH PIR along with lattice type GI supporting structure, platform with ladder, terminal connectors, Breaker Control Cabinets,, and interpole cabling, SF6 Gas cylinders. (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Breaker timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kits is in the scope of ETC contractor). Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	6.00	Nos.	₹ 1,36,000.00	₹ 8,16,000.00
2	765kV, 3150A, 3-Phase SF6 Circuit Breaker without PIR along with lattice type GI supporting structure, platform with ladder, terminal connectors, Breaker Control Cabinets,, and interpole cabling, SF6 Gas cylinders. (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Breaker timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kits is in the scope of ETC contractor). Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	2.00	Nos.	₹ 1,36,000.00	₹ 2,72,000.00
3	765kV, 3150A, 1-Phase SF6 Circuit Breaker without PIR along with lattice type GI supporting structure, platform with ladder, terminal connectors, Breaker Control Cabinets,, and cabling, SF6 Gas cylinders. (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Breaker timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kits is in the scope of ETC contractor). Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	1.00	Nos.	₹ 1,36,000.00	₹ 1,36,000.00
4	CSD (Control switching device) for 765kV 3 Phase, Circuit Breaker). (Supervision of Erection, Testing and commissioning will be done by supplier. Necessary manpower support, tools, tackles and testing kits is in the scope of ETC contractor). Work includes installation of CSD in Relay Panel & minor modification / panel wiring in circuit breaker and relay panel, and laying of special cable in HDPE/GI pipe - 250m (approx.) for each CSD relay.	2.00	Nos.	₹ 10,200.00	₹ 20,400.00
5	765kV, 3150A, 3-Phase, Knee Type Isolator with ONE earth switch (motor operated) electrically ganged complete with 6 nos. of support insulators, 3 nos operating rod insulators & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	12.00	Nos.	₹ 47,600.00	₹ 5,71,200.00

6	765kV, 3150A, 3-Phase, Knee Type Isolator with TWO earth switch (motor operated) electrically ganged complete with 6 nos. of support insulators, 3 nos operating rod insulators & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	4.00	Nos.	₹ 51,000.00	₹ 2,04,000.00
7	765kV, 3150A, 1-Phase, Knee Type Isolator with ONE earth switch (motor operated) electrically ganged complete with 2 nos. of support insulators, 1 nos operating rod insulator & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	7.00	Nos.	₹ 47,600.00	₹ 3,33,200.00
8	765kV, 3150A, 1-Phase, Knee Type Isolator without earth switch (motor operated) electrically ganged complete with 2 nos. of support insulators, 01 Nos. operating rod insulator & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	11.00	Nos.	₹ 40,800.00	₹ 4,48,800.00
9	765kV, 1 Ph, Current Transformer complete with terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	18.00	Nos.	₹ 25,500.00	₹ 4,59,000.00
10	765kV, 1 Ph, CVT complete with terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	12.00	Nos.	₹ 25,500.00	₹ 3,06,000.00
11	765kV, 1 Ph, LINE TRAP / WAVE TRAP complete with 3 numbers of 765kV BPI & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder must ensure the arrangement of a man-lift (with a minimum access height of 18.5 meters) during ETC works.	8.00	Nos.	₹ 15,300.00	₹ 1,22,400.00
12	624kV, 1 Phase, Gapless type Metal Oxide Surge Arrester complete with surge counter, leakage current meter, insulating base, connecting cable/strip and terminal connectors. without support structure. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	19.00	Nos.	₹ 11,900.00	₹ 2,26,100.00
13	765kV, 1 Ph, BPI (Solid core Bus Post insulator) with corona ring complete with terminal connectors without support structure. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	38.00	Nos.	₹ 4,250.00	₹ 1,61,500.00
14	DGA Test for 765kV CT Oil – Scope includes sampling of oil from CT (sample bottle, syringe etc for DGA test is NOT in the scope of bidder) under supervision of OEM / BHEL. Bidder's scope covers all supports for sampling, safely delivery and submission of test sample to Powergrid Bhiwadi laboratory, getting it tested and submission of test report to BHEL. Powergrid laboratory charges shall in the scope of bidder. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	18.00	Nos.	₹ 8,500.00	₹ 1,53,000.00
15	145kV, 1 Ph, BPI (Solid core Bus Post insulator) complete with terminal connector without support structure.	21.00	Nos.	₹ 1,700.00	₹ 35,700.00
16	145kV, 1 Ph, Circuit Breaker complete with terminal connector without support structure.	2.00	Nos.	₹ 4,250.00	₹ 8,500.00
17	145kV, 1 Ph, NGR complete with terminal connector without support structure.	2.00	Nos.	₹ 21,250.00	₹ 42,500.00
18	145kV, 1 Ph, LA complete with terminal connector without support structure.	2.00	Nos.	₹ 5,100.00	₹ 10,200.00
19	33kV, 1 Ph, Current Transformer, complete with terminal connector without support structure.	2.00	Nos.	₹ 4,250.00	₹ 8,500.00
STRUCTURES & EARTHING					
20	GI Lattice Structures including hardware for Towers, beams, LM & equipments support	800.00	MT	₹ 5,100.00	₹ 40,80,000.00
21	GI Pipe Structures including hardware for equipments support	10.00	MT	₹ 3,400.00	₹ 34,000.00

22	Supply of Equipment fixing hardware (hot dip galvanized) including nut, bolt and plain /spring washer as per Site requirement (Erection shall be covered with respective equipment support structure) 1. Bolts - Class 5.6 of IS:1367 (part 3) - 1991 (M12-M33, 30-145mm lg. & fully threaded). 2. Nuts - Class 5 of IS:1367 (part 6) - 1980. 3. Plain Washers - A type conforming to IS: 2016-1967. 4. Spring Washer - Type B of IS: 3063-1972 Note - Size of hardware shall be suitable for equipments /box/JB, and same shall be decided at site.	500.00	kg	₹ 272.00	₹ 1,36,000.00
23	Earthing work with 75X12 GI Flat - Installation of GI Flat including cutting, bending, welding with GI Flat / MS Rod, supply and application of paint, clamping to structure/building wall etc. to complete in all respect. All arc welding shall be done with low hydrogen content electrodes. the welds should be treated with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS:2074.	47.00	MT	₹ 3,995.00	₹ 1,87,765.00
24	Earthing work with 50X6 GI Flat - Installation of Flat including cutting, bending, welding with Flat / MS Rod, supply and application of paint, clamping to structure/building wall etc. to complete in all respect. All arc welding shall be done with low hydrogen content electrodes. the welds should be treated with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS:2074.	10.00	MT	₹ 3,995.00	₹ 39,950.00
25	Laying of 100 to 200 mm wide, 2.5 M long, 2mm thick (minimum) G.S. steel Perforated type cable trays with cover, coupler plates, hardware, fixing and clamping arrangement with lattice type support equipment's structure etc to complete including cutting & jointing to suitable length. Fixing and clamping hardware required for fixing of perforated tray with lattice / pipe structure shall be in ETC contractor scope.	200.00	Meter	₹ 382.50	₹ 76,500.00
26	Supply of 50x50x6 mm MS Angle - Powergrid approved make	9.00	MT	₹ 39,950.00	₹ 3,59,550.00
27	Supply of 50x6 mm MS Flat - Powergrid approved make	0.10	MT	₹ 39,950.00	₹ 3,995.00
28	Installation of Cable Rack - work includes <u>cutting</u> , welding and fabrication of cable racks with MS angles & MS Flat (for continues earthing run) on inserts of cable trench walls. Cable rack assembly shall be of 1/2/3/4 tier as applicable. Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. (supply of paint is in scope of bidder)	5.00	MT	₹ 39,950.00	₹ 1,99,750.00
29	Supply and installation of Panel Supporting Angles / Channel etc on cable trench in CRB / SPR, Vertical support for cables etc (Including Supply). Supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. (supply of paint is in scope of bidder)	1.00	MT	₹ 68,000.00	₹ 68,000.00
30	Dismantling of existing lattice / pipe structure and its disposal as per site requirement.	0.50	MT	₹ 5,100.00	₹ 2,550.00
STRING & CONDUCTORS					
31	765kV Double Tension Stringing Hardware - with/ without Turn Buckle, with 2 numbers Polymer Long Rod Insulator, suitable for QUAD / HEXA Conductor.	72.00	Set	₹ 1,700.00	₹ 1,22,400.00
32	765kV V-Suspension Stringing Hardware - with through / drop type clamp, 2 numbers Polymer Long Rod Insulator, suitable for QUAD / HEXA Conductor.	24.00	Set	₹ 17,000.00	₹ 4,08,000.00
33	765kV Guy Wire Arrangement - with Double 210kN Long Rod Polymer Insulator and string hardware with Turn Buckle set suitable for quad Bull conductor (450mm spacing) & shield wire at bottom. Including accessories complete in all respect.	30.00	Set	₹ 17,000.00	₹ 5,10,000.00

34	AAC Bull Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for Busbar jumpering, Twin/Quad bundle rigid/flexible spacers etc to complete. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	25.50	km	₹ 72,250.00	₹ 18,42,375.00
35	4.5" Al Tube (ETC of Al.Tube includes cutting, Aluminum welding, testing, bending & installation of Al. Tube). Welding sleeve and Al. tube will be supplied by BHEL). The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	1250.00	Meter	₹ 569.50	₹ 7,11,875.00
36	3" Al Tube (ETC of Al.Tube includes cutting, Aluminum welding, testing, bending & installation of Al. Tube). Welding sleeve and Al. tube will be supplied by BHEL)	250.00	Meter	₹ 297.50	₹ 74,375.00
37	Installation of 7/9 SWG GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	3.00	km	₹ 42,500.00	₹ 1,27,500.00
38	765kV Terminal Connector. - Dismantling / Installation of terminal connectors from customer supplied/erected items whereas erection of equipments are not in scope of contractor.	3.00	Nos.	₹ 765.00	₹ 2,295.00
39	145kV Terminal Connector. - Dismantling / Installation of terminal connectors at customer supplied/erected items whereas erection of equipments are not in scope of contractor.	1.00	Nos.	₹ 425.00	₹ 425.00
40	Dismantling of existing guy wire arrangement with drop conductor, Set of 3 Phase	1.00	set	₹ 17,000.00	₹ 17,000.00
CRP SAS					
41	SUBSTATION AUTOMATION SYSTEM : 765KV, LINE BAY, PROTECTION PANEL (WITH AUTOMATION). (Including Mounting & Internal wiring of loose-supplied CSD/PMU Units/Patch Cords/LIUs, As Applicable) (Testing and commissioning of numerical relays/BCU/Energy Meters/ SAS equipment's in scope of respective equipment's supplier. Necessary manpower support for wiring, BUS wiring, numerical device testing, arranging tools, tackles and testing equipments is in scope of ETC contractor). Note - Relay testing kit is covered in separate BOQ item. (1 Set = 2 No. of Panel)	4.00	SET	₹ 5,100.00	₹ 20,400.00
42	SUBSTATION AUTOMATION SYSTEM : 765KV, REACTOR PROTECTION PANEL (WITH AUTOMATION) (Including Mounting & Internal wiring of loose-supplied CSD/PMU Units/Patch Cords/LIUs, As Applicable) (Testing and commissioning of numerical relays/BCU/Energy Meters/ SAS equipment's in scope of respective equipment's supplier. Necessary manpower support for wiring, BUS wiring, numerical device testing, arranging tools, tackles and testing equipments is in scope of ETC contractor). Note - Relay testing kit is covered in separate BOQ item. (1 Set = 2 No. of Panel)	2.00	SET	₹ 5,100.00	₹ 10,200.00
43	SUBSTATION AUTOMATION SYSTEM : 765KV, TIE BAY RELAY PANEL (WITH AUTOMATION) (Including Mounting & Internal wiring of loose-supplied CSD/PMU Units/Patch Cords/LIUs, As Applicable) (Testing and commissioning of numerical relays/BCU/Energy Meters/ SAS equipment's in scope of respective equipment's supplier. Necessary manpower support for wiring, BUS wiring, numerical device testing, arranging tools, tackles and testing equipment is in scope of ETC contractor). Note - Relay testing kit is covered in separate BOQ item. (1 Set = 1 No. of Panel)	2.00	SET	₹ 5,100.00	₹ 10,200.00
44	SUBSTATION AUTOMATION SYSTEM : 765KV, AUGMENTATION OF EXISTING BUS BAR PROTECTION SYSTEM	1.00	LOT	₹ 5,100.00	₹ 5,100.00
45	SUBSTATION AUTOMATION SYSTEM : 765KV, AUGMENTATION OF SUBSTATION AUTOMATION SYSTEM FOR MAIN / TIE BAY	8.00	SET	₹ 5,100.00	₹ 40,800.00

46	PHASOR MEASUREMENT UNIT : PMU WITH GPS CLOCK	4.00	SET	₹ 5,100.00	₹ 20,400.00
47	PHASOR MEASUREMENT UNIT : WAMS - TIME SYSTEM (GPS RECEIVER)	4.00	SET	₹ 5,100.00	₹ 20,400.00
48	PHASOR MEASUREMENT UNIT : WAMS - SUBSTATION GRADE L3 LAN SWITCH	5.00	SET	₹ 5,100.00	₹ 25,500.00
49	PHASOR MEASUREMENT UNIT : WAMS - ASSOCIATED TERMINATION OF ARMORED FIBRE OPTIC CABLE FOR CONNECTING PMU PANELS. (E.G. L2 SWITCH IF APPLICABLE, PATCH CORD, LIU, NETWORK CABLES ETC.)	1.00	LOT	₹ 1,40,250.00	₹ 1,40,250.00
50	DEPUTATION OF 3-PH NUMERICAL RELAY TEST KIT WITH OPERATOR. THE TEST KIT SHOULD HAVE VALID CALIBRATION CERTIFICATE AND OF REPUTE MAKE. MODE OF MEASUREMENT SHALL BE DAYS AT SITE	10.00	Days	₹ 10,200.00	₹ 1,02,000.00
51	MOBILIZATION AND DEMOBILIZATION CHARGES FOR RELAY TEST KIT WITH OPERATOR. (THIS INCLUDES 1ST MOBILIZATION ALSO)	2.00	Nos.	₹ 21,250.00	₹ 42,500.00
PLCC & FO COMMUNICATION. SUPERVISION OF ERECTION AND COMMISSIONING SHALL BE PROVIDED BY BHEL / EQUIPMENT SUPPLIER					
52	FIBRE OPTIC COMMUNICATION SYSTEM : SDH EQUIPMENT CABINET, BASE EQUIPMENT & OTHER HARDWARE AND ACCESSORIES INCLUDING SUB RACKS, PATCH CORD, DDF ETC , SFP / OPTICAL AMPLIFIERS,	2.00	SET	₹ 4,250.00	₹ 8,500.00
53	FIBRE OPTIC COMMUNICATION SYSTEM : TELEPHONE INSTRUMENT WITH 8 PORT SWITCHES AND TELEPHONE CABLE E.T.C.	2.00	SET	₹ 4,250.00	₹ 8,500.00
54	FIBRE OPTIC COMMUNICATION SYSTEM : FODP 96FIBRE : INDOOR TYPE, RACK MOUNTED WITH FCPC COUPLING & PIGTAILS (5MTRS)	2.00	SET	₹ 4,250.00	₹ 8,500.00
55	OPGW Fibre Optic Distribution Panel (Joint Box)	2.00	SET	₹ 4,250.00	₹ 8,500.00
56	Coupling device for PLCC	4.00	SET	₹ 4,250.00	₹ 17,000.00
57	CARRIER EQUIPMENT ANALOG TYPE (FOR SPEECH+DATA & SPEECH+PROTECTION)	4.00	SET	₹ 4,250.00	₹ 17,000.00
58	Analog Protection Coupler for PLCC	4.00	SET	₹ 4,250.00	₹ 17,000.00
59	Digital Protection Coupler	4.00	SET	₹ 4,250.00	₹ 17,000.00
ETC Works for PLCC at Remote Station End Narela SS, Delhi. SUPERVISION OF ERECTION AND COMMISSIONING SHALL BE PROVIDED BY BHEL / EQUIPMENT SUPPLIER. PLEASE NOTE - ASSOCIATED SUPPLY & SERVICES I.E. CABLING, EARTHING etc SHALL BE MEASURED, AND PAID AS PER ETC MAIN PACKAGE BOQ ITEM SIKAR.					
60	ETC Works for PLCC at Remote Station End Narela SS, Delhi - Coupling device for PLCC	2.00	SET	₹ 6,800.00	₹ 13,600.00
61	ETC Works for PLCC at Remote Station End Narela SS, Delhi - CARRIER EQUIPMENT ANALOG TYPE (FOR SPEECH+DATA & SPEECH+PROTECTION)	2.00	SET	₹ 6,800.00	₹ 13,600.00
62	ETC Works for PLCC at Remote Station End Narela SS, Delhi - Analog Protection Coupler for PLCC	2.00	SET	₹ 6,800.00	₹ 13,600.00
63	ETC Works for PLCC at Remote Station End Narela SS, Delhi - Digital Protection Coupler	2.00	SET	₹ 6,800.00	₹ 13,600.00
64	ETC Works for PLCC at Remote Station End Narela SS, Delhi - HF CABLE	0.60	KM	₹ 25,500.00	₹ 15,300.00
JB, CABLING, TRAY, PIPE etc					
65	BMK - Bay Marshalling Kiosks (Outdoor type, Floor / Trench mounted)	6.00	Nos.	₹ 1,700.00	₹ 10,200.00
66	CTJB - Junction Box (on CT structure)	6.00	Nos.	₹ 850.00	₹ 5,100.00
67	CVTJB - Junction Box (on CVT structure)	2.00	Nos.	₹ 850.00	₹ 1,700.00
68	Supply of 50 mm (Nominal Dia) HDPE - High Density PE pipe including tee / elbow as per relevant IS code. Mode of measurement shall be running length of HDPE / PVC Pipe only. Tee & Bend as per requirements are deemed included.	100.00	Meter	₹ 248.00	₹ 24,800.00
69	Supply of 50 mm (Nominal Dia) PVC - Pipe including tee / elbow as per	100.00	Meter	₹ 49.50	₹ 4,950.00
70	Supply of 32 NB GI pipes (light grade) conduits along with socket, bend and	100.00	Meter	₹ 266.20	₹ 26,620.00

71	Supply of 50 NB GI pipes (light grade) conduits along with socket, bend and joint on trench rack support etc complete. Supply of required clamp for fixing GI conduits on Cable rack shall be in ETC contractor scope. Mode of measurement shall be running length of pipe conduit.	100.00	Meter	₹ 440.00	₹ 44,000.00
72	Supply of 50 NB GI flexible pipe. Supply of required clamp for fixing GI flexible pipe shall be in ETC contractor scope. Mode of measurement shall be running length of GI flexible pipe.	100.00	Meter	₹ 176.00	₹ 17,600.00
73	Supply of 25 mm GI flexible pipe. Supply of required clamp for fixing GI flexible pipe shall be in ETC contractor scope. Mode of measurement shall be running length of GI flexible pipe.	50.00	Meter	₹ 88.00	₹ 4,400.00
74	INSTALLATION OF 110 mm dia PVC Pipe including sockets, tee & bends as required. Which shall be buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. Both ends of PVC conduits shall be closed by plastering. (Payment will be made for the as erected pipe length)	6810.00	Meter	₹ 93.50	₹ 6,36,735.00
75	INSTALLATION OF 50 mm dia PVC Pipe including sockets, tee & bends as required. . Which shall be buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. Both ends of PVC conduits shall be closed by plastering. (Payment will be made for the as erected pipe length)	5100.00	Meter	₹ 55.25	₹ 2,81,775.00
76	INSTALLATION OF 50/32 NB GI pipes (light grade) conduits along with socket, bend and joint on trench rack support . Cutting, threading, fixing of clamps sockets/ bends/joints where required etc. complete. Mode of measurement shall be running length of pipe conduit. GI conduits shall be used for INSTALLATION OF fibre optic cables /sensor cables.	3000.00	Meter	₹ 68.00	₹ 2,04,000.00
77	INSTALLATION of 25/50 mm GI flexible pipe including fixing clamps	150.00	Meter	₹ 68.00	₹ 10,200.00
78	INSTALLATION OF 25/32 MM DIA. HDPE / PVC PIPE in cable trench, trays, hanger, supports, STRUCTURE, through wall etc	500.00	Meter	₹ 38.25	₹ 19,125.00
79	INSTALLATION OF 25/32 MM DIA. HDPE / PVC PIPE buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. (Payment will be made for the as erected pipe length)	200.00	Meter	₹ 38.25	₹ 7,650.00
80	INSTALLATION of FIBRE OPTIC CABLE (FO Cable) in GI Pipe / HDPE / PVC Pipe along with connectors and excluding Splicing and Termination of fibre. (Remark - Installation of GI / HDPE / PVC Pipe, Splicing and Termination covered in separate BOQ line item.)	5.00	km	₹ 25,500.00	₹ 1,27,500.00
81	SPLICING AND TERMINATION OF FIBRE OF FIBRE OPTIC CABLE	300.00	Nos.	₹ 382.50	₹ 1,14,750.00
82	INSTALLATION of HF / CO-AXIAL CABLE / CAT 6 CABLE / SHIELDED TWISTED PAIR - STP, UTP CABLE, SPECIAL PURPOSE CABLES IN GI Pipe / HDPE / PVC Pipe along with connectors / TERMINATION. Installation of GI / HDPE / PVC Pipe is covered in separate BOQ line item.	3.50	km	₹ 25,500.00	₹ 89,250.00
ETC of LT CABLE: Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland ,soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted.					
83	ETC of 1.1KV GRADE 3CX2.5 SQMM CONTROL CABLE	5.00	km	₹ 18,700.00	₹ 93,500.00
84	ETC of 1.1KV GRADE 5CX2.5 SQMM CONTROL CABLE	15.00	km	₹ 20,400.00	₹ 3,06,000.00
85	ETC of 1.1KV GRADE 10CX2.5 SQMM CONTROL CABLE	5.00	km	₹ 22,100.00	₹ 1,10,500.00
86	ETC of 1.1KV GRADE 19CX1.5 SQMM CONTROL CABLE	3.00	km	₹ 23,800.00	₹ 71,400.00
87	ETC of 1.1KV GRADE 27CX1.5 SQMM CONTROL CABLE	1.00	km	₹ 25,500.00	₹ 25,500.00

88	ETC of 8PAIR 1.5SQMM SCREENED INSTRUMENTATION CABLE	1.00	km	₹ 17,000.00	₹ 17,000.00
89	ETC of 1.1KV GRADE 3.5CX70 SQMM (PVC) POWER CABLE	2.00	km	₹ 38,250.00	₹ 76,500.00
90	ETC of 1.1KV GRADE 3.5CX35 SQMM (PVC) POWER CABLE	0.50	km	₹ 34,000.00	₹ 17,000.00
91	ETC of 1.1KV GRADE 2CX6 SQMM (PVC) POWER CABLE	3.00	km	₹ 25,500.00	₹ 76,500.00
92	ETC of 1.1KV GRADE 4CX6 SQMM (PVC) POWER CABLE	3.00	km	₹ 29,750.00	₹ 89,250.00
93	ETC of 1.1KV GRADE 4CX16 SQMM (PVC) POWER CABLE	15.00	km	₹ 32,300.00	₹ 4,84,500.00
94	ETC of 1.1KV GRADE 3.5CX300 SQMM (XLPE) POWER CABLE	0.50	km	₹ 56,100.00	₹ 28,050.00
95	Directly burried cable - Aux. power cables over 40mm OD along with lugs, cable glands to be laid in burried trench, all civil activities such as excavation, supply and laying of sand, bricks etc. shall be in contractor's scope. Including Cable Route Markers, excluding supply of Cable Gland.	2.00	km	₹ 47,600.00	₹ 95,200.00

Supply of CABLE GLAND: Tin/ Nickel, Nichel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. Bidder to offer the gland from authorised representative of manufacturer. Cable gland shall be subject to customer approval prior to dispatch. Cable glands shall match with the sizes of different HT/LT/Control cables. Quantity indicated is indicative only and shall be finalised during contract execution stage.

96	Supply of Cable Gland for 1.1KV GRADE 3CX2.5 SQMM CONTROL CABLE	624.00	Nos.	₹ 222.20	₹ 1,38,652.80
97	Supply of Cable Gland for 1.1KV GRADE 5CX2.5 SQMM CONTROL CABLE	368.00	Nos.	₹ 279.40	₹ 1,02,819.20
98	Supply of Cable Gland for 1.1KV GRADE 10CX2.5 SQMM CONTROL CABLE	528.00	Nos.	₹ 353.10	₹ 1,86,436.80
99	Supply of Cable Gland for 1.1KV GRADE 19CX1.5 SQMM CONTROL CABLE	160.00	Nos.	₹ 457.60	₹ 73,216.00
100	Supply of Cable Gland for 1.1KV GRADE 27CX1.5 SQMM CONTROL CABLE	112.00	Nos.	₹ 554.40	₹ 62,092.80
101	Supply of Cable Gland for 8PAIR 1.5SQMM SCREENED INSTRUMENTATION CABLE	160.00	Nos.	₹ 353.10	₹ 56,496.00
102	Supply of Cable Gland for 1.1KV GRADE 3.5CX70 SQMM (PVC) POWER CABLE	64.00	Nos.	₹ 986.70	₹ 63,148.80
103	Supply of Cable Gland for 1.1KV GRADE 3.5CX35 SQMM (PVC) POWER CABLE	32.00	Nos.	₹ 457.60	₹ 14,643.20
104	Supply of Cable Gland for 1.1KV GRADE 2CX6 SQMM (PVC) POWER CABLE	160.00	Nos.	₹ 222.20	₹ 35,552.00
105	Supply of Cable Gland for 1.1KV GRADE 4CX6 SQMM (PVC) POWER CABLE	352.00	Nos.	₹ 330.00	₹ 1,16,160.00
106	Supply of Cable Gland for 1.1KV GRADE 4CX16 SQMM (PVC) POWER CABLE	320.00	Nos.	₹ 353.10	₹ 1,12,992.00
107	Supply of Cable Gland for 1.1KV GRADE 3.5CX300 SQMM (XLPE) POWER CABLE	4.00	Nos.	₹ 6,657.20	₹ 26,628.80

ILLUMINATION & VMS SYSTEM

108	Lighting Panel ACP-2 (Outdoor type, Foundation Mounted) including installation of mounting hardwares / anchor fastener / foundation bolt etc complete in all respect.	2.00	Nos.	₹ 2,550.00	₹ 5,100.00
109	Sub Lighting panel SLP (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	1.00	Nos.	₹ 1,500.00	₹ 1,500.00
110	Outdoor Junction Box for loop in loop out of Lighting Cables (Outdoor type, Foundation / structure Mounted) including installation of support structure, mounting hardwares / anchor fastener etc complete in all respect.	1.00	Nos.	₹ 1,700.00	₹ 1,700.00
111	Receptacle 415V, 63A, 3 Phase outdoor type. (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	1.00	Nos.	₹ 1,700.00	₹ 1,700.00
112	Receptacle 415V, 250A, 3 Phase outdoor type. (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	2.00	Nos.	₹ 1,700.00	₹ 3,400.00

113	PTZ CAMERA (DOME TYPE) WITH IT'S HOUSING, POWER SUPPLY UNIT & MOUNTING HARDWARE (SUPERVISION & COMMISSIONING SHALL BE DONE BY EQUIPMENT SUPPLIER)	3.00	Set	₹ 649.00	₹ 1,947.00
114	JUNCTION BOX INCLUDING MOUNTING OF 600VA UPS, MEDIA CONVERTER, LIU & POWER SWITCH ETC FOR PTZ CAMERA. (SUPERVISION & COMMISSIONING SHALL BE DONE BY EQUIPMENT SUPPLIER)	3.00	Set	₹ 2,360.00	₹ 7,080.00
115	CABLING BETWEEN PTZ CAMERA AND JUNCTION BOX. (SET OF CAT-6 CABLE, FLEXIBLE 25/32 MM GI CONDUIT, POWER CABLE 3CX2.5 SQ.MM & MOUNTING HARDWARES). (SUPERVISION & COMMISSIONING SHALL BE DONE BY EQUIPMENT SUPPLIER)	30.00	Meter	₹ 23.60	₹ 708.00
Miscellaneous					
116	Supply of Rubber mats (Class-A suitable for 1.1 kV as per IS: 15652)	20.00	Sq.m	₹ 1,870.00	₹ 37,400.00
117	Installation of Rubber mats (Class-A suitable for 1.1 kV as per IS: 15652) in front of Panels	20.00	Sq.m	₹ 425.00	₹ 8,500.00
118	Supply of Cable Sealing System / cable transit system - Modular multi-diameter (type peel-able or adjustable blocks) cable sealing system consisting of frames, blocks, stay plate and accessories. The shall be installed where the cables enter CRB, SPR in the substations. (Approved make M/s Roxtec India Pvt. Ltd / M/s MCT Brattberg India Pvt. Ltd. / any other Powergrid approved make) Mode of measurement shall be in square meter of inner dimension of frame of cable sealing system. Bidder to submit drawing, document & type test report for approval during contract stage.	2.00	Sq.m	₹ 1,39,240.00	₹ 2,78,480.00
119	Installation of Cable Sealing System - Modular multi-diameter (type peel-able or adjustable blocks) cable sealing system consisting of frames, blocks, stay plate and accessories. The shall be installed where the cables enter CRB, SPR in the substations. Mode of measurement shall be in square meter of inner dimension of frame of cable sealing system. <u>Minor civil works required for installation of cable sealing system is in the scope of bidder.</u>	2.00	Sq.m	₹ 13,924.00	₹ 27,848.00
120	Modification of Hole Sizes in Structures: Structure Modification - All tools and tackles required for GI structure, any other steel structure modification, Aluminium Items etc. shall be in the scope of bidder. Cutting, drilling, punching, minor civil works also included in the scope. Minor welding and application of protective / zinc rich paint on welded surface is also included in the scope.	100.00	Nos.	₹ 42.50	₹ 4,250.00
121	Supply & ETC of 2 HP Dewatering Pump with Outdoor Three-Phase Motor Starter Junction Box: The same shall be Portable, Self Priming, Non clog, horizontal type monobloc pump. The Pump shall be driven by electric motor suitable for outdoor application with IP-55 degree of protection. Major technical parameters: Pump Rating : 2 HP, Flow Rate : 200-400 LPM, Minimum Total Head : 12 Mtrs, Voltage Range : 415 ± 10% Volts (Three Phase).	1.00	Nos.	₹ 17,000.00	₹ 17,000.00
122	Supply & ETC of 5 HP Dewatering Pump with Outdoor Three-Phase Motor Starter Junction Box: The same shall be Portable, Self Priming, Non clog, horizontal type monobloc pump. The Pump shall be driven by electric motor suitable for outdoor application with IP-55 degree of protection. Major technical parameters : Pump Rating : 5 HP, Flow Rate : 1000-1400 LPM, Minimum Total Head : 10 Mtrs, Voltage Range : 415 ± 10% Volts (Three Phase)	1.00	Nos.	₹ 21,250.00	₹ 21,250.00
123	Supply & Installation of BAY IDENTIFICATION - Bay Name Plate as per drawing no. C/ENG/STD/BAY NAME PLATE	4.00	Nos.	₹ 8,500.00	₹ 34,000.00

124	Supply & Installation of Grouting of block outs, pockets, foundations, bolts holes and underside of base plates with cement, sand aggregate (of size 6 mm and down) grout 1:1:2 with non-shrink additive/grouting compound and shall be of strength not less than M30 including placing, curing, cleaning, surface preparation, testing, etc. complete with labour, materials, equipment, handling, testing, etc. all complete as per instructions of the Engineer. Nominal thickness of grouting shall be approx 100 mm for Tower Structure & approx 60 mm for equipment support structure. Actual qty as per site condition	20.00	cum	₹ 8,903.00	₹ 1,78,060.00
125	Supply and installation: Modification in existing 415V ACDB / MLDB Panel with 63A, 4 Pole MCCB (FB MCCB with thermal magnetic release for O/L (80-100%) & Fixed S/C with rotary handle and 4 number 63A rating terminal block, mounting channel, internal wiring, door cutting etc complete. MCCB & TB are to be Powergrid approved make.	1.00	Set	₹ 29,289.96	₹ 29,289.96
126	Supply and installation: Modification in existing 220V DCDB Panels with 32A, DP, MCCB with thermal magnetic release SE for O/L (80-100%) & fixed S/C and 2 number 32A terminal block, mounting channel, internal wiring etc complete. MCCB & TB are to be Powergrid approved make.	1.00	Set	₹ 26,629.06	₹ 26,629.06
UNLOADING, MATERIAL HANDLING & SAFETY SECURITY					
127	FIRE PROTECTION SYSTEM (unloading & material handling) - Receipt of material, unloading, proper storage, material reconciliation, safe keeping, handing over to BHEL / Fire Fighting contractor, proper record keeping etc to complete.	5.00	MT	₹ 3,400.00	₹ 17,000.00
128	AIR CONDITIONING & VENTILATION SYSTEM (unloading & material handling) - Receipt of material, unloading, proper storage, material reconciliation, safe keeping, handing over to BHEL / ACVS contractor, proper record keeping etc to complete.	1.00	MT	₹ 3,400.00	₹ 3,400.00
129	MANDATORY SPARES - A: FIBRE OPTIC COMMUNICATION SYSTEM	1.00	Lot	₹ 17,000.00	₹ 17,000.00
130	Security personnel: Watch & ward of stored / erected / commissioned material at storage area, project site, erection area or any other locations within project boundry as per material safety requirement and instruction of site in-charge complete in all aspect. Security personnel, round the clock watch & ward by authorized service agency consisting of security guard as per requirement at site. No. of post for watch & ward shall be decided by BHEL site in charge. (Unarmed security guard)	20.00	One post per month	₹ 63,750.00	₹ 12,75,000.00
Total Amount (Excluding GST) (ANNEXURE-A)					₹ 2,00,57,090.42

(ANNEXURE-B)**BILL OF QUANTITY CUM PRICE SCHEDULE**

Name of Project: Extension of 765kV substation at Khetri					
Name of Work: Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan					
Tender Spec. No. :TBSM/SIKAR-KHETRI/ETC/TENDER/24-25, Date: 27.09.2024					
S. No.	Description of Item	Quantity	Unit	Unit Rate (Excl. GST)	Amount (Excl. GST)
OUTDOOR YARD EQUIPMENT					
1	765kV, 3150A, 3-Phase SF6 Circuit Breaker WITH PIR along with lattice type GI supporting structure, platform with ladder, terminal connectors, Breaker Control Cabinets,, and interpole cabling, SF6 Gas cylinders. (Supervision of Erection, Testing and commissioning will be done by supplier. Supplier will bring Breaker timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kits is in the scope of ETC contractor). Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	2	Nos.	₹ 1,36,000.00	₹ 2,72,000.00
2	765kV, 3150A, 3-Phase, Knee Type Isolator with ONE earth switch (motor operated) electrically ganged complete with 6 nos. of support insulators, 3 nos operating rod insulators & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	4	Nos.	₹ 47,600.00	₹ 1,90,400.00
3	765kV, 3150A, 3-Phase, Knee Type Isolator with TWO earth switch (motor operated) electrically ganged complete with 6 nos. of support insulators, 3 nos operating rod insulators & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	2	Nos.	₹ 51,000.00	₹ 1,02,000.00
4	765kV, 1 Ph, Current Transformer complete with terminal connectors without support structure. Please note, climbing on equipment is not permitted.The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	6	Nos.	₹ 25,500.00	₹ 1,53,000.00
5	765kV, 1 Ph, CVT complete with terminal connectors without support structure. Please note, climbing on equipment is not permitted.The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	6	Nos.	₹ 25,500.00	₹ 1,53,000.00
6	765kV, 1 Ph, LINE TRAP / WAVE TRAP complete with 3 numbers of 765kV BPI & terminal connectors without support structure. Please note, climbing on equipment is not permitted. The bidder must ensure the arrangement of a man-lift (with a minimum access height of 18.5 meters) during ETC works.	4	Nos.	₹ 15,300.00	₹ 61,200.00
7	624kV, 1 Phase, Gapless type Metal Oxide Surge Arrester complete with surge counter, leakage current meter, insulating base, connecting cable/strip and terminal connectors. without support structure. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	6	Nos.	₹ 11,900.00	₹ 71,400.00
8	765kV, 1 Ph, BPI (Solid core Bus Post insulator) with corona ring complete with terminal connectors without support structure. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	18	Nos.	₹ 4,250.00	₹ 76,500.00

9	DGA Test for 765kV CT Oil – Scope includes sampling of oil from CT (sample bottle, syringe etc for DGA test is NOT in the scope of bidder) under supervision of OEM / BHEL. Bidder's scope covers all supports for sampling, safely delivery and submission of test sample to Powergrid Bhiwadi laboratory, getting it tested and submission of test report to BHEL. Powergrid laboratory charges shall in the scope of bidder. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	6	Nos.	₹ 8,500.00	₹ 51,000.00
STRUCTURES & EARTHING					
10	GI Lattice Structures including hardware for Towers, beams, LM & equipments support	85	MT	₹ 5,100.00	₹ 4,33,500.00
11	GI Pipe Structures including hardware for equipments support	10	MT	₹ 3,400.00	₹ 34,000.00
12	Supply of Equipment fixing hardware (hot dip galvanized) including nut, bolt and plain /spring washer as per Site requirement (Erection shall be covered with respective equipment support structure) 1. Bolts - Class 5.6 of IS:1367 (part 3) - 1991 (M12-M33, 30-145mm lg. & fully threaded). 2. Nuts - Class 5 of IS:1367 (part 6) - 1980. 3. Plain Washers - A type conforming to IS: 2016-1967. 4. Spring Washer - Type B of IS: 3063-1972 Note - Size of hardware shall be suitable for equipments /box/JB, and same shall be decided at site.	200	kg	₹ 272.00	₹ 54,400.00
13	Earthing work with 75X12 GI Flat - Installation of GI Flat including cutting, bending, welding with GI Flat / MS Rod, supply and application of paint, clamping to structure/building wall etc. to complete in all respect. All arc welding shall be done with low hydrogen content electrodes. the welds should be treated with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS:2074.	12	MT	₹ 3,995.00	₹ 47,940.00
14	Earthing work with 50X6 GI Flat - Installation of Flat including cutting, bending, welding with Flat / MS Rod, supply and application of paint, clamping to structure/building wall etc. to complete in all respect. All arc welding shall be done with low hydrogen content electrodes. the welds should be treated with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS:2074.	4	MT	₹ 3,995.00	₹ 15,980.00
15	Laying of 100 to 200 mm wide, 2.5 M long, 2mm thick (minimum) G.S. steel Perforated type cable trays with cover, coupler plates, hardware, fixing and clamping arrangement with lattice type support equipment's structure etc to complete including cutting & jointing to suitable length. Fixing and clamping hardware required for fixing of perforated tray with lattice / pipe structure shall be in ETC contractor scope.	54	Meter	₹ 382.50	₹ 20,655.00
16	Supply of 50x50x6 mm MS Angle - Powergrid approved make	1	MT	₹ 39,950.00	₹ 39,950.00
17	Supply of 50x6 mm MS Flat - Powergrid approved make	0.1	MT	₹ 39,950.00	₹ 3,995.00
18	Installation of Cable Rack - work includes cutting, welding and fabrication of cable racks with MS angles & MS Flat (for continues earthing run) on inserts of cable trench walls. Cable rack assembly shall be of 1/2/3/4 tier as applicable. Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. (supply of paint is in scope of bidder)	3	MT	₹ 39,950.00	₹ 1,19,850.00
19	Supply and installation of Panel Supporting Angles / Channel etc on cable trench in CRB / SPR, Vertical support for cables etc (Including Supply). Supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. (supply of paint is in scope of bidder)	0.5	MT	₹ 68,000.00	₹ 34,000.00
20	Dismantling of existing lattice / pipe structure and its disposal as per site requirement.	0.5	MT	₹ 5,100.00	₹ 2,550.00
STRING & CONDUCTORS					

21	765kV Double Tension Stringing Hardware - with/ without Turn Buckle, with 2 numbers Polymer Long Rod Insulator, suitable for QUAD / HEXA Conductor.	6	Set	₹ 1,700.00	₹ 10,200.00
22	765kV V-Suspension Stringing Hardware - with through / drop type clamp, 2 numbers Polymer Long Rod Insulator, suitable for QUAD / HEXA Conductor.	6	Set	₹ 17,000.00	₹ 1,02,000.00
23	765kV Guy Wire Arrangement - with Double 210kN Long Rod Polymer Insulator and string hardware with Turn Buckle set suitable for quad Bull conductor (450mm spacing) & shield wire at bottom. Including accessories complete in all respect.	6	Set	₹ 17,000.00	₹ 1,02,000.00
24	AAC Bull Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for Busbar jumpering, Twin/Quad bundle rigid/flexible spacers etc to complete. The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	3.7	km	₹ 72,250.00	₹ 2,67,325.00
25	4.5" Al Tube (ETC of Al.Tube includes cutting, Aluminum welding, testing, bending & installation of Al. Tube). Welding sleeve and Al. tube will be supplied by BHEL). The bidder to arrange a man-lift (with a minimum access height of 14.5 meters) during ETC works.	380	Meter	₹ 569.50	₹ 2,16,410.00
26	Installation of 7/9 SWG GI Stranded Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete.	0.25	km	₹ 42,500.00	₹ 10,625.00
27	765kV Terminal Connector. - Dismantling / Installation of terminal connectors from customer supplied/erected items whereas erection of equipments are not in scope of contractor.	3	Nos.	₹ 765.00	₹ 2,295.00
28	Dismantling of existing guy wire arrangement with drop conductor, Set of 3 Phase	1	set	₹ 17,000.00	₹ 17,000.00
CRP SAS					
29	SUBSTATION AUTOMATION SYSTEM : 765KV, LINE BAY, PROTECTION PANEL (WITH AUTOMATION). (Including Mounting & Internal wiring of loose-supplied CSD/PMU Units/Patch Cords/LIUs, As Applicable) (Testing and commissioning of numerical relays/BCU/Energy Meters/ SAS equipment's in scope of respective equipment's supplier. Necessary manpower support for wiring, BUS wiring, numerical device testing, arranging tools, tackles and testing equipments is in scope of ETC contractor). Note - Relay testing kit is covered in separate BOQ item. (1 Set = 2 No. of Panel)	2	SET	₹ 5,100.00	₹ 10,200.00
30	SUBSTATION AUTOMATION SYSTEM : 765KV, AUGMENTATION OF EXISTING BUS BAR PROTECTION SYSTEM	1	LOT	₹ 5,100.00	₹ 5,100.00
31	SUBSTATION AUTOMATION SYSTEM : 765KV, AUGMENTATION OF SUBSTATION AUTOMATION SYSTEM FOR MAIN / TIE BAY	2	SET	₹ 5,100.00	₹ 10,200.00
32	PHASOR MEASUREMENT UNIT : PMU WITH GPS CLOCK	2	SET	₹ 5,100.00	₹ 10,200.00
33	PHASOR MEASUREMENT UNIT : WAMS - TIME SYSTEM (GPS RECEIVER)	2	SET	₹ 5,100.00	₹ 10,200.00
34	PHASOR MEASUREMENT UNIT : WAMS - SUBSTATION GRADE L3 LAN SWITCH	3	SET	₹ 5,100.00	₹ 15,300.00
35	PHASOR MEASUREMENT UNIT : WAMS - ASSOCIATED TERMINATION OF ARMORED FIBRE OPTIC CABLE FOR CONNECTING PMU PANELS. (E.G. L2 SWITCH IF APPLICABLE, PATCH CORD, LIU, NETWORK CABLES ETC.)	1	LOT	₹ 1,40,250.00	₹ 1,40,250.00
36	DEPUTATION OF 3-PH NUMERICAL RELAY TEST KIT WITH OPERATOR. THE TEST KIT SHOULD HAVE VALID CALIBRATION CERTIFICATE AND OF REPUTE MAKE. MODE OF MEASUREMENT SHALL BE DAYS AT SITE	10	Days	₹ 10,200.00	₹ 1,02,000.00
37	MOBILIZATION AND DEMOBILIZATION CHARGES FOR RELAY TEST KIT WITH OPERATOR. (THIS INCLUDES 1ST MOBILIZATION ALSO)	2	Nos.	₹ 21,250.00	₹ 42,500.00

PLCC & FO COMMUNICATION. SUPERVISION OF ERECTION AND COMMISSIONING SHALL BE PROVIDED BY BHEL / EQUIPMENT SUPPLIER

38	FIBRE OPTIC COMMUNICATION SYSTEM : SDH EQUIPMENT CABINET, BASE EQUIPMENT & OTHER HARDWARE AND ACCESSORIES INCLUDING SUB RACKS, PATCH CORD, DDF ETC , SFP / OPTICAL AMPLIFIERS,	1	SET	₹ 4,250.00	₹ 4,250.00
39	FIBRE OPTIC COMMUNICATION SYSTEM : TELEPHONE INSTRUMENT WITH 8 PORT SWITCHES AND TELEPHONE CABLE E.T.C.	2	SET	₹ 4,250.00	₹ 8,500.00
40	FIBRE OPTIC COMMUNICATION SYSTEM : FODP 96FIBRE : INDOOR TYPE, RACK MOUNTED WITH FCPC COUPLING & PIGTAILS (5MTRS)	1	SET	₹ 4,250.00	₹ 4,250.00
41	OPGW Fibre Optic Distribution Panel (Joint Box)	1	SET	₹ 4,250.00	₹ 4,250.00
42	Coupling device for PLCC	2	SET	₹ 4,250.00	₹ 8,500.00
43	CARRIER EQUIPMENT ANALOG TYPE (FOR SPEECH+DATA & SPEECH+PROTECTION)	2	SET	₹ 4,250.00	₹ 8,500.00
44	Analog Protection Coupler for PLCC	2	SET	₹ 4,250.00	₹ 8,500.00
45	Digital Protection Coupler	2	SET	₹ 4,250.00	₹ 8,500.00

ETC Works for PLCC at Remote Station End Narela SS, Delhi. SUPERVISION OF ERECTION AND COMMISSIONING SHALL BE PROVIDED BY BHEL / EQUIPMENT SUPPLIER.

PLEASE NOTE - ASSOCIATED SUPPLY & SERVICES I.E. CABLING, EARTHING etc SHALL BE MEASURED, AND PAID AS PER ETC MAIN PACKAGE BOQ ITEM SIKAR.

JB, CABLING, TRAY, PIPE etc

46	BMK - Bay Marshalling Kiosks (Outdoor type, Floor / Trench mounted)	2	Nos.	₹ 1,700.00	₹ 3,400.00
47	CTJB - Junction Box (on CT structure)	2	Nos.	₹ 850.00	₹ 1,700.00
48	CVTJB - Junction Box (on CVT structure)	2	Nos.	₹ 850.00	₹ 1,700.00
49	Supply of 50 mm (Nominal Dia) HDPE - High Density PE pipe including tee / elbow as per relevant IS code. Mode of measurement shall be running length of HDPE / PVC Pipe only. Tee & Bend as per requirements are deemed included.	50	Meter	₹ 248.00	₹ 12,400.00
50	Supply of 50 mm (Nominal Dia) PVC - Pipe including tee / elbow as per	50	Meter	₹ 49.50	₹ 2,475.00
51	Supply of 32 NB GI pipes (light grade) conduits along with socket, bend and	50	Meter	₹ 266.20	₹ 13,310.00
52	Supply of 50 NB GI pipes (light grade) conduits along with socket, bend and joint on trench rack support etc complete. Supply of required clamp for fixing GI conduits on Cable rack shall be in ETC contractor scope. Mode of measurement shall be running length of pipe conduit.	50	Meter	₹ 440.00	₹ 22,000.00
53	Supply of 50 NB GI flexible pipe. Supply of required clamp for fixing GI flexible pipe shall be in ETC contractor scope. Mode of measurement shall be running length of GI flexible pipe.	50	Meter	₹ 176.00	₹ 8,800.00
54	Supply of 25 mm GI flexible pipe. Supply of required clamp for fixing GI flexible pipe shall be in ETC contractor scope. Mode of measurement shall be running length of GI flexible pipe.	25	Meter	₹ 88.00	₹ 2,200.00
55	INSTALLATION OF 110 mm dia PVC Pipe including sockets, tee & bends as required. Which shall be buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. Both ends of PVC conduits shall be closed by plastering. (Payment will be made for the as erected pipe length)	1850	Meter	₹ 93.50	₹ 1,72,975.00
56	INSTALLATION OF 50 mm dia PVC Pipe including sockets, tee & bends as required. . Which shall be buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. Both ends of PVC conduits shall be closed by plastering. (Payment will be made for the as erected pipe length)	1650	Meter	₹ 55.25	₹ 91,162.50

57	INSTALLATION OF 50/32 NB GI pipes (light grade) conduits along with socket, bend and joint on trench rack support . Cutting, threading, fixing of clamps sockets/ bends/joints where required etc. complete. Mode of measurement shall be running length of pipe conduit. GI conduits shall be used for INSTALLATION OF fibre optic cables /sensor cables.	800	Meter	₹ 68.00	₹ 54,400.00
58	INSTALLATION of 25/50 mm GI flexible pipe including fixing clamps	75	Meter	₹ 68.00	₹ 5,100.00
59	INSTALLATION OF 25/32 MM DIA. HDPE / PVC PIPE in cable trench, trays, hanger, supports, STRUCTURE, through wall etc	200	Meter	₹ 38.25	₹ 7,650.00
60	INSTALLATION OF 25/32 MM DIA. HDPE / PVC PIPE buried in the ground at a depth of 300 mm below FGL. Work includes excavation, backfilling, making trench holes and repairing of cable trench walls, cutting, fixing of sockets/ bends where required etc. complete. (Payment will be made for the as erected pipe length)	200	Meter	₹ 38.25	₹ 7,650.00
61	INSTALLATION OF FIBRE OPTIC CABLE (FO Cable) in GI Pipe / HDPE / PVC Pipe along with connectors and excluding Splicing and Termination of fibre. (Remark - Installation of GI / HDPE / PVC Pipe, Splicing and Termination covered in separate BOQ line item.)	2	km	₹ 25,500.00	₹ 51,000.00
62	SPLICING AND TERMINATION OF FIBRE OF FIBRE OPTIC CABLE	100	Nos.	₹ 382.50	₹ 38,250.00
63	INSTALLATION of HF / CO-AXIAL CABLE / CAT 6 CABLE / SHIELDED TWISTED PAIR - STP, UTP CABLE, SPECIAL PURPOSE CABLES IN GI Pipe / HDPE / PVC Pipe along with connectors / TERMINATION. Installation of GI / HDPE / PVC Pipe is covered in separate BOQ line item.	1	km	₹ 25,500.00	₹ 25,500.00
ETC of LT CABLE: Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland ,soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted.					
64	ETC of 1.1KV GRADE 3CX2.5 SQMM CONTROL CABLE	3	km	₹ 18,700.00	₹ 56,100.00
65	ETC of 1.1KV GRADE 5CX2.5 SQMM CONTROL CABLE	8	km	₹ 20,400.00	₹ 1,63,200.00
66	ETC of 1.1KV GRADE 10CX2.5 SQMM CONTROL CABLE	3	km	₹ 22,100.00	₹ 66,300.00
67	ETC of 1.1KV GRADE 19CX1.5 SQMM CONTROL CABLE	2	km	₹ 23,800.00	₹ 47,600.00
68	ETC of 1.1KV GRADE 27CX1.5 SQMM CONTROL CABLE	1	km	₹ 25,500.00	₹ 25,500.00
69	ETC of 8PAIR 1.5SQMM SCREENED INSTRUMENTATION CABLE	1	km	₹ 17,000.00	₹ 17,000.00
70	ETC of 1.1KV GRADE 3.5CX70 SQMM (PVC) POWER CABLE	2	km	₹ 38,250.00	₹ 76,500.00
71	ETC of 1.1KV GRADE 3.5CX35 SQMM (PVC) POWER CABLE	0.5	km	₹ 34,000.00	₹ 17,000.00
72	ETC of 1.1KV GRADE 2CX6 SQMM (PVC) POWER CABLE	3	km	₹ 25,500.00	₹ 76,500.00
73	ETC of 1.1KV GRADE 4CX6 SQMM (PVC) POWER CABLE	3	km	₹ 29,750.00	₹ 89,250.00
74	ETC of 1.1KV GRADE 4CX16 SQMM (PVC) POWER CABLE	8	km	₹ 32,300.00	₹ 2,58,400.00
75	Directly burried cable - Aux. power cables over 40mm OD along with lugs, cable glands to be laid in burried trench, all civil activities such as excavation, supply and laying of sand, bricks etc. shall be in contractor's scope. Including Cable Route Markers, excluding supply of Cable Gland.	1	km	₹ 47,600.00	₹ 47,600.00
Supply of CABLE GLAND: Tin/ Nickel, Nichel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. Bidder to offer the gland from authorised representative of manufacturer. Cable gland shall be subject to customer approval prior to dispatch. Cable glands shall match with the sizes of different HT/LT/Control cables. Quantity indicated is indicative only and shall be finalised during contract execution stage.					
76	Supply of Cable Gland for 1.1KV GRADE 3CX2.5 SQMM CONTROL CABLE	156	Nos.	₹ 222.20	₹ 34,663.20
77	Supply of Cable Gland for 1.1KV GRADE 5CX2.5 SQMM CONTROL CABLE	92	Nos.	₹ 279.40	₹ 25,704.80

78	Supply of Cable Gland for 1.1KV GRADE 10CX2.5 SQMM CONTROL CABLE	132	Nos.	₹ 353.10	₹ 46,609.20
79	Supply of Cable Gland for 1.1KV GRADE 19CX1.5 SQMM CONTROL CABLE	40	Nos.	₹ 457.60	₹ 18,304.00
80	Supply of Cable Gland for 1.1KV GRADE 27CX1.5 SQMM CONTROL CABLE	28	Nos.	₹ 554.40	₹ 15,523.20
81	Supply of Cable Gland for 8PAIR 1.5SQMM SCREENED INSTRUMENTATION CABLE	40	Nos.	₹ 353.10	₹ 14,124.00
82	Supply of Cable Gland for 1.1KV GRADE 3.5CX70 SQMM (PVC) POWER CABLE	16	Nos.	₹ 986.70	₹ 15,787.20
83	Supply of Cable Gland for 1.1KV GRADE 3.5CX35 SQMM (PVC) POWER CABLE	8	Nos.	₹ 457.60	₹ 3,660.80
84	Supply of Cable Gland for 1.1KV GRADE 2CX6 SQMM (PVC) POWER CABLE	40	Nos.	₹ 222.20	₹ 8,888.00
85	Supply of Cable Gland for 1.1KV GRADE 4CX6 SQMM (PVC) POWER CABLE	88	Nos.	₹ 330.00	₹ 29,040.00
86	Supply of Cable Gland for 1.1KV GRADE 4CX16 SQMM (PVC) POWER CABLE	80	Nos.	₹ 353.10	₹ 28,248.00
87	Supply of Cable Gland for 1.1KV GRADE 3.5CX300 SQMM (XLPE) POWER CABLE	4	Nos.	₹ 6,657.20	₹ 26,628.80
ILLUMINATION & VMS SYSTEM					
88	Lighting Panel ACP-2 (Outdoor type, Foundation Mounted) including installation of mounting hardwares / anchor fastener / foundation bolt etc complete in all respect.	1	Nos.	₹ 2,550.00	₹ 2,550.00
89	Sub Lighting panel SLP (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	1	Nos.	₹ 1,500.00	₹ 1,500.00
90	Outdoor Junction Box for loop in loop out of Lighting Cables (Outdoor type, Foundation / structure Mounted) including installation of support structure, mounting hardwares / anchor fastener etc complete in all respect.	1	Nos.	₹ 1,700.00	₹ 1,700.00
91	Receptacle 415V, 63A, 3 Phase outdoor type. (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	1	Nos.	₹ 1,700.00	₹ 1,700.00
92	Receptacle 415V, 250A, 3 Phase outdoor type. (Outdoor type, Foundation / structure Mounted) including installation of structure, mounting hardwares / anchor fastener etc complete in all respect.	1	Nos.	₹ 1,700.00	₹ 1,700.00
Miscellaneous					
93	Supply of Rubber mats (Class-A suitable for 1.1 kV as per IS: 15652)	10	Sq.m	₹ 1,870.00	₹ 18,700.00
94	Installation of Rubber mats (Class-A suitable for 1.1 kV as per IS: 15652) in front of Panels	10	Sq.m	₹ 425.00	₹ 4,250.00
95	Supply of Cable Sealing System / cable transit system - Modular multi-diameter (type peel-able or adjustable blocks) cable sealing system consisting of frames, blocks, stay plate and accessories. The shall be installed where the cables enter CRB, SPR in the substations. (Approved make M/s Roxtec India Pvt. Ltd / M/s MCT Brattberg India Pvt. Ltd. / any other Powergrid approved make) Mode of measurement shall be in square meter of inner dimension of frame of cable sealing system. Bidder to submit drawing, document & type test report for approval during contract stage.	0.5	Sq.m	₹ 1,39,240.00	₹ 69,620.00
96	Installation of Cable Sealing System - Modular multi-diameter (type peel-able or adjustable blocks) cable sealing system consisting of frames, blocks, stay plate and accessories. The shall be installed where the cables enter CRB, SPR in the substations. Mode of measurement shall be in square meter of inner dimension of frame of cable sealing system. <u>Minor civil works required for installation of cable sealing system is in the scope of bidder.</u>	0.5	Sq.m	₹ 13,924.00	₹ 6,962.00

97	Modification of Hole Sizes in Structures: Structure Modification - All tools and tackles required for GI structure, any other steel structure modification, Aluminium Items etc. shall be in the scope of bidder. Cutting , drilling, punching, minor civil works also included in the scope. Minor welding and application of protective / zinc rich paint on welded surface is also included in the scope.	50	Nos.	₹ 42.50	₹ 2,125.00
98	Supply & ETC of 2 HP Dewatering Pump with Outdoor Three-Phase Motor Starter Junction Box: The same shall be Portable, Self Priming, Non clog, horizontal type monobloc pump. The Pump shall be driven by electric motor suitable for outdoor application with IP-55 degree of protection. Major technical parameters: Pump Rating : 2 HP, Flow Rate : 200-400 LPM, Minimum Total Head : 12 Mtrs, Voltage Range : 415 ± 10% Volts (Three Phase).	1	Nos.	₹ 17,000.00	₹ 17,000.00
99	Supply & ETC of 5 HP Dewatering Pump with Outdoor Three-Phase Motor Starter Junction Box: The same shall be Portable, Self Priming, Non clog, horizontal type monobloc pump. The Pump shall be driven by electric motor suitable for outdoor application with IP-55 degree of protection. Major technical parameters : Pump Rating : 5 HP, Flow Rate : 1000-1400 LPM, Minimum Total Head : 10 Mtrs, Voltage Range : 415 ± 10% Volts (Three Phase)	1	Nos.	₹ 21,250.00	₹ 21,250.00
100	Supply & Installation of BAY IDENTIFICATION - Bay Name Plate as per drawing no. C/ENG/STD/BAY NAME PLATE	2	Nos.	₹ 8,500.00	₹ 17,000.00
101	Supply & Installation of Grouting of block outs, pockets, foundations, bolts holes and underside of base plates with cement, sand aggregate (of size 6 mm and down) grout 1:1:2 with non-shrink additive/grouting compound and shall be of strength not less than M30 including placing, curing, cleaning, surface preparation, testing, etc. complete with labour, materials, equipment, handling, testing, etc. all complete as per instructions of the Engineer. Nominal thickness of grouting shall be approx 100 mm for Tower Structure & approx 60 mm for equipment support structure. Actual qty as per site condition	5	cum	₹ 8,903.00	₹ 44,515.00
102	Supply and installation: Modification in existing 415V ACDB / MLDB Panel with 63A, 4 Pole MCCB (FB MCCB with thermal magnetic release for O/L (80-100%) & Fixed S/C with rotary handle and 4 number 63A rating terminal block, mounting channel, internal wiring, door cutting etc complete. MCCB & TB are to be Powergrid approved make.	1	Set	₹ 29,289.96	₹ 29,289.96
103	Supply and installation: Modification in existing 220V DCDB Panels with 32A, DP, MCCB with thermal magnetic release SE for O/L (80-100%) & fixed S/C and 2 number 32A terminal block, mounting channel, internal wiring etc complete. MCCB & TB are to be Powergrid approved make.	1	Set	₹ 26,629.06	₹ 26,629.06
UNLOADING, MATERIAL HANDLING & SAFETY SECURITY					
104	Security personnel: Watch & ward of stored / erected / commissioned material at storage area, project site, erection area or any other locations within project boundry as per material safety requirement and instruction of site in-charge complete in all aspect. Security personnel, round the clock watch & ward by authorized service agency consisting of security guard as per requirement at site. No. of post for watch & ward shall be decided by BHEL site in charge. (Unarmed security guard)	20	One post per month	₹ 63,750.00	₹ 12,75,000.00
Total Amount (Excluding GST) (ANNEXURE-B)					₹ 63,37,669.72

Percentage BoQ

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

Name of Work: Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

1.765kV AIS Switchyard at PGCIL Sikar project

2.765kV AIS Switchyard at PGCIL Khetri project in Rajasthan.

Contract No: TBSM/SIKAR-KHETRI/ETC/TENDER/24-25 DATE 27.09.2024

Name of the Bidder/ Bidding Firm / Company :						
<p align="center">PRICE SCHEDULE</p> <p align="center">(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)</p>						
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 "Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for 1.765kV AIS Switchyard at PGCIL Sikar project 2.765kV AIS Switchyard at PGCIL Khetri project in Rajasthan." - Excluding GST	1.000	Nos	26394760.00	26394760.00	INR Two Crore Sixty Three Lakh Ninety Four Thousand Seven Hundred & Sixty Only
Total in Figures					26394760.00	INR Two Crore Sixty Three Lakh Ninety Four Thousand Seven Hundred & Sixty Only
Quoted Rate in Figures			Select		0.000	INR Zero Only
Quoted Rate in Words		INR Zero Only				

	STANDARD DRAWING & DOCUMENT LIST
1	STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-1 of 2)
2	STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
3	ELECTRICAL LAYOUT PLAN AND SECTION - KHETRI
4	ELECTRICAL LAYOUT PLAN AND SECTION - SIKAR
5	SINGLE LINE DIAGRAM - KHETRI
6	SINGLE LINE DIAGRAM - SIKAR
7	TS ANNEXURE_ALUMINIUM_WELDING Procedure Aluminium Buses
8	TS ANNEXURE_INSULATING_ MAT
9	TS C-ENGG-STD-2016-RCT-01 CABLE TRENCH _ CROSSING
10	TS C-ENGG-STD-GUY-ARR Guy Arrangement detail
11	TS - CIRCUIT BREAKER
12	TS - CT AND CVT
13	TS - GTR, Revision-14-2
14	TS - ISOLATOR
15	TS PG-C-ENGG-STD-EARTHING-09 EARTHING DRAWING
16	TS - SURGE ARRESTOR
17	TS - Switchyard Erection Rev 10
18	TS TB-385-316-126 SHIELD WIRE
19	TS TB-XXX-316-041 PVC_Pipe
20	TS - TB-XXX-618-002a Specification for GI Hardware

	STANDARD DRAWING & DOCUMENT LIST
21	TS D-2-01-03-01-04 Pre Commissioning Procedures NT2
22	TS -Tempreature_TRANSDUCER

Sl.	1.1 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-1 of 2)
1	Brief scope of ETC (Erection, Testing & Commissioning) work includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning including trial run (as per BHEL / Customer FQP) of 765kV AIS and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer. The Scope also include all T&P including all testing and commissioning equipment suitable for 765kV equipment, hydra/crane, man lifter etc as required to complete installation, testing & commissioning of the system shall be bidder's scope.
2	Bidder Supplied Material - For approved make of supply items, please visit "POWERGRID COMPENDIUM OF VENDORS OF THE EQUIPMENT" at following website address. https://apps.powergrid.in/ims-doc/default Bidder to offer items from powergrid approved make only (as applicable). Bidder to supply material of proven design and make, which have already been extensively used and tested. Bidder to obtain approval from BHEL Engineer incharge / Customer prior to supply. Quantity of supply items are provisional and shall be finalised during contract stage. Qty of supply item may vary upto any extend and and even may get deleted.
3	All consumables required for sucessful erection testing & commissioning of present scope of work is in bidders scope, such as (not limited to) Welding Electrodes, Low hydrogen content welding electrode, Ferruls, Cable Lug, cable ties, , Paint, bitumen compound, Zinc riched enamel paint, red oxide and zinc chromate etc. complete in all respect.
4	All pre/commissioning activities for substation equipment shall be carried out in accordance "Pre- Commissioning procedures for Switchyard Equipments (Doc. No. D-2-01-03-01-03)".
5	Tower & Equipment foundation shall have foundation bolts pre installed by BHEL's Civil contractor. However installation of some Inserts & Embedded material, bolts, anchor fastner shall be deemed inclusive of bidder's scope of service under respective main item etc works where as required
6	The storage instructions of the equipment manufacturer/ Employer shall be strictly adhered to. POWERGRID Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.
7	ETC of Power / Control / Instrument Cable: Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland ,soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted.

Sl.	1.1 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-1 of 2)
8	ETC of Directly Buried Cable (including sand bed & brick cover) - Scope includes laying of cables, directly in buried cable trench. All civil & erection activities such as excavation, supply and placement of sand, bricks, backfilling, compaction, tagging, dressing, ferruling, lugging, installation of cable gland, soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates etc shall be in contractor's scope. All erection materials viz. Sand, Bricks, Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted.
9	For Directly Buried Cable (as mentioned above) bidder to supply & install cable route marker. Location of cables laid directly underground shall be clearly indicated with cable route marker made of galvanised iron plate. The cable route marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings as per relevant standard.
10	All arc welding shall be done with low hydrogen content electrodes for all earthing works i.e. MS Rod, GI Flat & MS Flat
11	The welds on 40MM MS Rod should be treated with red oxide primer and afterwards coated with two layers of bitumen compound to prevent corrosion.
12	50mm x 6mm MS flat shall run on the top tier and all along the cable trenches and the same shall be welded to each of the racks. Further this flat shall be earthed at both ends and at an interval of 30 mtrs. The M.S. flat shall be finally painted with two coats of Red oxide primer and two coats of Zinc riched enamel paint.
13	Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
14	All welding done at site for equipment and structures, shall be painted with zinc rich paint immediately to avoid corrosion.
15	Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminium paint. The red oxide and zinc chromate shall conform to IS: 2074.
16	Installation of Cable Trench Material include all miscellaneous activity including minor fabrication, welding, cutting, drilling holes, bolting, anchor bolting, etc. complete in all respect. Where as fabrication is required shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminium paint. The red oxide and zinc chromate shall conform to IS: 2074.
17	Quoted rates are deemed to be inclusive of all miscellaneous works viz erection of mounting hardware, clamp- connectors, etc complete in all respect. For example - Equipment erection (say Surge Arrestor) means complete erection, metallics, connectors (expansion/rigid tubular for Al. Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc.
18	All the phases are to be identified by painting the structures Red, Yellow and Blue by reflecting colour as per as built condition. Phase identification colour is to be provided around the top of the structure with colour band of 100 mm width at a height of approximately 2000mm from the finished ground level.

Sl.	1.1 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-1 of 2)
19	Supply of 110 MM & 50mm dia. PVC PIPES CLASS-IV PIPES (if called in bid price schedule) including Bend and Tee etc shall be as per technical specification TB-XXX-316-041. (Supply of PVC Pipe (class 4) as per IS 4985, alongwith accessories like sockets, bends, tees etc, Customer accepted make.)
20	Supervision of testing and commissioning of Relay / Protection / SAS / Automation / Bus Bar Panes (as applicable) is in the scope of BHEL/ Panel supplier. Necessary manpower support, tools, tackles and testing equipment to be in scope of ETC contractor.
21	Removal of gravel, if gravelling is already done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing , contractor should place the gravel to bring it in original shape.
22	Complete ETC package is under the scope of bidder. All T&P required to complete the job shall be provided by bidder only. Bidder to arrange MAN LIFTER for 765kV & 400kV equipment erection & testing. Height of manlifter shall be 14m approach for 765kV Yard

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
1	All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract.
2	The ETC instructions of the equipment manufacturer/ Employer shall be strictly adhered to. Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.
3	Automatic Relay Test Kit along with Laptop and Testing engineer shall be provided by BHEL/ Panel supplier. (NOT in Bidder's scope). Necessary manpower support, tools, tackles, wiring, BUS wiring and other testing equipment to be in scope of Bidder (ETC contractor).
4	All consumables required for successful erection testing & commissioning of present scope of work is in bidders scope, such as (not limited to) Welding Electrodes, Low hydrogen content welding electrode, Ferrules, Cable Lug, cable ties, Paint, bitumen compound, Zinc riched enamel paint, red oxide and zinc chromate paint ..etc complete in all respect.
5	ETC of Power / Control / Instrument Cable: Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland ,soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted.
6	Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 metre interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminium strip clamps at every 2m.
7	Vertical run of cables on equipment support structure shall be supported on perforated cable trays of suitable width which shall be suitably bolted/clamped with the equipment support structure. Tray shall be supplied by BHEL.
8	All welding done at site for equipment and structures, shall be painted with zinc rich paint immediately to avoid corrosion.

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
9	<p>Bidder to offer items from Powergrid approved make only (as applicable). Bidder to supply material of proven design and make, which have already been extensively used and tested. Bidder to obtain approval from BHEL Engineer incharge / Customer prior to supply. Quantity of supply items are provisional and shall be finalised during contract stage. Qty of supply item may vary upto any extend and and even may get deleted.</p>
10	<p>CABLE LUG: Supply of cable lug is in bidders scope. cable lugs shall be tinned copper solderless crimping type conforming to IS-8309 & 8394 for all control Cables and cables with copper wire.</p> <p>For Aluminium Bimetallic lugs for power cables as required shall be used depending upon type of cables and terminations. Solderless crimping of terminals shall be done by using corrosion inhibitory compound.</p> <p>The cable lugs shall suit the type of terminals provided. The bidder shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve.</p> <p>Bidder to supply cable lug from manufacturer's authorised representative / dealer. Make of cable lug is to be approved by Powergrid i.e. DOWELLS /COMET/ JAIN ELECTRONICS/ JAICO ELECTRIC/ SI METAL WORKS / Powergrid approved make etc.</p>
11	<p>Cable TAGS & Markers - Bidder to supply and install cable tag & markers. The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS:280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.</p> <p>Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/trench runs.</p> <p>Cable tags shall be provided inside the switchgear, motor control centres, control and relay panels etc., wherever required for cable identification, where a number of cables enter together through a gland plate.</p>

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
12	<p>Cable Gland: Tin/ Nickel, Nickel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. Bidder to offer the gland from authorised representative of manufacturer. Cable gland shall be subject to customer approval prior to dispatch. Cable glands shall match with the sizes of different HT/LT/Control cables. After installation of cabling work balance gland holes are to be sealed by bidder with suitable aluminium sheeth, cost of additive and aluminium sheet are deemed inclusive in the bidders scope.</p>
13	<p>Modular Multi-diameter Cable sealing system consisting of Openable frames, blocks and accessories shall be installed where the underground and over-ground cables enter or leave concrete bay kiosks /Switchyard panel room & control rooms in the substations. Cable sealing system shall consist of Multi-diameter type peel-able or adjustable blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system.</p> <p>Solid blocks shall not be used on frame. Openable frames & stay-plate material shall be of galvanized steel and for compression single piece wedge with galvanized steel bolts shall be used. Cable sealing system should have been tested for fire/ water/ smoke tightness. All the accessories of cable sealing system shall be suitable for mounting after the laying of cable.</p> <p>Modular Multi-diameter Cable sealing system should be Powergrid approved make & conformed relevant IS/IEC</p>

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
14	<p>Cable Transit System / Modular Multi-diameter Cable sealing system: Cable sealing system shall consist of multi-diameter type peel-able or adjustable blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system.</p> <p>1) Scope shall include all the items which are necessary for successful supply & installation (including nuts and bolts, if required) and satisfactorily working/maintenance of the offered cable.</p> <p>2) Compression tools and accessories necessary in the installation shall be considered in the supply scope that shall be required at a later stage for new cable.</p> <p>3) The Contract shall be on lump-sum basis for the package. Within the scope of the contract, no variation shall be admissible to the Contractor so far the input remains unchanged. In case of change in scope after award of the contract, the additions/ deletions to the scope shall be as per the breakup unit rates for all the equipment and services furnished by the bidder in his offer.</p> <p>4) Minor Civil work with brick masonry required for installation is in the scope of bidder.</p> <p>5) Solid blocks shall not be used on frame. Frames & stay-plate material shall be of galvanized steel and for compression, single piece wedge with galvanized steel bolts shall be used. 30% spare blocks on the frame shall be provided for expansion in future. Cable sealing system should have been tested for fire/water/smoke tightness.</p> <p>6) Minor civil work required for installation of cable sealing system is included in the scope of bidder.</p>
15	<p>Insulating Rubber Mats - The scope covers supply and laying of insulating mats of class-A conforming to IS: 15652-2006. These insulating mats shall be laid in front of all floor mounted ACDB, CRP, SAS (As applicable under present scope) in control room building/ Switchyard panel room. The insulating mats shall be made of elastomer material free from any insertions leading to deterioration of insulating properties. It shall be resistant to acid, oil and low temperature. Upper surface of the insulating mats shall have small aberration (rough surface without edges) to avoid slippery effects while the lower surface shall be plain or could be finished slip resistant without affecting adversely the dielectric property of the mat. The Insulating mat shall be of pastable type, to be fixed permanently on the front of the panels except for the chequered plate area which shall not be pasted as per requirement. The insulating mats shall generally be fixed and joints shall be welded as per recommendations in Annexure-A of IS: 15652. Width of insulating mats shall generally be of 1.5 meters or as per site requirements. Length shall be supplied as per site requirement.</p>
16	<p>Complete ETC package is under the scope of bidder. All T&P required to complete the job including cranes, forklift e.t.c. shall be provided by bidder. Bidder to arrange MAN LIFTER for equipment erection & testing as per requirement. Height of manlifter boom shall be 14m approach for 765kV Substation.</p>

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
17	Equipment and tower erection would include supply and erection of miscellaneous items , viz Phase colour discs , labels painting of equipments , phase colour painting , phase marking , bay identification board , danger plates , rubber mats , device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.
18	The welds on MS Rod should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
19	MS / GI flat shall run on the top tier and all along the cable trenches and the same shall be bolted / welded to each of the racks. Further this flat shall be earthed at both ends and at an interval of 30 mtrs.
20	The welds involving GI Flat should be treated with zinc chromate primer and coated with zinc rich paint. Equipment bolted connections after being tested and checked shall be painted with anti corrosive paint/compound.
21	MS Welding - The M.S. flat/angle/channel shall be finally painted with two coats of Red oxide primer and two coats of Zinc rich enamel paint.
22	All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. All arc welding with large dia. conductors shall be done with low hydrogen content electrodes.
23	Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
24	Grouting: Cost of Supply and placement of grouting is deemed inclusive in bidder's scope of work. i) Non-shrink flowable grout shall be used for under pinning work below base plate of columns. Non-shrink cum plasticiser admixture shall be added in the grout. ii) Minimum grade of grout shall be M30. iii) Nominal thickness of grouting shall be approx 80 mm for Tower Structure & approx 60 mm for equipment support struture.
25	All final adjustment of foundation levels, chipping and dressing of foundation surfaces, setting and grounding of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil works as may be required for erection. Cost of the same is deemed inclusive in the scope.

Sl.	1.2 STANDARD TECHNICAL NOTES & BIDDER'S SCOPE (Part-2 of 2)
26	Any cutting of masonry / concrete work, Wall openings at suitable locations for ventilation fans, Civil works such as grouting, filling up of crevices/ cut outs etc. during installation of equipments, modification of civil foundations, making holes in the trenches/ control room building, fixing of trench material shall be done by the bidder and shall be made good including supply and installation of chicken wire mesh to match the original work. Any other damage caused to civil works during ETC work of the equipment/ system shall be made good to the original finish. Cost of the same is deemed inclusive in the scope.
27	Individual item may vary up-to any extent and even may get deleted, however overall contract value may vary +/- 30%. Variation will be valid up-to contract stage.
28	Testing instruments (duly calibrated) have to be arranged by ETC Contractor in full completion of testing requirement at it's own cost on returnable basis (List is only provided for information , if any other instrument not mentioned below but required for successful completion of ETC work shall be in ETC contractor's scope. Bidder to review complete BOQ for possible requirements of instruments)
28.01	CRM (Contact Resistance Measurement kit)
28.02	Capacitance and Tan delta measurement Kit
28.03	Dew Point Measurement kit
28.04	5kV & 1kV Insulation tester
28.05	Primary current / Voltage Injection Kit
28.06	Secondary current/Voltage Injection kit
28.07	1Ph Variac
28.08	Multimeters
28.09	Clamp on meter
28.10	Power supply sockets with extension board -2 nos.
28.11	Necessary numbers of fire extinguisher
28.12	Timing & DCRM (Dynamic Contact Resistance Measurement kit) OPERATIONAL ANALYZER
29	NOT IN BIDDER's scope: Following Testing instruments are NOT IN BIDDER's scope. However complete skilled & unskilled manpower supports are to be provided for successful ETC works
29.01	OMICRON or equivalent kit for Numerical relay testing, Automatic Relay Test Kit along with Laptop

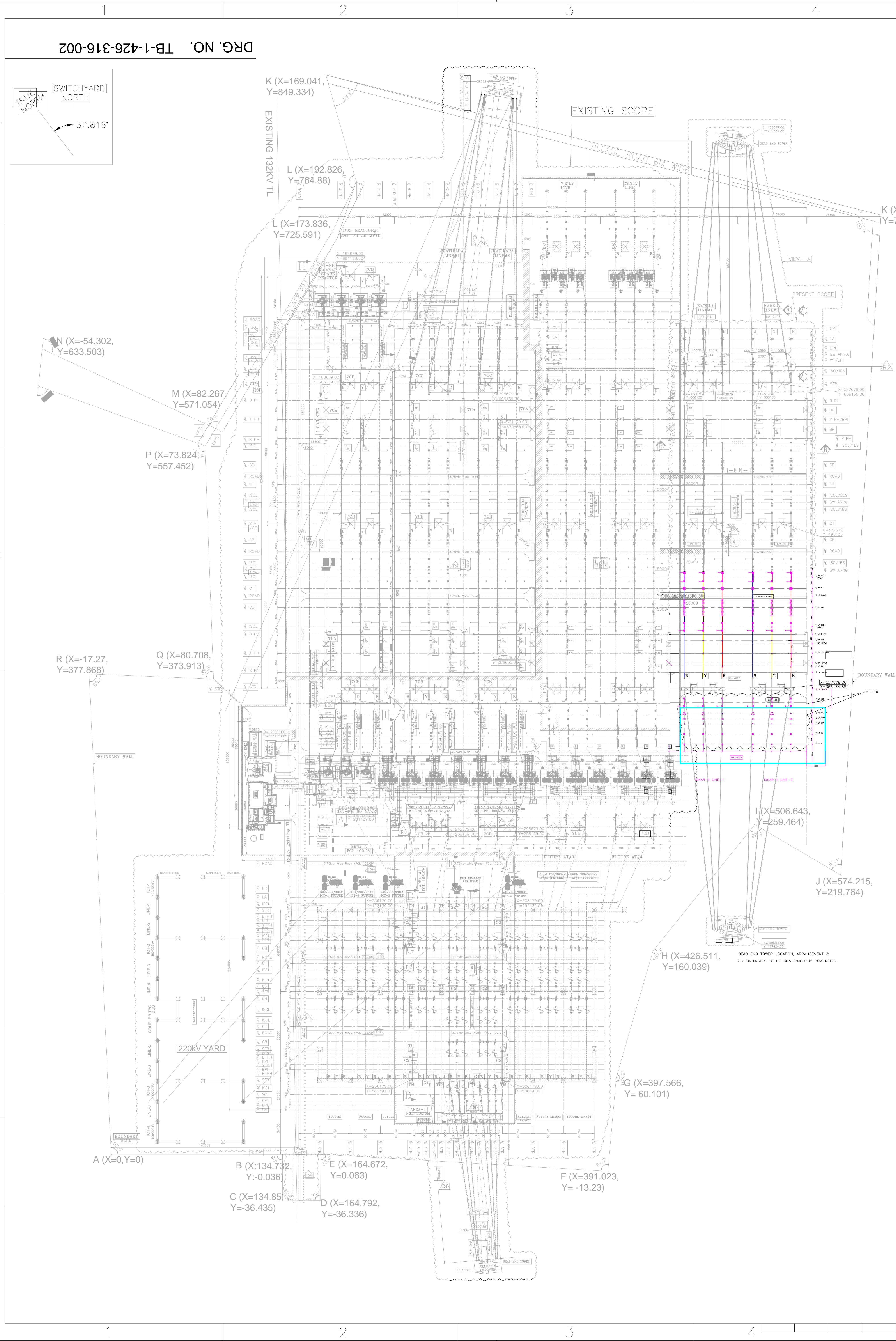
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COMPUTER DRG. PATH NAME :

REF. DRG. NO.

SIGN. AND DATE

INVENTORY NO



BILL OF QTY. FOR 765KV MAIN EQUIPMENTS:

SL.NO	DESCRIPTION	UNIT	QUANTITY & PARTO		REMARKS
			AS PER LOA	AS PER ACTUAL	
1	765KV, 3150A, 50KA CIRCUIT BREAKER(3-PH) WITH CLOSING RESISTOR (W/R Support Structure)	EA	02	02	
2	765KV, 3000A, 50KA 1 PHASE CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING	EA	06	06	
3	765KV, 800F CAPACITIVE VOLTAGE TRANSFORMER(3-PH)	EA	06	06	
4	765KV, 3150A, 50KA VERTICAL KNEE / DOUBLE BREAK ISOLATOR(3-PH) WITH 1 ES	EA	04	04	
5	765KV, 3150A, 50KA VERTICAL KNEE / DOUBLE BREAK ISOLATOR(3-PH) WITH 2 ES	EA	02	02	
6	624KV SURGE ARRESTER (1 PH)	EA	06	06	
7	765KV, 3150A, 1 OHM, 50KA LINE TRAP	EA	04	04	
8	765KV, BUS POST INSULATOR (FOR LINE TRAPS)	EA	12	12	
9	765KV, BUS POST INSULATOR (EXCEPT FOR LINE TRAPS)	EA	18	18	
10	GYL ARRANGEMENT - PRESENT SCOPE	EA	--	06	PART OF ERECTION HARDWARE

SWITCHYARD PANEL ROOM & BAY MARSHALLING KIOSK:

SL. NO.	DESCRIPTION	LOA QTY	ACTUAL QTY	REMARKS
1	SWITCHYARD PANEL ROOM (SPR) - 765KV (IM X 4.5M)	00	00	EXISTING SPR
2	BAY MARSHALLING KIOSK (BMK) - 765KV	02	02	PART OF ERECTION HARDWARE

SYSTEM PARAMETERS:

SL.No	DESCRIPTION	765KV
1.0	RATED VOLTAGE	765 kV
2.0	HIGHEST SYSTEM VOLTAGE	850 kV rms
3.0	RATED FREQUENCY	50 Hz
4.0	MAX. FAULT LEVEL (1 Sec.)	50 KA
5.0	RATED 1 min POWER FREQ. WITHSTAND VOLTAGE	850 kV rms
6.0	RATED SWITCHING IMPULSE VOLTAGE (WV & WET)	1550 kVp
7.0	FULL WAVE IMPULSE WITHSTAND VOLTAGE	2100 kVp
8.0	MINIMUM CREEPAGE DISTANCE	20000 mm
9.0	SYSTEM EARTHING	EFFECTIVELY EARTH
10.0	AUXILIARY SUPPLY VOLTAGE	ii) 415V, 3PH, 3W, 4WY, 3PH AC iii) 220V, D.C, 50V DC

CONDUCTOR DETAILS OF 765 kV SIDE:-	
a) MAIN BUS	QUAD BULL AAC AT 29 M.
b) JACK BUS	QUAD BULL AAC AT 42 M.
c) BAY EQPT BUS	4.5" IPS AL TUBE AT 14 M
d) DROPPER / JUMPER	QUAD BULL AAC
NO. OF STRINGS/PHASE:-	
a) FOR TENSION	2
b) FOR SUSPENSION	1
SUB CONDUCTOR SPACING:-	
EARTHWARE	
10.98 MM DIA GI WIRE	

CLEARANCE TABLE AS PER PGCIL SPEC:-

S.No	DESCRIPTION	MIN. SYSTEM CLEARANCE
1	PHASE TO PHASE FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm
2	PHASE TO GROUND FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm
3	PHASE TO GROUND FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm
4	PHASE TO GROUND FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm
5	PHASE TO GROUND FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm
6	PHASE TO GROUND FOR CONDUCTOR-CONDUCTOR CONFIGURATION	Minimum 14000mm

GENERAL NOTE:

- FGL SHOWN IS TENTATIVE ONLY & TO BE CONFIRMED BY POWERGRID.
- ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- LINE SIDE EQUIPMENTS ARE UNDER HOLD & SHALL BE FINALIZED AFTER FINALIZATION OF DEAD END TRANSMISSION LINE TOWER.
- 765KV WAVE TRAP HAVE BEEN PLACED IN R AND Y PHASE, HOWEVER FINALIZATION TO BE CONSTRUCTED IN ALL THREE PHASES.
- DEAD END TOWER ERECTION AND OUTGOING STRINGING OF LINE CONDUCTOR & SHIELD WIRE ARE NOT IN BHEL SCOPE BUT CONNECTION OF EQUIPMENT TOWARDS LINE SIDE SHALL BE DONE BY BHEL. SUPPLY OF TENSION INSULATOR STRING ON LINE SIDE OF TAKE OFF GANTRY IS IN BHEL SCOPE OF WORK INCLUDING TENSION CLAMP FOR EARTHWARE.
- DETAILS OF BMK, CTB, CVT, JUNCTION BOX & SWITCHYARD PANEL ROOM (SPR) LOCATION SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.

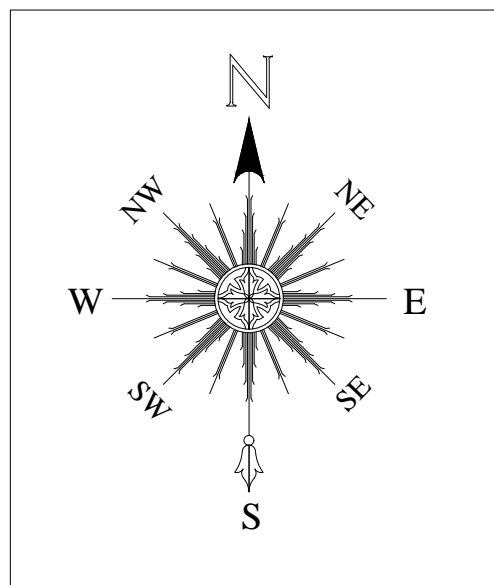
LEGEND:

- PRESENT SCOPE
- NOT IN SCOPE OR FUTURE SCOPE
- LEVEL LINE UNDER PRESENT SCOPE
- SLOPE

NOA NO. : CC/TW-AIS/DOM/A02/24/02512/NOA-1/24-102620/01 (Supply of Goods Contract) dt 22/02/2024
and CC/TW-AIS/DOM/A02/24/02512/NOA-2/24-102620/02 (Supply of Services Contract) dt 22/02/2024

ADDITIONAL INFORMATION W.O.No.		NAME OF CUSTOMER/PROJECT SIKAR KHETRI TRANSMISSION LIMITED (M/s POWERGRID)		SUBSTATION PACKAGE SS01 FOR (a) EXTN. OF 765KV SIKAR-II SUBSTATION, (b) EXTN OF 765KV KHETRI SUBSTATION, ASSOCIATED WITH TRANSMISSION SYSTEM FOR EVACUATION OF POWER FROM REZ IN RAJASTHAN (20 GW) UNDER PHASE III-PART D	
STATUS OF DRAWING		NAME OF CONSULTANT		---	
DISTRIBUTION OF PRINTS		BHEL		BHEL	
REV.	DATE	ALTERED CHECKED APPROVED	DEPT. CODE	उत्तरपत्र / SCALE CARD CODE	हस्ता / SIGN. दि./DATE
ZONE	शीर्षक/TITLE		KHETRI S/S EXTN - 765KV ELECTRICAL LAYOUT PLAN		ड्राईंग.क्र./DRAWING NO. TB202383-1002397-SS3520-765KV-ELECT-LAY-PLAN (BHEL DWG NO. TB-1-426-316-002)
पृष्ठ क्र./SHEET No. 01		अगला पृष्ठ/NEXT SHEET		00	

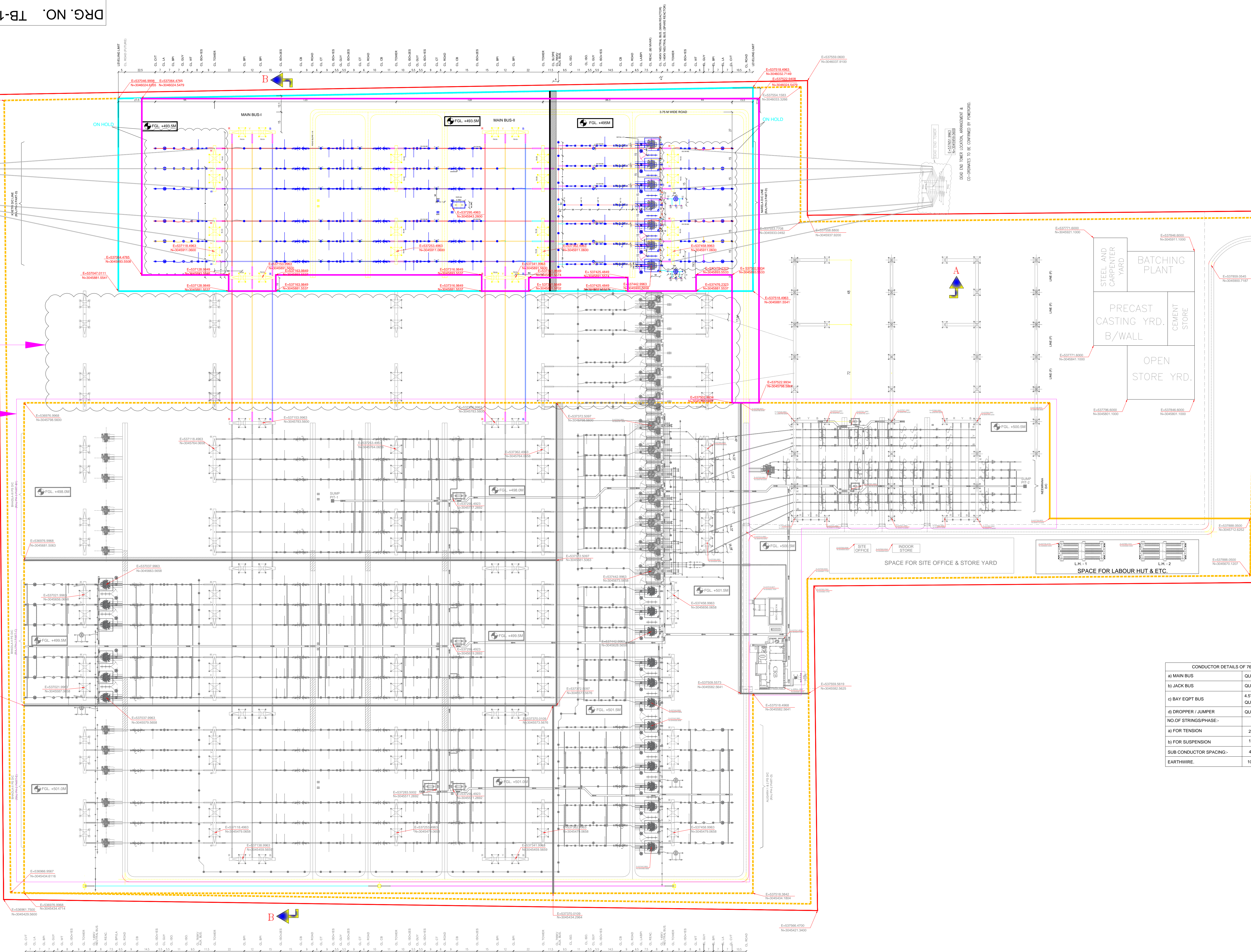
DRG. NO. TB-1-426-316-002A



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NOT IN BHEL
SCOPE

EXISTING



BILL OF QTY. FOR 765KV MAIN EQUIPMENTS:

SL.NO.	DESCRIPTION	UNIT	QUANTITY # PART D AS PER LOA	AS PER ACTUAL	REMARKS
1	800KVA 765 KV LINE REACTOR (1 PH) (Including 3000 Resistor)	NOS	07	07	OWNER'S SUPPLY
2	765KV 3150A SNA CIRCUIT BREAKER (PH) WITH CLOSING RESISTOR WITH SUPPORT STRUCTURE	EA	05	05	
3	765 KV 3150 A 50 KA 3 PH CIRCUIT BREAKER WITHOUT CLOSING RESISTOR WITH CONTROL SWITCHING SUITABLE FOR 1 PH REACTOR SWITCHING (W/S SUPPORT STRUCTURE)	EA	02	02	
4	765KV 3150A SNA SINGLE PHASE CIRCUIT BREAKER (W/S SUPPORT STRUCTURE)	EA	01	01	
5	CONTROLLED SWITCHING DEVICE FOR 765KV 3 PH CIRCUIT BREAKER	EA	02	02	
6	765KV 3000A SNA 1 PHASE CURRENT TRANSFORMER WITH EXTENDED CURRENT RATING	EA	15	15	
7	765KV 1000KVAR CAPACITIVE VOLTAGE TRANSFORMER (1 PH)	EA	12	12	
8	765KV 3150A SNA VERTICAL KNEE / DOUBLE BREAK ISOLATOR (PH) WITH 1 E/S	EA	10	12	
9	765KV 3150A SNA VERTICAL KNEE / DOUBLE BREAK ISOLATOR (PH) WITH 2 E/S	EA	04	04	
10	765KV 3150A SNA VERTICAL KNEE / DOUBLE BREAK ISOLATOR (PH) WITH 1 E/S	EA	07	07	
11	765KV 3150A SNA VERTICAL KNEE / DOUBLE BREAK ISOLATOR (PH) WITHOUT E/S	EA	11	11	
12	624KV SURGE ARRESTER (1 PH)	EA	19	19	
13	765KV 3150A 1.0MH 50KA LINE TRAP	EA	08	08	
14	765 KV BUS POST INSULATOR (FOR LINE TRAPS)	EA	24	24	
15	765 KV BUS POST INSULATOR (EXCEPT FOR LINE TRAPS)	EA	43	38	
16	765 KV BUS POST INSULATOR (FOR AUX. BUS)	EA	17	17	PART OF ERECTION HARDWARE
17	GVY ARRANGEMENT - PRESENT SCOPE	EA	12	12	
18	GVY ARRANGEMENT - ADDITIONAL SCOPE	EA	12	12	

BILL OF QTY. FOR 145KV & 33KV EQUIPMENTS

SL.NO.	DESCRIPTION	UNIT	QUANTITY # PART D AS PER LOA	AS PER ACTUAL	REMARKS
1	145 KV 1200A 31 SNA CB (PH)	EA	02	02	OWNER'S SUPPLY
2	132 KV SURGE ARRESTOR (1 PH)	EA	02	02	OWNER'S SUPPLY
3	145 KV 500 OHM NGR	EA	02	02	OWNER'S SUPPLY
4	33 KV CURRENT TRANSFORMER FOR 765V REACTOR NEUTRAL ALONG WITH SUPPORT	EA	02	02	
5	145 KV BUS POST INSULATOR (W/S BYPASS ARRANGEMENT)	EA	04	04	
6	145 KV BUS POST INSULATOR (FOR REACTOR NEUTRAL AUX. BUS)	EA	17	17	PART OF ERECTION HARDWARE

SWITCHYARD PANEL ROOM & BAY MARSHALLING KIOSK:

SL. NO.	DESCRIPTION	LOA QTY	ACTUAL QTY	REMARKS
1	SWITCHYARD PANEL ROOM (SPR) - 765KV (8M X 4.5M)	01	02	PART OF ERECTION HARDWARE
2	BAY MARSHALLING KIOSK (BMK) - 765KV	04	05	

AS PER INPUT DRAWINGS SHARED BY POWERGRID. THESE ARE ADDITIONAL QUANTITY REQUIREMENTS OVER CONTRACT BOQ.

SYSTEM PARAMETERS:

SL.No	DESCRIPTION	765KV
1.0	RATED VOLTAGE	765 KV
2.0	HIGHEST SYSTEM VOLTAGE	800 KV rms
3.0	RATED FREQUENCY	50 Hz
4.0	MAX. FAULT LEVEL (1 Sec.)	50 KA
5.0	RATED 1 min POWER FREQ. WITHSTAND VOLTAGE	630 KV rms
6.0	RATED SWITCHING IMPULSE VOLTAGE (ORY & WET)	1550 KV
7.0	FULL WAVE IMPULSE WITHSTAND VOLTAGE	2100 KV
8.0	MINIMUM CREEPAGE DISTANCE	2000 mm
9.0	SYSTEM EARTHING	EFFECTIVELY EARTH
10.0	AUXILIARY SUPPLY VOLTAGE	a) 415V 3PH AC 240V 1PH AC b) 220V D.C. 50V DC

CLEARANCE TABLE AS PER PGCIL SPEC:

SL.No	DESCRIPTION	765KV
1	MINIMUM CLEARANCE FOR CONDUCTOR-TO-CONDUCTOR CONFIGURATION	10000 mm
2	MINIMUM CLEARANCE FOR CONDUCTOR-TO-STRUCTURE CONFIGURATION	8000 mm
3	MINIMUM CLEARANCE FOR CONDUCTOR-TO-CONDUCTOR CONFIGURATION	8000 mm
4	MINIMUM CLEARANCE FOR CONDUCTOR-TO-CONDUCTOR CONFIGURATION	10000 mm

GENERAL NOTE:

1. FGL SHOWN IS TENTATIVE ONLY & TO BE CONFIRMED BY POWERGRID.
2. ALL DIMENSIONS ARE IN METER UNLESS OTHERWISE SPECIFIED.
3. SUPPLY, ERECTION, TESTING & COMMISSIONING OF 80 MVAR 765 / 3 KV SINGLE PHASE LINE REACTOR AND ASSOCIATED NGR & 120KV LA ARE NOT IN UNDER SCOPE OF WORK.
4. LINE SIDE EQUIPMENTS ARE UNDER HOLD & SHALL BE FINALIZED AFTER FINALIZATION OF DEAD END TRANSMISSION LINE TOWER.
5. 765KV WAVE TRAP HAVE BEEN PLACED IN R AND Y PHASE, HOWEVER FOUNDATION TO BE CONSTRUCTED IN ALL THREE PHASES.
6. DEAD END TOWER ERECTION AND OUTGOING STRINGINGS OF LINE CONDUCTOR & SHIELD WIRE ARE NOT IN BHEL SCOPE BUT CONNECTION OF EQUIPMENT TOWARDS LINE SIDE SHALL BE DONE BY BHEL. SUPPLY OF TENSION INSULATOR STRING ON LINE SIDE OF TAKE OFF GANTRY IS IN BHEL SCOPE OF WORK INCLUDING TENSION CLAMP FOR EARTHWIRE.
7. FIRE RESISTANT WALL BETWEEN 765V REACTORS UNITS ARE IN BHEL SCOPE.
8. DETAILS OF BMK, CTJB, CVT JUNCTION BOX & SWITCHYARD PANEL ROOM (SPR) LOCATION SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.
9. DETAILS OF BMK, CTJB, CVT JUNCTION BOX & SWITCHYARD PANEL ROOM (SPR) LOCATION SHALL BE SHOWN IN CABLE TRENCH LAYOUT DRAWING.

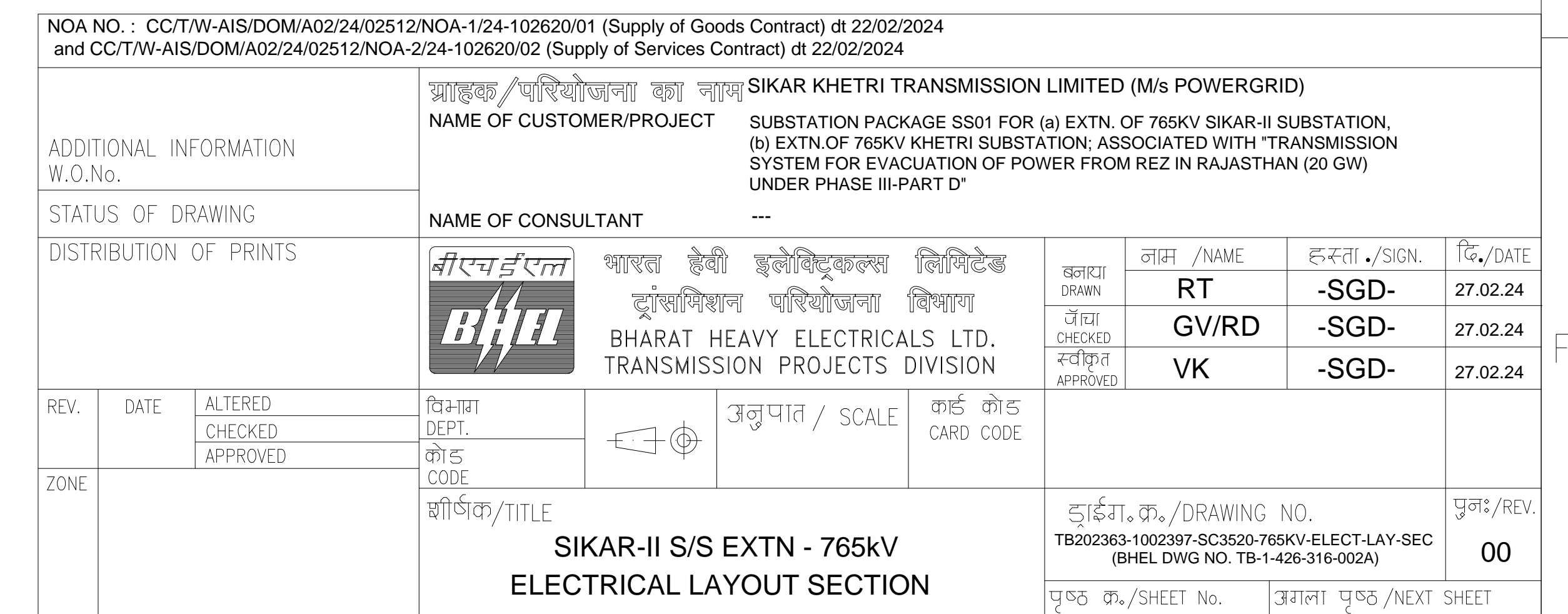
LEGEND:

---	PRESENT SCOPE
---	NOT IN SCOPE OR FUTURE SCOPE
---	FIXED (NOT IN BHEL SCOPE)
---	BOUNDARY WALL (NOT IN BHEL SCOPE)
---	LEVEL LINE UNDER PRESENT SCOPE
---	SLOPE

CONDUCTOR DETAILS OF 765 KV SIDE:	
a) MINIMUM BUS	QUAD BULL AAC AT 28 M
b) JACK BUS	QUAD BULL AAC AT 42 M
c) BAY EQPT BUS	4.5" IPS AL TUBE AT 14 M
d) DROPPER / JUMPER	QUAD BULL AAC
e) NO OF STRINGS/PHASE:-	
a) FOR TENSION	2
b) FOR SUSPENSION	1
c) SUB CONDUCTOR SPACING:-	450 mm
EARTHWIRE:	10.98 MM DIA GI WIRE

NOA NO. : CC/TW-AIS/DOM/A02/24/02512/NOA-1/24-102620/01 (Supply of Goods Contract) dt 22/02/2024
and CC/TW-AIS/DOM/A02/24/02512/NOA-2/24-102620/02 (Supply of Services Contract) dt 22/02/2024

ADDITIONAL INFORMATION W.O.No.		NAME OF CUSTOMER/PROJECT SIKAR KHETRI TRANSMISSION LIMITED (M/s POWERGRID)	
STATUS OF DRAWING		NAME OF CONSULTANT	
DISTRIBUTION OF PRINTS		---	
REV.	DATE	ALTERED CHECKED APPROVED	DEPT. CODE
ZONE	शीर्षक/TITLE SIKAR-II S/S EXTN - 765KV ELECTRICAL LAYOUT PLAN		
DRAWN RT		CHECKED GV/RD	
APPROVED VK		APPROVED SGD	
DATE		DATE	
DRAWING NO. TB202363-1002397-SC3520-765KV-ELECT-LAY-PLAN (BHEL DWG NO. TB-1-426-316-002A)		DRAWING NO. TB202363-1002397-SC3520-765KV-ELECT-LAY-PLAN (BHEL DWG NO. TB-1-426-316-002A)	
Pृष्ठ क्र./SHEET No.		अगला पृष्ठ/NEXT SHEET	



DRG. NO. TB-1-426-S10-001

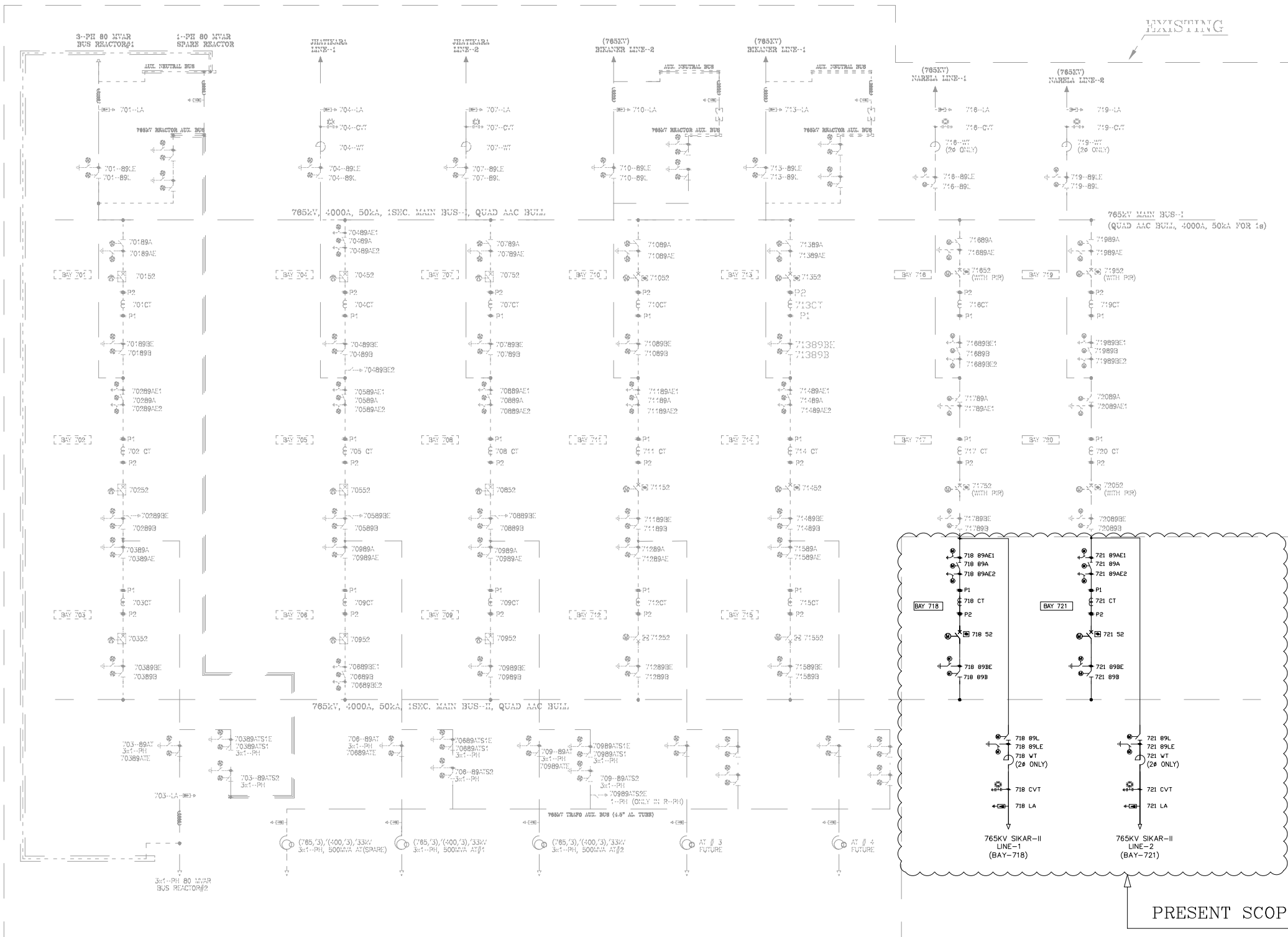
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COMPUTER DRG. PATH NAME :

REF. DRG. NO.

SIGN AND DATE

INVENTORY NO



BILL OF QUANTITY-765KV EQUIPMENTS (50KA FOR 1 SEC.)							
SL. NO.	SYMBOL	LEGEND	DESCRIPTION	SUPPLY	MAKE	LOCATION	ACTUAL QTY.
01		LA	624KV SURGE ARRESTER (1-PHASE)	BHEL	SHALL BE PROVIDED LATER	718-LA, 721-LA	06
02		CVT	765KV/800 pF CAPACITIVE VOLTAGE TRANSFORMER (1-PHASE)	BHEL		718-CVT, 721-CVT	06
03		WT	765KV/3150A/1.0MH, 50kA LINE TRAP (1-PHASE)	BHEL		718-WT, 721-WT	04
04		CT	765 KV, 3000A, 50KA, 1-PHASE CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING	BHEL		718-CT, 721-CT	06
05		CB	765KV, 3150A, 50KA CIRCUIT BREAKER(3-PHASE) WITH CLOSING RESISTOR	BHEL		718-52, 721-52	02
06		80	765KV, 3150A, 50KA VERTICAL KNEE/DOUBLE BREAK ISOLATOR (3-PHASE) WITH ONE L/S	BHEL		718-89B, 718-89L, 721-89B, 721-89L	04
07		80	765KV, 3150A, 50KA VERTICAL KNEE/DOUBLE BREAK ISOLATOR (3-PHASE) WITH TWO L/S	BHEL		718-89A, 721-89A	02

765 KV, 3000A, 50KA, 1-PHASE CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING

TABLE:-A1							
CORE	APPLICATION	CURRENT RATIO	BURDEN (VA)	CLASS	MINIMUM KNEE POINT VOLTAGE (kV)	MAXIMUM CT SECONDARY WINDING RESISTANCE (OHM)	Max. Exc. Current at 100% TAP
1	BUS DFE. CHECK	3000-2000-500/1	-	PX	3000/2000/500	15/10/2.5	20 ON 3000/1 TAP 30 ON 2000/1 TAP 120 ON 500/1 TAP
2	BUS DFE. MIN	3000-2000-500/1	-	PX	3000/2000/500	15/10/2.5	20 ON 3000/1 TAP 30 ON 2000/1 TAP 120 ON 500/1 TAP
3	METERING	3000-2000-500/1	20 VA	0.2S	-	-	-
4	METERING	3000-2000-500/1	20 VA	0.2S	-	-	-
5	TRANS. DIFF./LINE PROT.	3000-2000-500/1	-	PX	3000/2000/500	15/10/2.5	20 ON 3000/1 TAP 30 ON 2000/1 TAP 120 ON 500/1 TAP
6	LINE PROT./LB PROT.	3000-2000-500/1	-	PX	3000/2000/500	15/10/2.5	20 ON 3000/1 TAP 30 ON 2000/1 TAP 120 ON 500/1 TAP

765KV, 8800PF CAPACITIVE VOLTAGE TRANSFORMER (3 CORE)

CORE NO.	PRIMARY VOLTAGE	SECONDARY VOLTAGE	ACCURACY CLASS	MIN. OUTPUT BURDEN (VA)	RATED VOLTAGE FACTORS	PURPOSE	PHASE ANGLE ERROR	CAPACITANCE (PF)
CORE-1	765/√3	110/√3	0.5 & 3P	50	1.5FOR 30 SECS 1.2FOR CONTINUOUS	PROTECTION	-	8800 (+10%/-5%)
CORE-2	765/√3	110/√3	0.5 & 3P	50	1.5FOR 30 SECS 1.2FOR CONTINUOUS	PROTECTION	-	8800 (+10%/-5%)
CORE-3	765/√3	110/√3	0.2	50	1.5FOR 30 SECS 1.2FOR CONTINUOUS	METERING	±10 MINUTES	8800 (+10%/-5%)

SYSTEM PARAMETERS:-

S.No.	DESCRIPTION OF PARAMETER	UNIT	765KV SYSTEM
1	SYSTEM OPERATING VOLTAGE	kV	765
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	kV	800
3	FREQUENCY	Hz	50
4	LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2/50 microsec.)	kVp	±2100
5	SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500 micro sec.)	kVp	±1550
6	ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (rms)	kV	975
7	CREEPAGE DISTANCE	MM/kV	25
8	CREEPAGE DISTANCE FOR INSULATOR STRING/ LONG ROD INSULATORS/ OUTDOOR BUSHINGS	MM/kV	31
9	RATED SHORT CIRCUIT CURRENT FOR 1 SECOND DURATION	kA	50
10	CORONA EXTINCTION VOLTAGE	kV	508
11	SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED	
12	DESIGN AMBIENT TEMPERATURE	°C	50

CONSIDERING CURRENT RATINGS FOR PRESENT SCOPE OF BAYS (AS PER SECTION PROJECT)

S.No.	BAY/ELEMENT	765KV
1	BUS BAR	4000A
2	LINE BAY	3150A

NOTES:-

- WAVE TRAP SHALL BE ERECTED IN TWO PHASES ONLY. PGCL TO CONFIRM THE SAME. LOCATION OF WT IS INDICATIVE ONLY. ~~WAVE TRAP SHALL BE ERECTED IN TWO PHASES ONLY. PGCL TO CONFIRM THE SAME. LOCATION OF WT IS INDICATIVE ONLY.~~
- BAY NUMBERING HAS BEEN DONE BASED ON EXISTING SLD.
- MAKE SHALL BE PROVIDED AFTER FINALIZATION OF EQUIPMENT VENDOR AND SAME SHALL BE INCORPORATED IN LATER STAGE.
- EQUIPMENT DESIGNATION PHILOSOPHY IS BASED ON EXISTING SLD.

REFERENCE DRAWING:-

- 765KV SINGLE LINE DIAGRAM FOR KHETRI (EXTN) SUBSTATION DRAWING NO. KEC-SAB23-KHE-ESE-301-DRG-001, REV. 0

LEGEND:

- PRESENT SCOPE
- NOT IN SCOPE/EXISTING

PRESENT SCOPE

NOA NO. : CC/TW-AIS/DOM/A02/24/02512/NOA-1/24-102620/01 (Supply of Goods Contract) dt 22/02/2024
and CC/TW-AIS/DOM/A02/24/02512/NOA-2/24-102620/02 (Supply of Services Contract) dt 22/02/2024

ADDITIONAL INFORMATION				W.O.No.			
STATUS OF DRAWING				NAME OF CONSULTANT			
DISTRIBUTION OF PRINTS				NAME OF CONSULTANT			
REV.				DATE			
ALTERED				CHECKED			
APPROVED				APPROVED			
ZONE				TITILE			
SINGLE LINE DIAGRAM FOR 765KV KHETRI S/S EXTENSION				DRAWING NO.			
				REV.			
				SHEET NO.			
				NEXT SHEET			

PROCEDURE FOR WELDING OF ALUMINIUM BUSES

A. Recommended welding procedures to insure a sound weld are as follows:

Pure aluminum melts at 660 Deg. C while aluminum alloy melts in the range of 519 Deg. C depending on the alloy content of the particular metal involved. When aluminum alloy are heated there is no change in color. This makes it difficult, if not impossible; to tell metal is near the welding temperature.

The ever present surface oxide films on aluminum have a melting point of 1982 Deg. C. The parent aluminum or aluminum alloy can therefore be melted without fusing the surface oxides. Unless this film is removed, cleanliness of the molten filler metal and the parent metal cannot be completed and both strength and conductivity may be sacrificed. Therefore, it is of prime importance that aluminum oxides be removed from the aluminum alloys before welding is started. In the shielded arc welding method the shielding gas has a tendency to clean the material as welding progresses.

B. CLEANING OF BUSES & FITTINGS:

It is very important to remove all greases and oxides from the surfaces to be welded. This can be accomplished by using a mild alkaline solution or standard degreasing solution. The preferred method is to use a stainless steel wire brush and vigorously scrub the surfaces to be welded. The stainless steel brushes are specified because the stainless steel has fewer tendencies to pick up particles of aluminum.

C. WELDING METHODS

The following types of welding methods for welding aluminum fittings and buses are recommended.

1. TUNGSTEN-ARC WELDING (TIG)

The inert-gas shielded tungsten arc process is widely used for welding aluminum bus fittings. In this process the arc is established between a non-consumable tungsten electrode and the section to be welded. Inert gas envelopes the arc to prevent oxidation during welding.

Hence no flux is required. A bare filler rod supplies filler metal to the weld area. To initiate the arc the tungsten electrode is placed in contact with the component and then withdrawn to establish an arc length of approximately 3/16". The arc is given a circular motion until the base metal liquefies and the weld puddle is established. Filler metal is added by hand as required. In this process, if more than one pass is required for a sufficient weld, the weld should be wire brushed between passes, to remove any surface dirt or oxides which have accumulated from the previous pass. Since no flux is used the finished weld does not require cleaning. In this process the heat of the tungsten arc is concentrated in a smaller area and is much faster than the conventional type of welding and distortion of the weld is negligible since the heat is concentrated in a small area. In this process, if thickness is greater than 0.5" arc to be welded, pre-heating of parts will increase the arc speed.

2. METALLIC ARC INERT GAS SHIELDED WELDING

MIG welding process combines the advantages of tungsten arc welding with the increased welding speed. Welding can be done from any position and the process can be either manual or automatic. Manual welding techniques are somewhat different from other methods. However, a welder can be trained to use the MIG process with only a few days concentrated training. In the MIG process the bare filler rod is supplied as a coil of bare wire. In the commercially available equipment this wire is added to the weld at predetermined rate by a motor driven feed that can be adjusted to the magnitude of the welding current. In this process as well as the tungsten arc process, gas forms a shield around the arc to prevent oxidation during welding.

Either helium, argon or a mixture of helium and argon are suitable shielding gases. Pure argon is most widely used on the gas arc usually mixed to combine the hotter arc argon. If exceptionally hot arc characteristics are required pure helium can be substituted for the gas mixture. Precaution should be exercised if this substitution is made in that it is very easy to burn through the items that are to be welded with a pure helium atmosphere.

As it is readily apparent, the basic difference between the two types of welding apparatus is the automatic feeding mechanism for the filler wire. In both types of apparatuses the electrode holder and the welding gun can or cannot be cooled by water. If welding currents of more than 125 Amps are required, both methods will have to have water cooling apparatuses to the electrode holder and the welding gun.

D.WELDERS QUALIFICATIONS

No welding should be done until the operator has had experience with welding aluminum alloys by the methods described above. Men with previous experience with in metal welding should be selected for training in welding aluminum for a period of training of not less than one week after which time the man can be considered to be proficient in the use of the equipment and in the welding of aluminum joints. After this period there should be no difficulty experienced in welding aluminum alloys. It is suggested, if practical, that welders should practice on actual fittings or buses before proceeding with the welding of the required job.

The following is the recommended specification for the current fittings wire feeds, gas flows etc. These specifications are of a general nature to the extent that many factors have to be considered such as:

1. Type of equipment used, whether water cooled or not.
2. The size and mass of the piece to be welded.
3. The position of the weld.
4. And most important of all, the operator's skill
5. All persons in the welding area would wear the proper shields. The arc is approximately twice as strong as the standard AC welding arc. Extreme caution should be exercised for the protection of eyes.

ACCEPTANCE STANDARDS FOR NON-DESTRUCTIVE TESTING **LIQUID PENETRANT EXAMINATION OF WELDED JOINTS**

- a) Evaluation of indications:
 - Relevant indications are those which result from mechanical discontinuities.
 - Linear indications are those indications in which the length is more than three times with width.
 - Rounded indications or indication, which are circular or elliptical with the length less than three times, the width.
 - Any questionable or doubtful indications shall be re-tested to verify whether or not actual defects are present.
 - Localised surface imperfections, such as may occur from machining marks, surface conditions, may produce similar indications, which are not relevant to detection of unacceptable discontinuities.

b) Acceptance standards:

- Linear indications
- Four or more rounded defects with any dimensions more than 1.6 mm in a line separated by 1/16 inch (1.6 mm) or less (edge to edge)

c) Defect removal and repair:

Unacceptable imperfections shall be removed and reexamination made to assure the complete removal. Whenever a defect is removed and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners. Where welding is required after removal of a defect, the area shall be cleaned and welding performed in accordance with a qualified welding procedure. Completed repairs shall be re-examined by the method originally used for detection of the deflection.

d) Treatment of imperfections believed non-relevant.

Any indication of an imperfection, which is believed to be non-relevant, shall be regarded as defect unless, on re-evaluation, it is shown by re-examination by the same method or by the use of other non-destructive methods and/ or by surface conditioning that no unacceptable defect is present.

e) Examination of areas from which defects have been removed:

After a defect is thought to have been removed and prior to making weld repairs, the area shall be examined by suitable methods to ensure the defect has been eliminated.

f) Re-examination of repaired areas:

After repairs are made, the repaired areas shall be blended.

ACCEOTANBCE STANDARDS FOR NON-DESTRUCTIVE TESTING
RADIOGRAPHIC EXAMINATION OF WELDED JOINTS

Radiographic examination shall cover minimum 10% of weld seam and acceptance standard for visual examination and Radiography shall be as follows:

Any of the following imperfections shall not be acceptable.

1. Cracks
2. Zone of incomplete fusion or penetration, which exceed 10% of the weld length of the joint in longitudinal or transverse butt weld, where full penetration is intended by the weld procedure, some lack of penetration acceptable. The total length of weld with lack of penetration shall not exceed 10% of the overall weld length. At no place, shall weld penetration be less than 90% of the thickness of the material. Continuous occurrence of lack of penetration is permitted, but shall not exceed 50 mm in any 500 mm length of weld.
3. Inadequate weld dimensions, root cavity (shrinkage) and incompletely filled groove greater than 10% effective throat thickness.

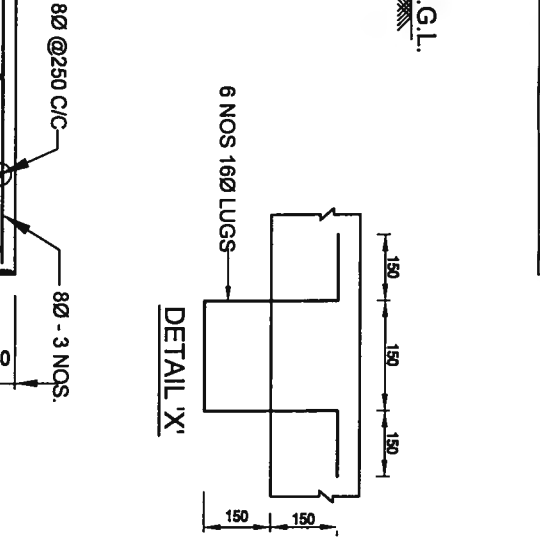
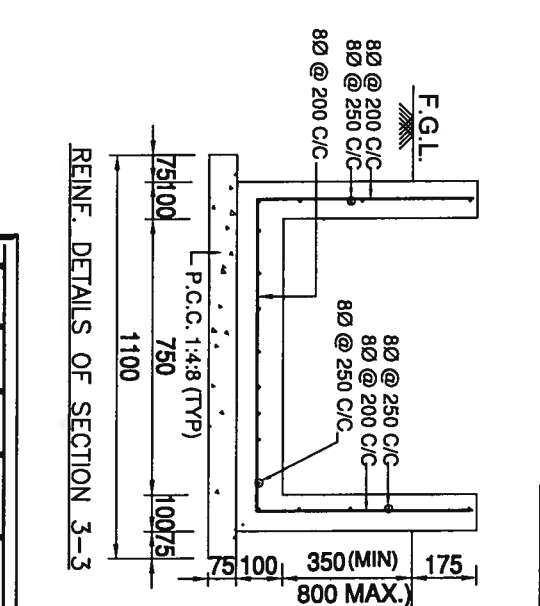
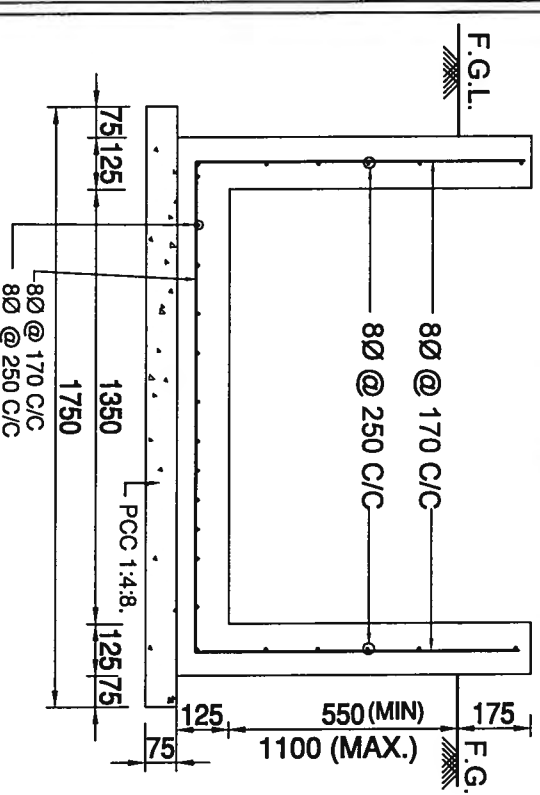
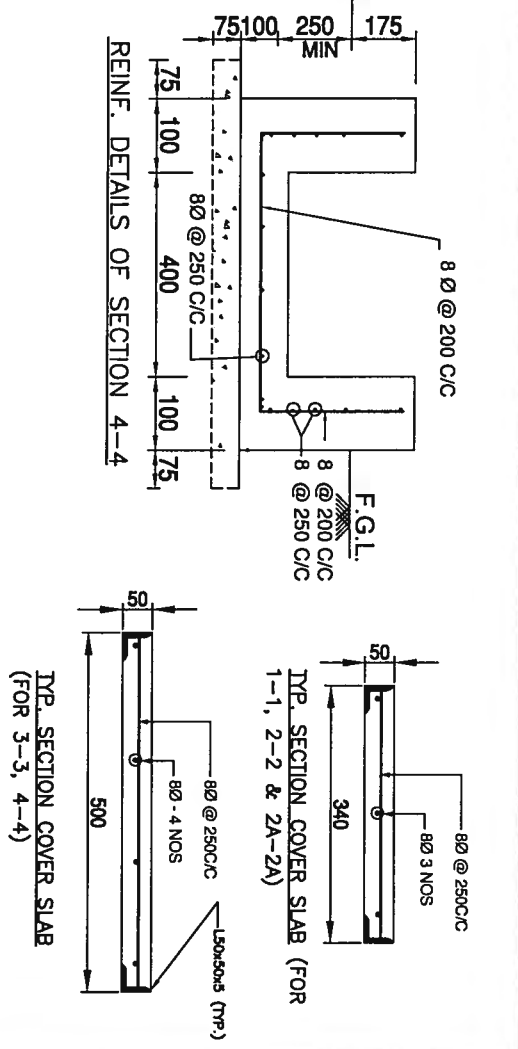
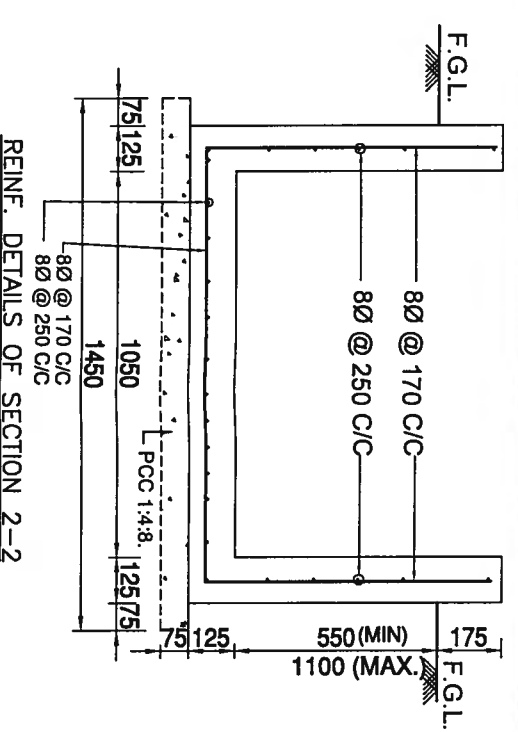
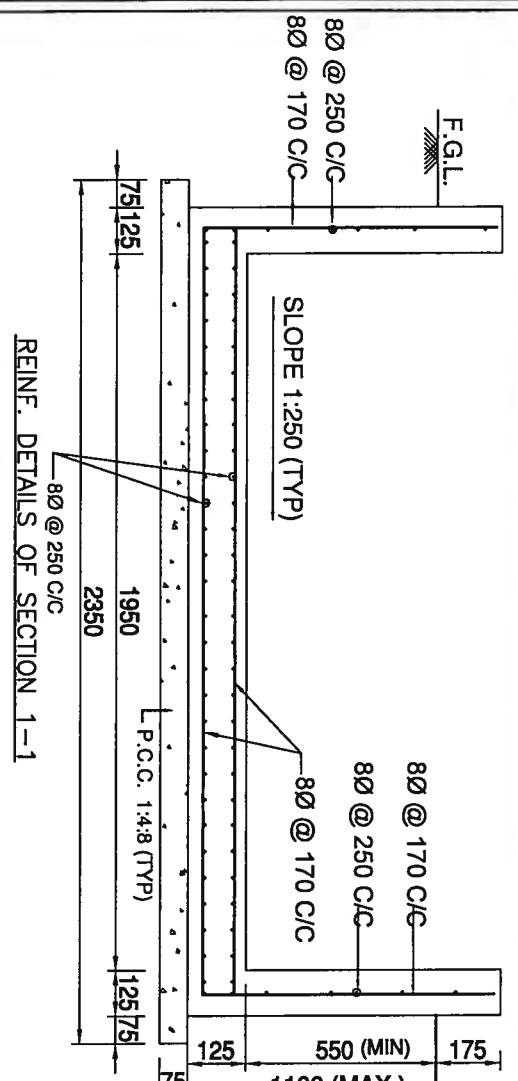
4. Excess penetration shall be permitted provided it does not exceed 25% of the wall thickness or 4 mm whichever is smaller.
5. Weld reinforcement: Build up in excess of 25% of the effective throat thickness shall be dressed. Any reinforcement shall be substantially symmetrical about the center line of the weld and shall be of smooth contour blending smoothly at the toes with the parent material.
6. Undercutting and overlapping, greater than 10% effective throat thickness.
7. Elongated cavities and/or worm holes exceeding 3 mm dia or equivalent area in length provided the limitations on porosity are met with.
8. Copper, tungsten or oxide inclusions greater than $t/1$ or 3 mm whichever is smaller.
9. Crater pipes exceeding 25% effective throat thickness or 3 mm whichever is smaller.
10. Porosity: Scattered porosity not exceeding 0.5% by volume is acceptable. In general, the size of the pores shall not exceed 0.8 mm dia, but occasional 1.6 mm dia pores may be acceptable, provided the following limits are not exceeded.
 - a) Where pore size is 0.4 mm or less, up to 150 pores may be permitted in 1000 mm sq. area of radiograph.
 - b) Where pore size is 0.8 mm or less, up to 19 pores may be permitted in 1000 mm. sq. area of radiograph.
 - c) Where pore sizes are generally 0.8 mm dia or less, but occasional 1.6 mm dia/pores are present, up to 9 pores of 0.8 mm dia may be permitted in 1000 sq. mm area of radiograph, provided the number of pores up to 1.6 mm in dia does not exceed it.
 - d) However, visible surface porosity > 1mm dia is not acceptable.

Note:

- i. In all cases, t thickness of the thinnest section of the weld under examination.
- ii. Unacceptable weld defects shall be repaired in accordance with the original welding procedure. All repairs shall be 100% inspected in accordance with original testing procedure.

TECHNICAL SPECIFICATION
FOR INSULATING MAT

- 9.11 **Insulating mats**
- 9.11.1 The scope covers supply and laying of insulating mats of “class A” conforming to IS: 15652-2006.
- 9.11.2 These insulating mats shall be laid in front of all floor mounted AC and DC switchboards and control **& relay** panels located in control room building/**Switchyard panel room**.
- 9.11.3 The insulating mats shall be made of elastomer material free from any insertions leading to deterioration of insulating properties. It shall be resistant to acid, oil and low temperature.
- 9.11.4 Upper surface of the insulating mats shall have small aberration (rough surface without edges) to avoid slippery effects while the lower surface shall be plain or could be finished slip resistant without affecting adversely the dielectric property of the mat.
- 9.11.5 Insulating mat **(wherever applicable)** shall be of pastable type, to be fixed permanently on the front and rear side of the panels except for the chequered plate area which shall not be pasted **as per requirement**. The insulating mats shall generally be fixed and joints shall be welded as per recommendations in Annexure-A of IS: 15652.
- 9.11.6 Width of insulating mats shall generally be of 1.5 meters or as per site requirements. Length shall be supplied as per site requirements.
- 9.11.7 The insulating mats offered shall conform to IS: 15652-2006.



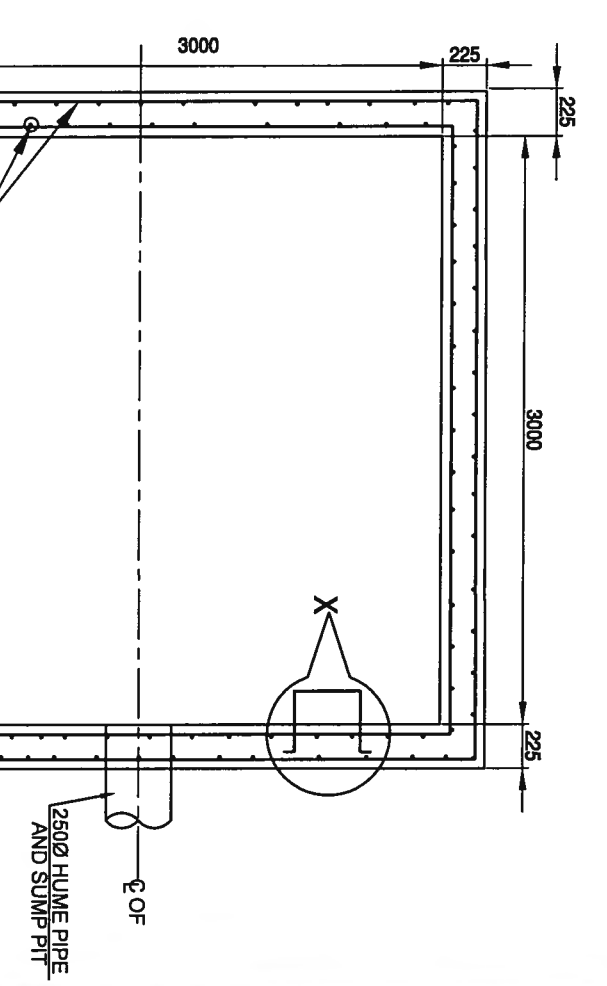
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REIN. DETAILS OF SECTION 3-3

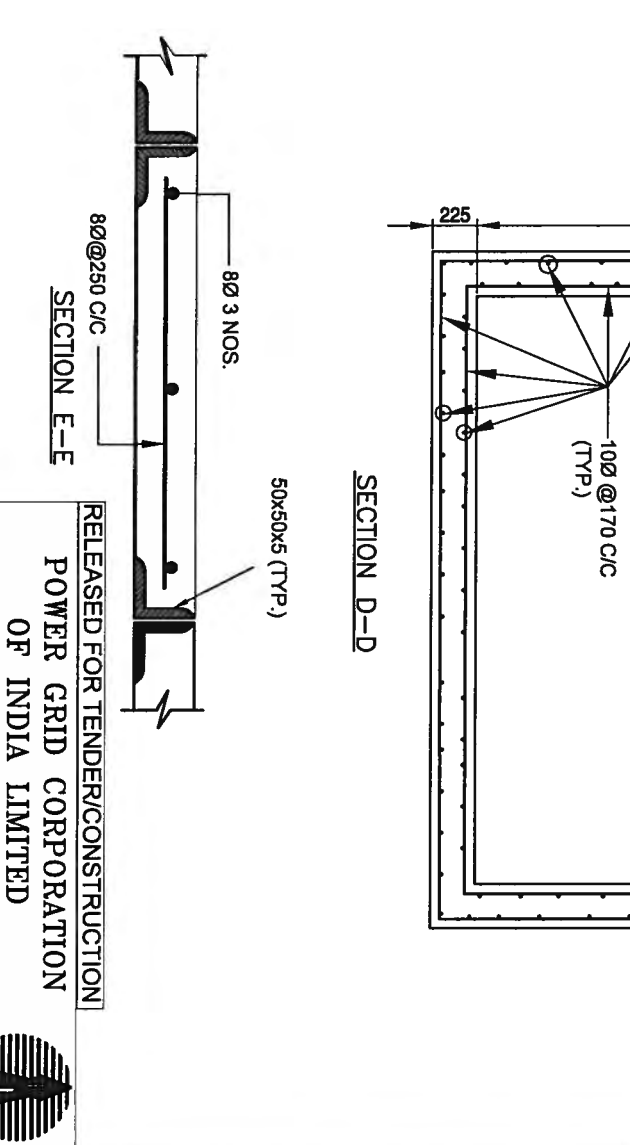
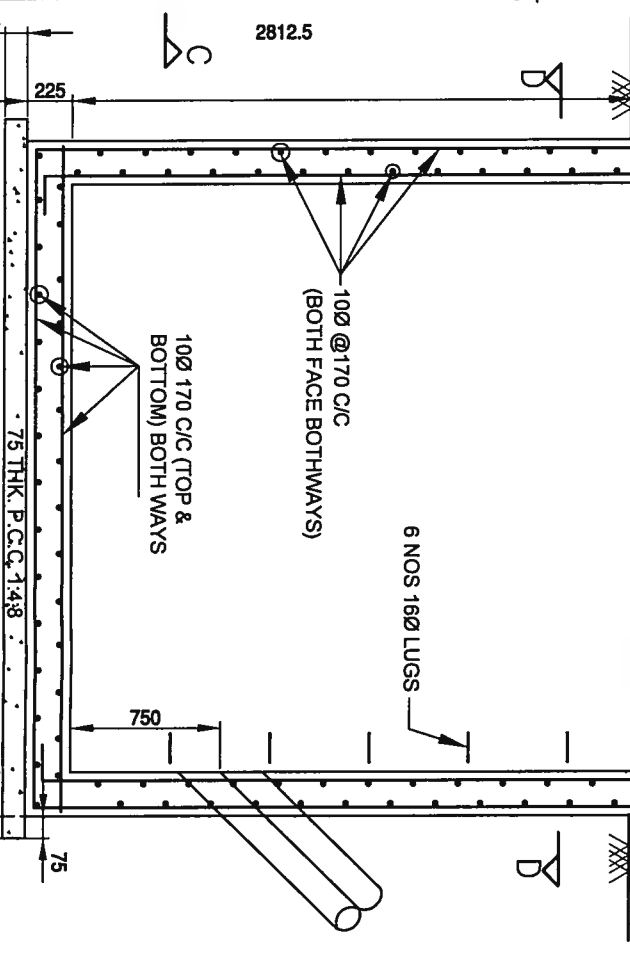
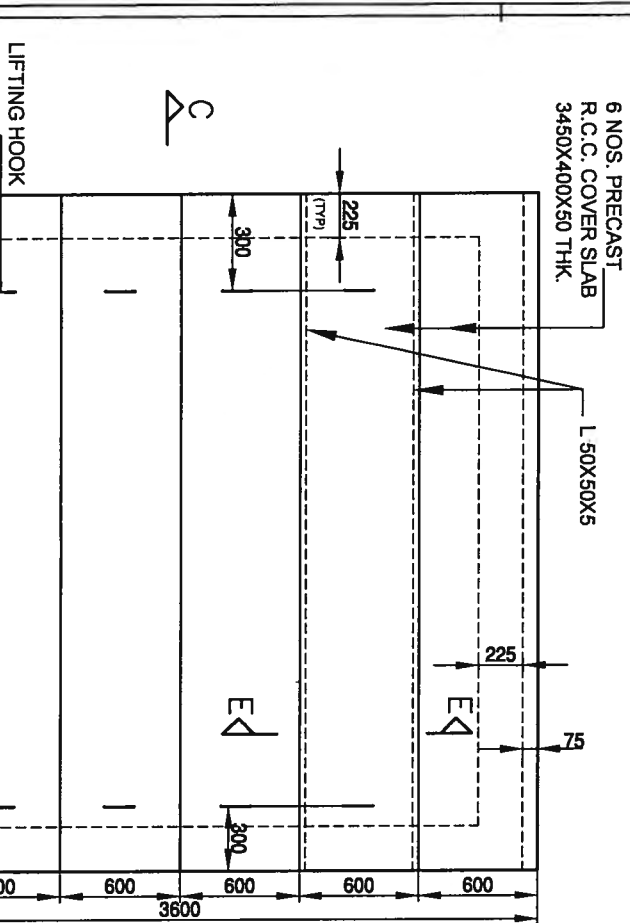
FORMATION LEVEL

8Ø @ 250 C/C

8Ø - 3 NOS.



SECTION D-D



SECTION E-E

NOTE: THIS DRAWING SUPERCEDES STANDARD CABLE TRENCH DRAWINGS (DRG. NO.: C/ENG/STD/CT/01 TO 05)

PROJECT: STANDARD CABLE TRENCH FOR SUBSTATION SWITCH YARD

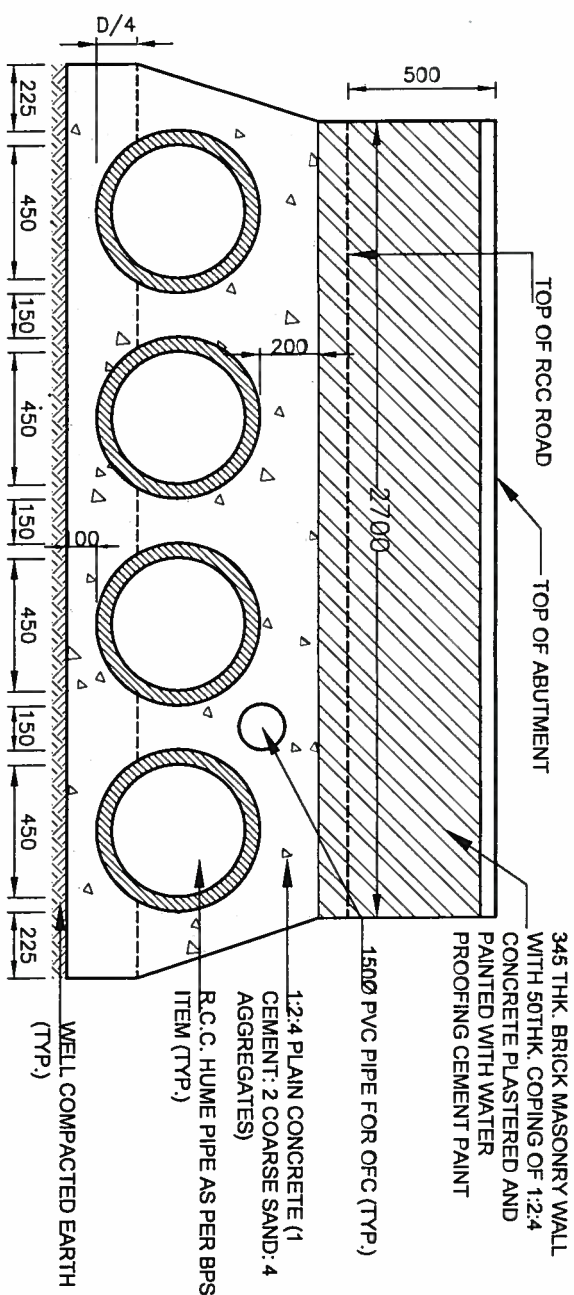
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(A Government of India Enterprise)



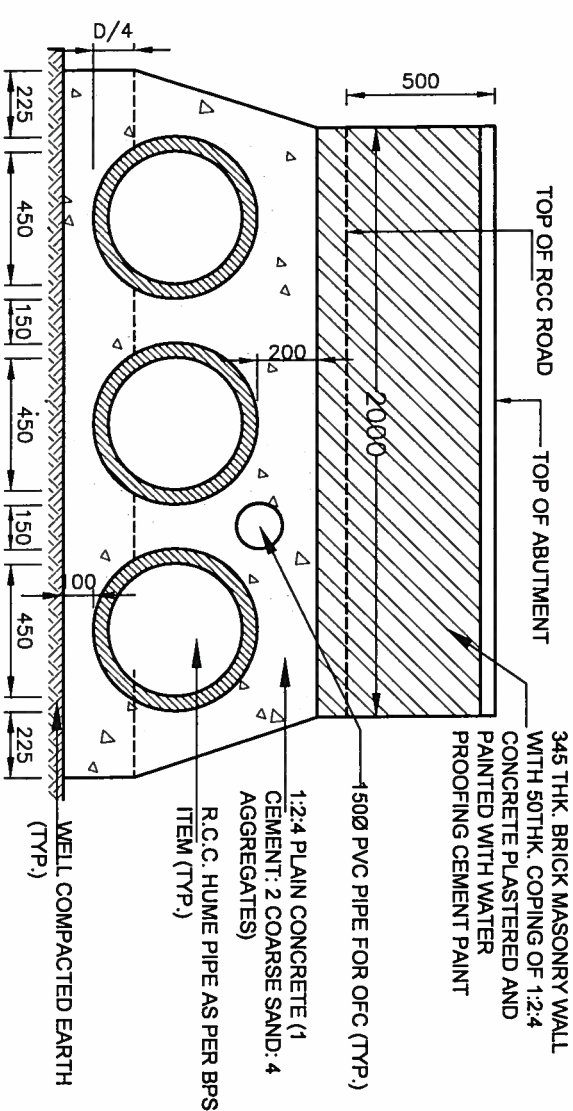
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TOP PLAN OF SUMP PIT

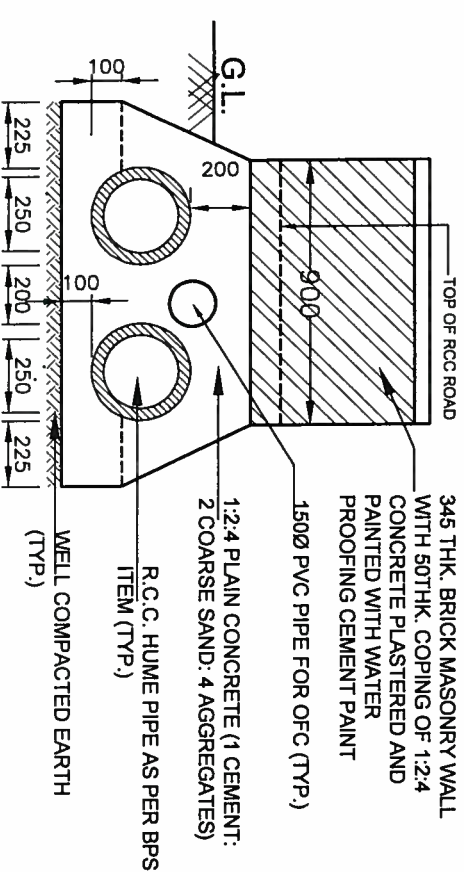
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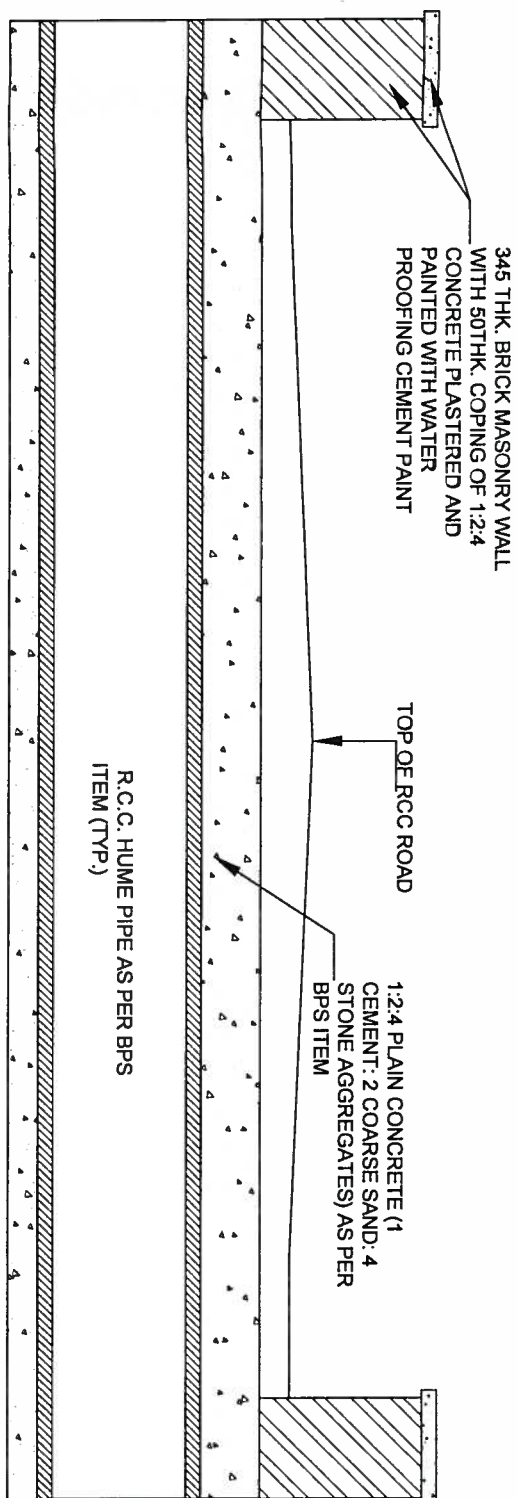
ROAD CROSSING SECTION FOR CABLE TRENCH FOR "SEC-1-1 & 2A-2A"



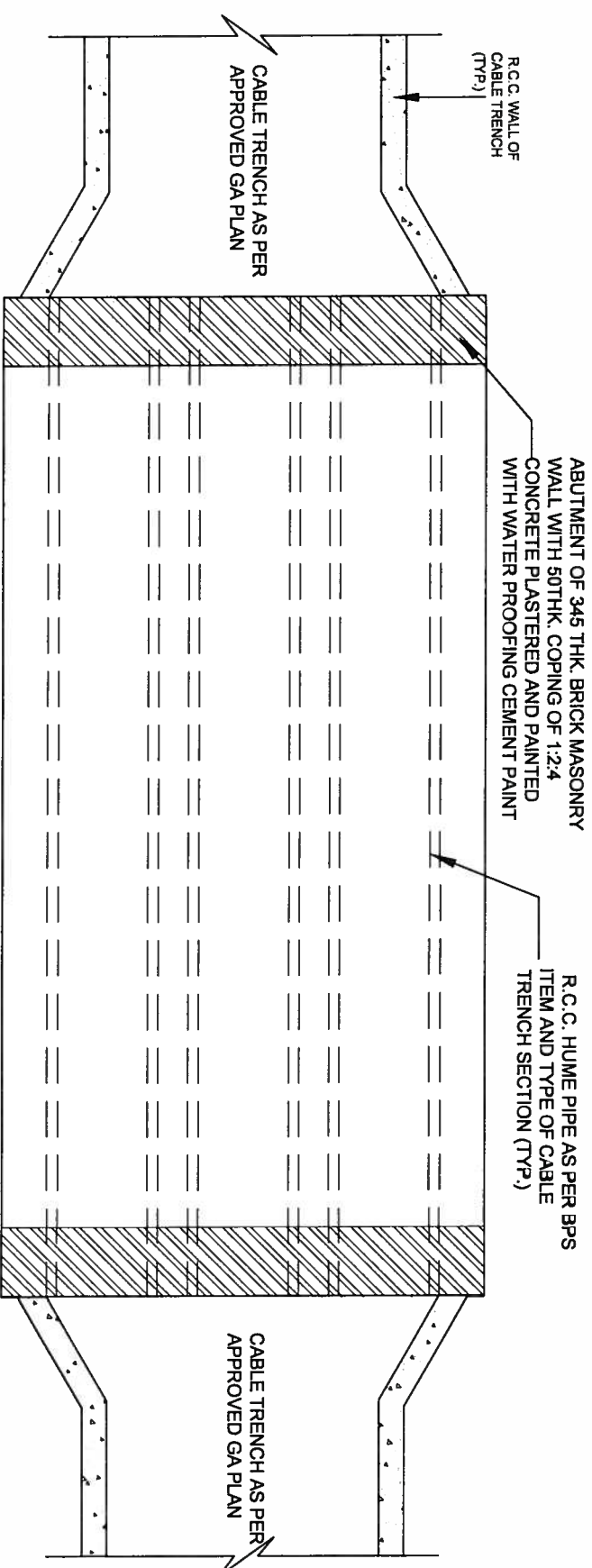
ROAD CROSSING SECTION FOR CABLE TRENCH "SEC-2-2"



ROAD CROSSING SECTION FOR CABLE TRENCH "SEC-3-3"



TYPICAL LONGITUDINAL ROAD CROSSING SECTION OF CABLE TRENCH THROUGH RCC PIPE



TYPICAL PLAN OF CABLE TRENCH WITH ROAD CROSSING

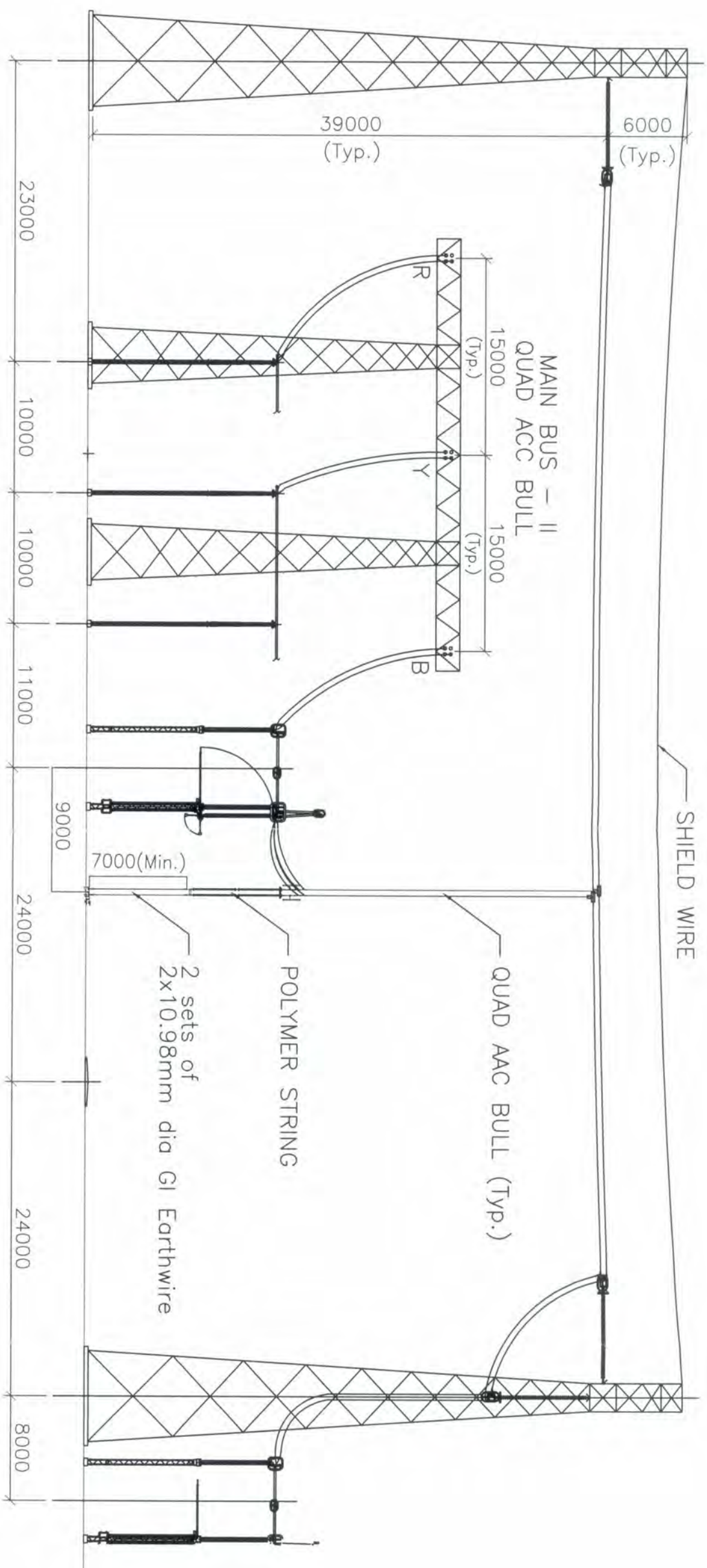
NOTE:- THIS DRAWING SUPERCEDES STANDARD CABLE TRENCH DRAWINGS (DRG. NO.: C/ENGG/STD/CT/01 TO 05)

REV	DESCRIPTION	CDE (ENGG-CIVIL)	AGM (ENGG-CIVIL)	AGM (ENGG-S/S)	GM (ENGG-S/S)	APVD. BY GM (ENGG-CIVIL)	DATE
00	CABLE TRENCH SECTION 2A-2A INTRODUCED AND CABLE TRENCH CROSSING SECTIONS MODIFIED						

RELEASED FOR TENDER/CONSTRUCTION
POWER GRID CORPORATION
OF INDIA LIMITED
(A Government of India Enterprise)



PROJECT: STANDARD CABLE TRENCH FOR SUBSTATION SWITCH YARD
TITLE: DETAILS OF CABLE TRENCHES AND CABLE TRENCH ROAD CROSSING
DRG. NO.: C/ENGG/STD/2016/RCT/01 (Sheet 04 of 04)
SCALE: NTS



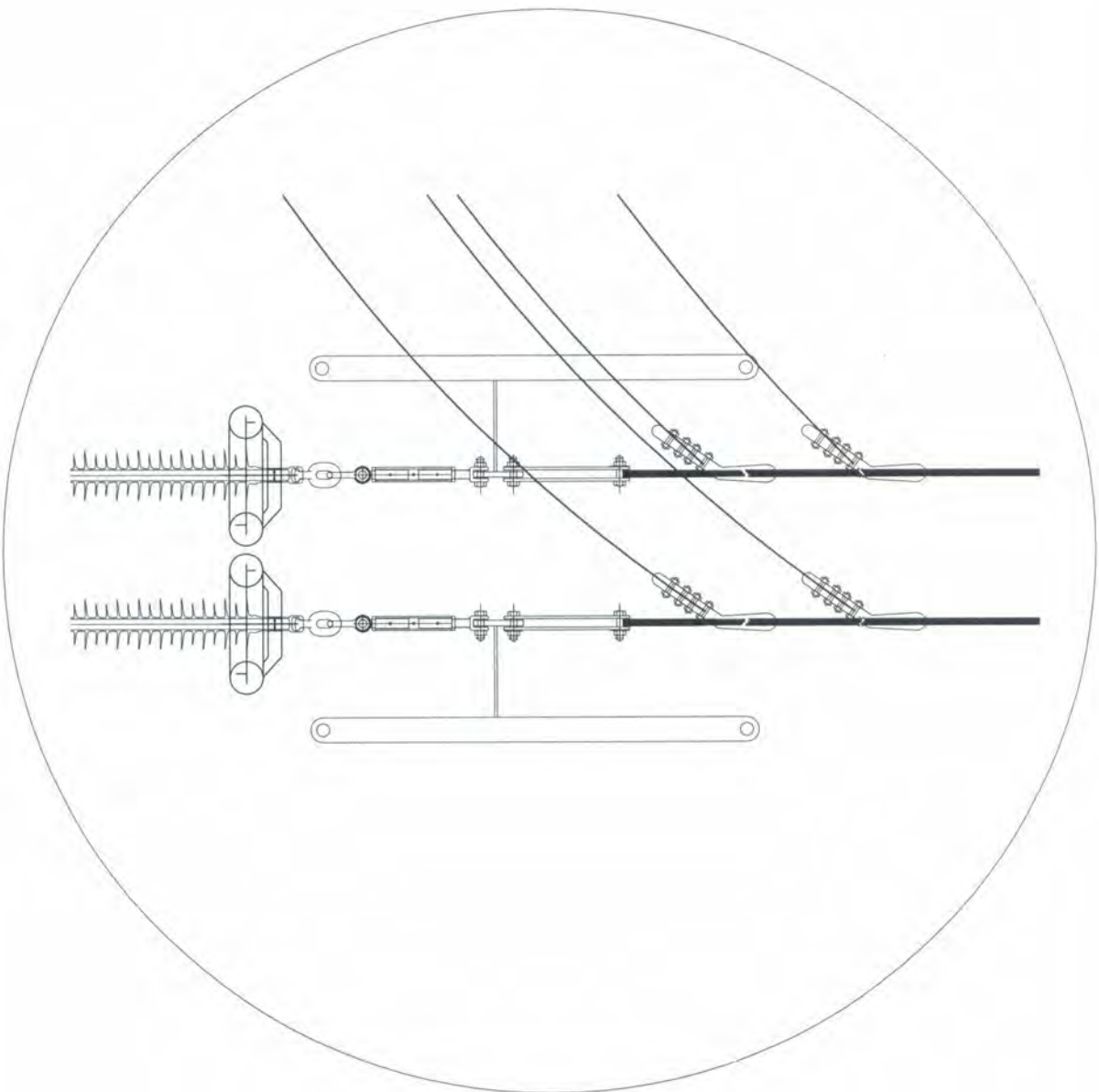
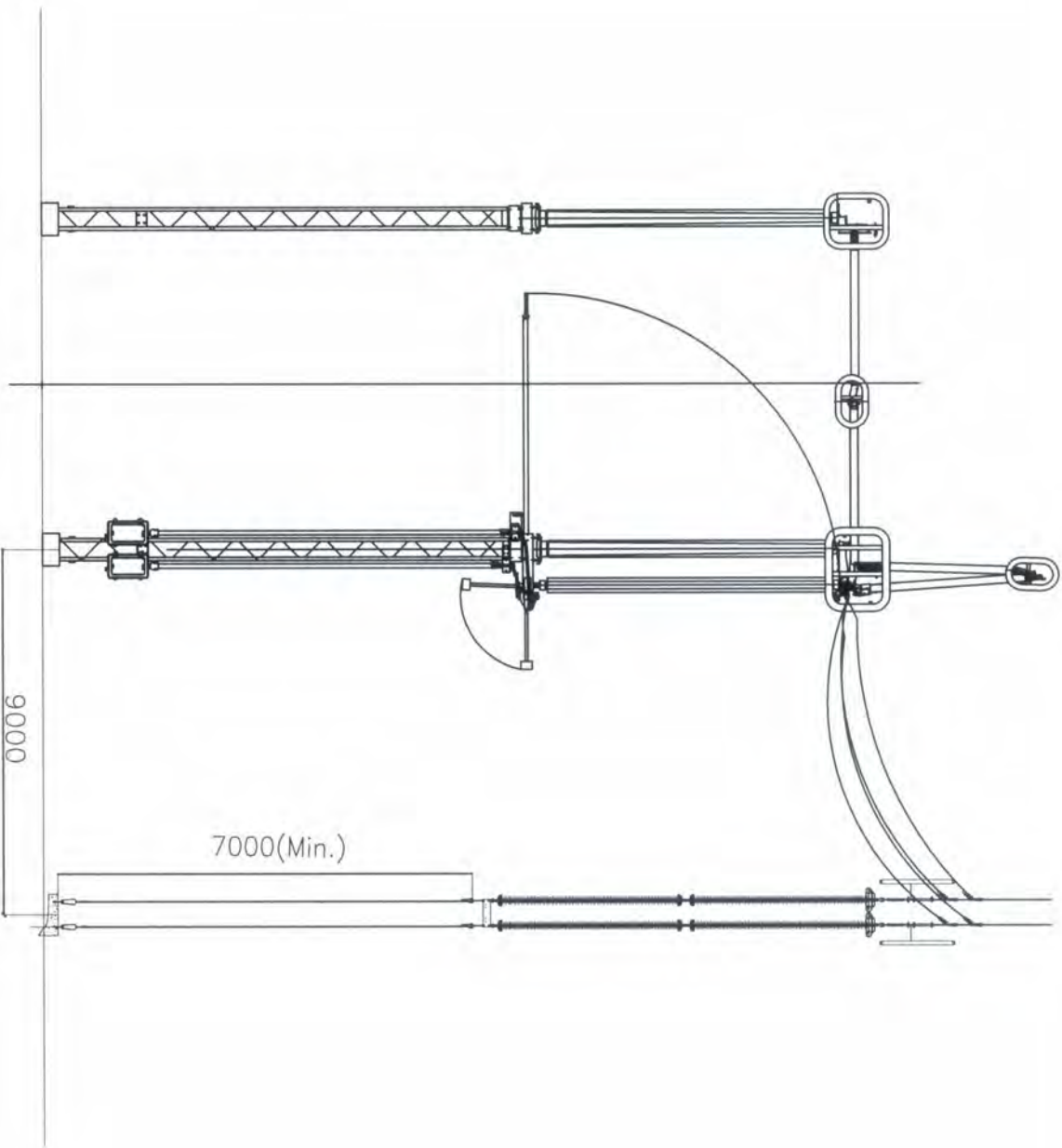
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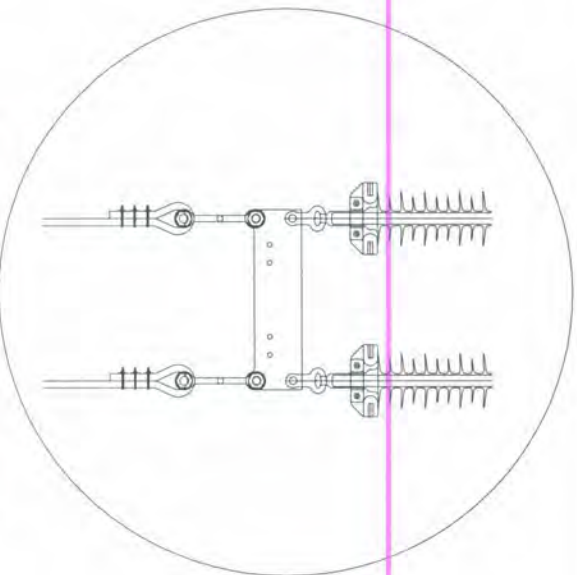
PROJECT :- STANDARD

TITLE:- GUY ARRANGEMENT (765kV)

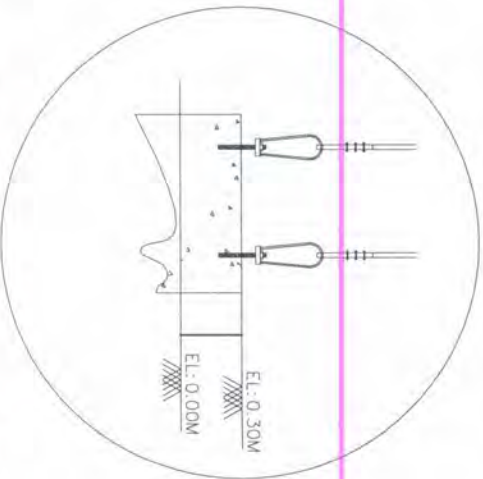
APPD	REVIEWED	CKD	PRPD	Date	Drawing No.: C/ENG/STD/GUY ARR SHEET 1 of 2	Rev. 00
				Oct-2013		




CONNECTION ARRANGEMENT



ANCHORING DETAILS



FOUNDATION DETAILS

POWER GRID CORPORATION OF INDIA LIMITED (A Government of India Enterprise)  पारदर्शी गठ						
PROJECT :- STANDARD						
TITLE:- GUY ARRANGEMENT (765kV)						
APPD	REVIEWED	CKD	PRPD	Oct-2013 Date	Drawing No.: C/ENG/STD/GUY ARR SHEET 2 of 2	Rev. 00

TECHNICAL SPECIFICATION
SECTION: SWITCHGEAR-CB
REVISION-11

17.0 PRE-COMMISSIONING TESTS

- 17.1 An indicative list of tests is given below. All routine tests except power frequency voltage dry withstand test on main circuit breaker shall be repeated on the completely assembled breaker at site. For Pre-commissioning tests, procedures and formats for circuit breakers, POWERGRID document no. CF/CB/03/R-4 dated 01/04/2013 of document no. D-2-01-03-01-04 dated 01-04-2013 will be the reference document. This document will be available at respective sites and shall be referred by the contractor. Contractor shall perform any additional test based on specialties of the items as per the field Q.P./instructions of the equipment Supplier or Employer without any extra cost to the Employer. The Contractor

shall arrange all instruments required for conducting these tests alongwith calibration certificates and shall furnish the list of instruments to the Employer for approval.

- (a) Insulation resistance of each pole.
- (b) Check adjustments, if any suggested by manufacturer.
- (c) Breaker closing and opening time.
- (d) Slow and Power closing operation and opening.
- (e) Trip free and anti pumping operation.
- (f) Minimum pick-up voltage of coils.
- (g) Dynamic Contact resistance measurement.
- (h) Functional checking of control circuits interlocks, tripping through protective relays and auto reclose operation.
- (i) Insulation resistance of control circuits, motor etc.
- (j) Resistance of closing and tripping coils.
- (k) SF6 gas leakage check.
- (l) Dew Point Measurement
- (m) Operation check of pressure switches and gas density monitor during gas filling.
- (n) Checking of mechanical 'CLOSE' interlock, wherever applicable.
- (o) Testing of grading capacitor.
- (p) Resistance measurement of main circuit.
- (q) Checking of operating mechanisms
- (r) Check for annunciations in control room.
- (s) Point of wave switching test (wherever applicable)

17.2 The contractor shall ensure that erection, testing and commissioning of circuit breaker shall be carried out under the supervision of the circuit breaker manufacturer's representative. The commissioning report shall be signed by the manufacturer's representative.

MODEL TECHNICAL SPECIFICATION
SECTION-SWITCHGEAR-INST
(INSTRUMENT TRANSFORMERS)
(REV. NO. 11)

9.0 PRE-COMMISSIONING TESTS

- 9.1 An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the field Q.P./Instructions of the equipment Supplier or Employer without any extra cost to the Employer. **The Contractor shall arrange all instruments**

required for conducting these tests alongwith calibration certificates at his own cost.

9.2 Current Transformers

- (a) Insulation Resistance Test for primary and secondary
- (b) Polarity test
- (c) Ratio identification test - checking of all ratios on all cores by primary injection of current
- (d) Dielectric test of oil (wherever applicable)
- (e) Magnetizing characteristics test
- (f) Tan delta and capacitance measurement
- (g) Secondary winding resistance measurement
- (h) Contact resistance measurement (wherever possible/accessible)
- (i) Test for SF₆ (for SF₆ filled CTs) – Dew point measurement, SF₆ alarm/lockout check
- (j) DGA test of oil

Dissolved Gas Analysis (DGA) shall be carried out twice within the first year of service, first within the first month of commissioning/charging and second between six months to one year from the date of commissioning/charging.

CTs/IVTs must have adequate provision for taking oil samples from the bottom of the CT/IVT without exposure to atmosphere. Manufacturer shall recommend the frequency at which oil samples should be taken and norms for various gases in oil after being in operation for different durations. ~~Bidder~~/Manufacturer should also indicate the total quantity of oil which can be withdrawn from CT for gas analysis before refilling or further treatment of CT becomes necessary.

Bidder shall supply 2 nos. oil sampling device for every 20 nos. oil filled CT supplied with a minimum of 2 nos. oil sampling device for each substation.

9.3 Inductive Voltage Transformers/Capacitive Voltage Transformers

- (a) Insulation Resistance test for primary (if applicable) and secondary winding
- (b) Polarity test
- (c) Ratio test
- (d) Dielectric test of oil (wherever applicable)

- (e) Tan delta and capacitance measurement of individual capacitor stacks
- (f) Secondary winding resistance measurement

For pre-commissioning procedures and formats for Current Transformers, Doc.No.: CF/CT/04/R-4 dtd-01.04.2013 and for Voltage Transformers, CF/CVT/05/R-4 dtd-01.04.2011 under POWERGRID document no. D-2-01-03-01-04 will be the reference document. **This document will be available at respective sites and shall be referred by the contractor.**



SECTION-GENERAL TECHNICAL REQUIREMENTS (GTR)

- v) The Manufacturing Quality Plan(MQP) indicating Customer Inspection Points (CIPs) at various stages of manufacturing and methods used to verify that the inspection and testing points in the quality plan were performed satisfactorily.
- vi) Factory test results for testing required as per applicable quality plan/technical specifications/GTP/Drawings etc.
- vii) Stress relief time temperature charts/oil impregnation time temperature charts, wherever applicable.

8.3 INSPECTION, TESTING & INSPECTION CERTIFICATE

8.3.1 Contractor shall procure bought out items from sub-vendors as per the list in "Compendium of Vendors" available on POWERGRID web-site www.powergridindia.com after ensuring compliance to the requirements/conditions mentioned therein. Contractor shall explore first the possibilities of procuring the bought out items from POWERGRID approved existing vendors. In case of their unavailability / non-response, Contractor may approach POWERGRID for additional sub-vendor approval. In that case, the assessment report of proposed sub vendor by Contractor along with the enclosures as per **Annexure-F** shall be submitted within 60 days of the award. The proposal shall be reviewed and approval will be accorded based on the verification of the document submitted and/or after the physical assessment of the works as the case may be. The physical assessment conducted by POWERGRID, if required, shall be on chargeable basis. Charges shall be as per the POWERGRID norms prevailing at that time, which shall be intimated by POWERGRID separately. If proposal for sub-vendor is submitted after 60 days, the Contractor's proposal normally will not be considered for current LOA. However, POWERGRID may process the case for developing more vendors for referred items, if found relevant. In all cases, It is the responsibility of the Contractor that Project activities do not suffer on account of delay in approval/non approval of a new sub-vendor.

The responsibility and the basis of inspection for various items & equipment is placed at **Annexure-G** along with the requirement of MQP (Manufacturing Quality Plan), ITP(Inspection & Test Plan), FAT(Factory Acceptance Test) which should be valid & POWERGRID approved and Level of inspection envisaged against each item.


Contractor shall ensure that order for items where MQP/ITP/FAT is required will be placed only on vendors having valid MQP/ITP/FAT and where the supplier's MQP/ITP/FAT is either not valid or has not been approved by POWERGRID, MQP shall be generally submitted as per POWERGRID format before placing order.

Items not covered under MQP/ITP/FAT shall be offered for inspection as per POWERGRID LOA/technical Specifications/POWERGRID approved data sheets/ POWERGRID approved drawings and relevant Indian/International standards.

Inspection Levels: For implementation of projects in a time bound manner and to avoid any delay in deputation of POWERGRID or its authorized representative, involvement of POWERGRID for inspection of various items / equipment will be based on the level below:

Level -I: Contractor to raise all inspection calls and review the report of tests carried out by the manufacturer, on his own, as per applicable standards/ POWERGRID specification, and submit to concerned POWERGRID inspection office/Inspection Engineer. CIP/MICC will be issued by POWERGRID based on review of test reports/certificates of manufacturers.

SECTION-GENERAL TECHNICAL REQUIREMENTS (GTR)

- 
- Level - II:** Contractor to raise all inspection calls and carry out the inspection on behalf of POWERGRID on the proposed date of inspection as per applicable standards/specification. However, in case POWERGRID wishes to associate itself during inspection, the same would be intimated to Contractor and CIP/MICC will be issued by POWERGRID. Else, Contractor would submit their test reports/certificates to POWERGRID. CIP/MICC will be issued by POWERGRID based on review of test reports/certificates.
- Level - III:** Contractor to raise inspection calls for both, stage (as applicable) & final inspection and carry out the stage inspections (if applicable) on behalf of POWERGRID on the proposed date of inspection as per applicable standards/specification. However, in case POWERGRID wishes to associate itself during stage inspection, the same would be intimated to Contractor and CIP will be issued by POWERGRID. Else, Contractor would submit the test reports / certificates of stage inspection after their own review and CIP will be issued by POWERGRID based on review of test reports / certificates. Final inspection will be carried out by POWERGRID and CIP/MICC will be issued by POWERGRID.
- Level - IV:** Contractor to raise inspection calls for both, stage (as applicable) & final inspections. POWERGRID will carry out the inspection for both stage & final inspection as per applicable standards/specification and CIP/MICC will be issued by POWERGRID.
-

SECTION-GENERAL TECHNICAL REQUIREMENTS (GTR)**Annexure-G****MQP & INSPECTION LEVEL REQUIREMENT**

Sl. No.	Item / Equipment	Requirement of MQP/ITP/FAT	Inspection Level
1 A	Transformer /Reactor	Yes	IV
1 B	Circuit Breakers	Yes	IV
2	Current transformer	Yes	IV
3	Capacitive voltage transformers/Potential transformer	Yes	IV
4	Isolators	Yes	IV
5	Lightening Arrestors	Yes	III
6	Line Trap	Yes	III
7	Control & Relay Panels	Yes	III
8	Power Cables	Yes	III
9	Control Cables	Yes	III
10	LT Switchgear & ACDB/DCDB/MLDB/ELDB/ Lighting Panels	Yes	III
11	Fire protection system		
11-A	Panels, Deluge valve, Hydro pneumatic tank.	No	III
11-B	Strainers, extinguishers, MS/GI pipes, Pumps, motors, air compressor, and other valves, Diesel Engines	No	II
11-C	Others	No	I
12	Insulator (Disc, Long Rod, Solid Core)	Yes	IV
13	Conductor	Yes	IV
14	Clamps & Connectors (including equipment connectors)	Yes	III
15	Junction Box / Lighting Switch Boards / Bay MB/Telecom Equipment Cabinet	No	II
16	Cable lugs	No	I
17	Lighting Fixtures ,Lamps & fans	No	I
18	Switches	No	I
19	Conduits	No	I
20	Lighting Poles	No	II
21	MS/GI /PVC Pipes for cable trenches and lighting	No	I
22	Hume Pipes	No	I
23	Galvanized Cable trays	No	II
24	MS/ GI Flat and earthing material	No	II
25	MS Round for Earthmat (40mm dia)	No	I
26	Lighting Earthwire	No	I
27	Aluminium Tube & Busbar materials	No	II
28	Outdoor Receptacle	No	I
29	Nut / Bolts / Spring Washers (Gr 5.6/5)	No	II
30	LT Transformer	Yes	III
31	Battery	No	II
32	Battery Charger	Yes	III

SECTION-GENERAL TECHNICAL REQUIREMENTS (GTR)**Annexure-G**

Sl. No.	Item / Equipment	Requirement of MQP/ITP/FAT	Inspection Level
33	D. G. Set	No	II
34	Split A.C/window A.C.	No	I
35	Substation Automation system	No	III
36	Telephone wires	No	I
37	Telephone sockets	No	I
38	Aluminium ladder	No	I
39	Occupancy sensors for control of lighting	No	I
40	Sub Station Structure (lattice/pipe type)	Yes	III
41	HG fuse	No	II
42	PLCC equipment Viz PLCC Terminal ,Carrier equipment, Protection Coupler , Coupling Device but excluding EPAX / HF Cable/ SDH Equipment	Yes	III
43	HF Cable / GPS Clock	No	I
44	EPAX	No	I
45	Cable Glands / Joints /Clamps/ Termination	No	I
46	Video Monitoring System	No	II
47	Controller for switching	No	IV
48	Solar based street lighting pole including solar panel as per technical specification	No	III
49	Event Logger	No	III
50	Lighting transformers	Yes	II
51	String Hardware	Yes	IV
52	Test Equipment	No	I *
53	GS Earthwire	Yes	IV
54	Oil Storage Tank	Yes	III
55	Insulating Oil	No	III
56	Flow sensitive conservator isolation valve	No	II **
57	On-Line insulating oil drying system	No	II **
58	On line DGA & Moisture Analyzer	No	II **
59	WAMS-(PMU & Accessories)	Yes	III
60	FO Cable	Yes	III
61	Re-rollers of MS/HT Angle Section and galvanized tower parts.	Yes	IV
62	Hardware fittings & Earthwire Accessories	Yes	IV
63	OPGW & H/W	Yes	III
64	Bolts & Nuts Gr up to 5.6/5	Yes	II
65	Bolts & Nuts of Gr 8.8 / 8	Yes	IV
66	D-shackle/ Hanger / Links	Yes	IV
67	Danger Plate /Phase Plate / Number Plate / Circuit plate	No	I
68	Pipe Type & Counter Poise Earthing	No	II
69	Spring Washer	No	II
70	ACD & Barbed wire for ACD/Bird guard	No	II

SECTION-GENERAL TECHNICAL REQUIREMENTS (GTR)

Annexure-G

Sl. No.	Item / Equipment	Requirement of MQP/ITP/FAT	Inspection Level
71	Span Marker & Obstruction Light	No	III
72	GIS including spares	Yes	IV
73	GIS Bus Duct	Yes	IV
74	GIS Bushing	Yes	IV
75	SF6 Gas processing Unit	No	II
76	Partial Discharge Monitoring System	No	II
77	STATCOM including Valve, valve base electronics, DC capacitor, series reactor and all accessories	Yes	IV
78	Mechanically switched Reactor bank (3-ph) including all accessories (MSR Branches)	Yes	IV
80	Mechanically switched Capacitor bank (3-ph) including all accessories (MSC Branches)	Yes	IV
81	Pass Harmonic filters	Yes	IV
82	Valve cooling system	Yes	III
	FODP including pigtail	No	II
	Radio link Telecom	Yes	III
	Hardware Fittings for Fibre Optic approach cable	Yes	III
	SDH Equipments (ADM), PDH, Primary Multiplexer	Yes	IV
	Drop & Insert Multiplexer	Yes	IV
	DACS	Yes	IV
	Main Distribution Frame	No	I
	HDPE Pipe	No	II
	NMS, TMN	Yes	IV
	Synchronization Equipment	No	Level-I
93	HT Capacitor	Yes	IV
94	PLC Capacitor	Yes	III
95	48V DCPS	Yes	III
96	Nitrogen Injection system	Yes	III
97	Foundation/Anchor bolts	Yes	III
98	EOT crane/Lift	No	II
99	Optical Signal Column	No	II
100	Maintenance Platform	No	II
101	Spark Gap	Yes	III
102	Thyristor Valve	Yes	III
103	DC current & voltage measuring device	ITP	III
104	Furniture	No	I

Note:

- * MICC for test and measuring equipment shall be issued only after actual verification/demonstration of satisfactory performance at site.
- ** Though level-2 items, CIP can be issued also on review of TCs and visual inspection of these items.

12.0 PRE-COMMISSIONING TESTS

- 12.1 Contractor shall perform any additional test based on specialties of the items as per the field Q.P./Instructions of the equipment manufacturer or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates at his own cost.

An indicative list of tests on isolator and earthswitch is given below. For pre-commissioning procedures and formats for Isolators and Grounding switch, Doc.No.: CF/ISO/07/R-4, dtd-01.04.2013 under POWERGRID Document no. D-2-01-03-01-04 will be the reference document. This document will be available at respective sites and shall be referred by the contractor.

- (a) Insulation resistance of each pole
- (b) Manual and electrical operation and interlocks
- (c) Insulation resistance of control circuits and motors
- (d) Ground connections
- (e) Contact resistance
- (f) Proper alignment so as to minimize vibration during operation
- (g) Measurement of operating Torque for isolator and Earth switch
- (h) Resistance of operating and interlocks coils
- (i) Functional check of the control schematic and electrical & mechanical interlocks
- (j) 50 operations test on isolator and earth switch

12.2 The Contractor shall ensure that erection, testing and commissioning of Isolators above 72.5 kV class shall be carried out under the supervision of the Isolator manufacturer's representative and the cost of the same shall be included in the erection price of the respective equipment.

GENERAL INSTRUCTION FOR EARTHING:

1. Location of earthing conductors / risers shown in the earthing drawing may change to suit the site condition.
2. Two different risers of one structure/equipment shall be connected to different conductors of main earthmat.
3. Earthing conductor around the building shall be buried at a minimum distance of 1500 mm from the outer boundary of the building.
4. Minimum distance of 6000 mm shall be maintained between two treated (pipe) electrode.
5. For surge arrester, earthing lead from surge counter to main earthmat shall be shortest in length as practically as possible. Earthing lead from surge arrester shall not be passed through any pipe.
6. No welding is allowed in the over ground earthing leads/risers if the length is less than 6m .
7. All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on it. Artificial cooling shall not be allowed.
8. All arc welding with MS ROD shall be done with low hydrogen content electrodes. the welds should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
9. Wherever earthing conductor crosses cable trenches, underground service ducts, pipes, tunnels, railway tracks etc., it shall be laid minimum 300 mm below them and shall be circumvented in case it fouls with equipment/structure foundations.
10. Earthing conductor around the building shall be buried in earth at a minimum distance of 1500 mm from the outer boundary of the building.
11. Earthing conductors crossing the road shall be laid 300mm below road or at greater depth to suit the site conditions.
12. Earthing conductors embedded in the concrete shall have approximately 50mm concrete cover

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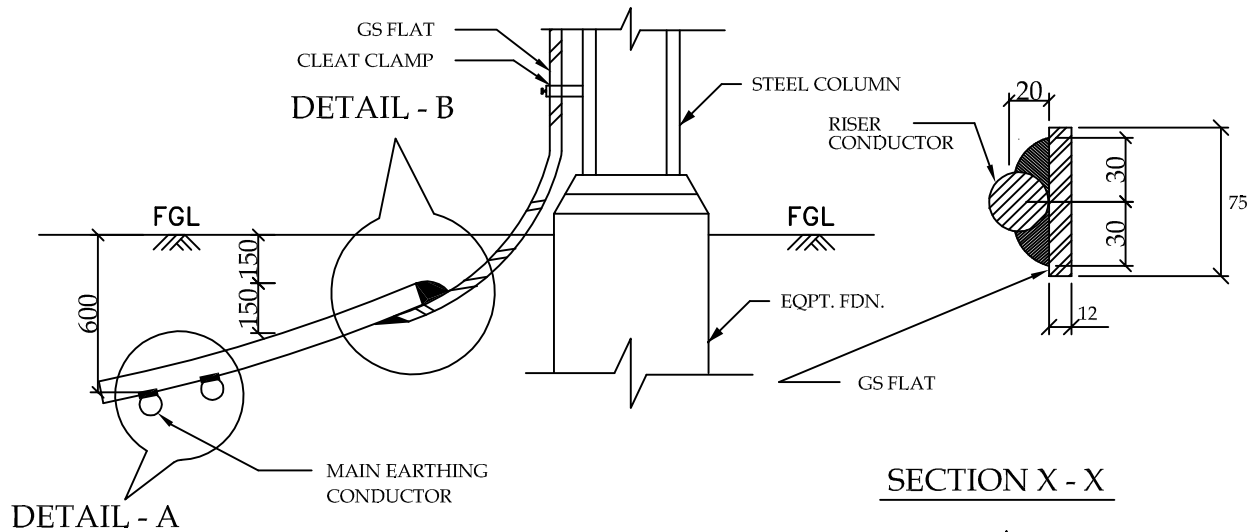
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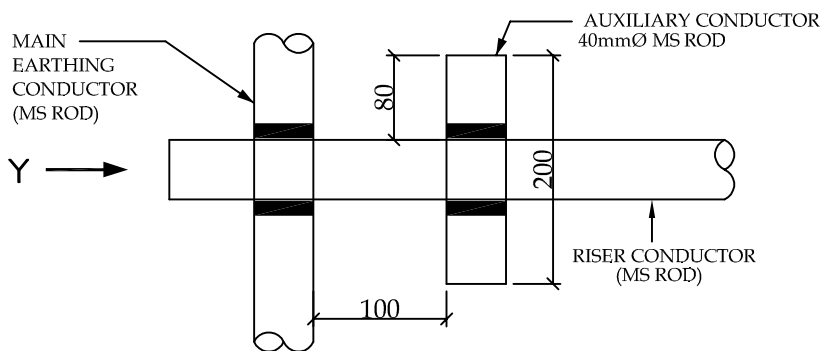
PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

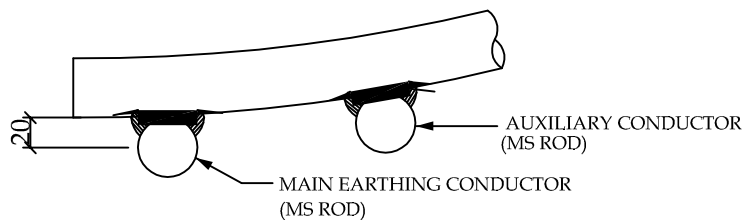
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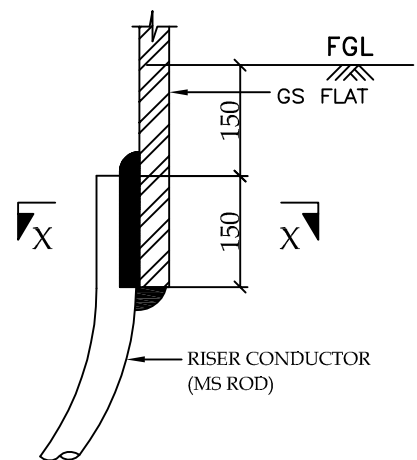
TYPICAL DETAILS OF RISER



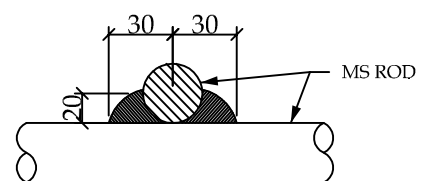
PLAN



ELEVATION
DETAIL - A



ELEVATION
DETAIL - B



VIEW - Y

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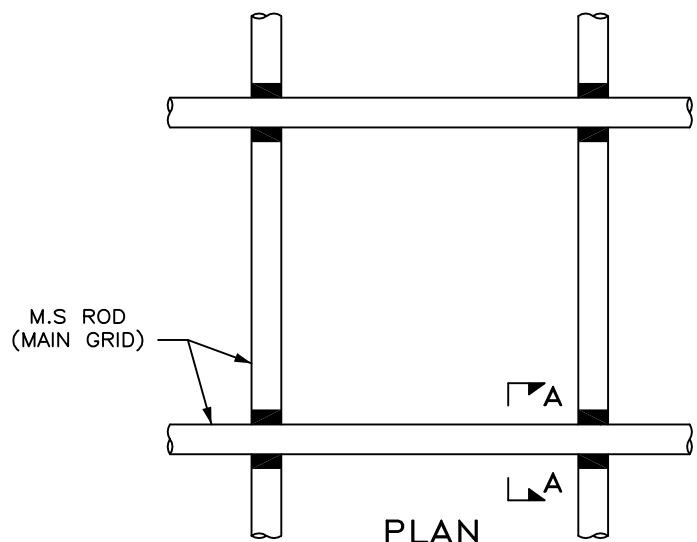
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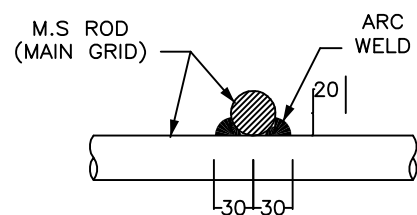
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SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

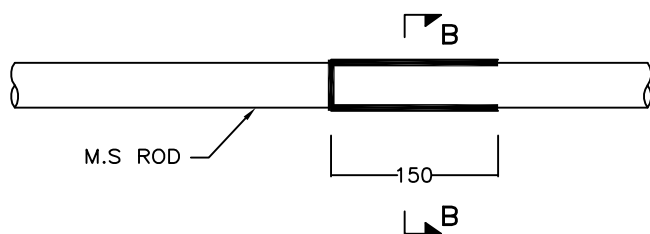
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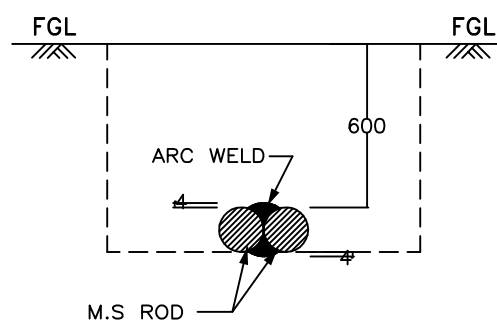
DETAIL OF CROSS JOINT



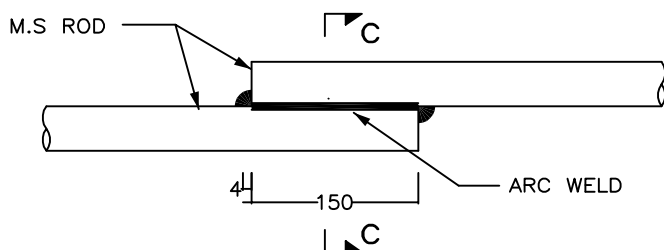
SECTION A - A



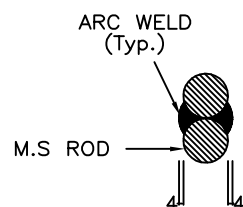
(CONDUCTORS KEPT ON SIDES)



SECTION B - B



(CONDUCTORS ONE ABOVE THE OTHER)



SECTION C - C

DETAIL OF LAP JOINT

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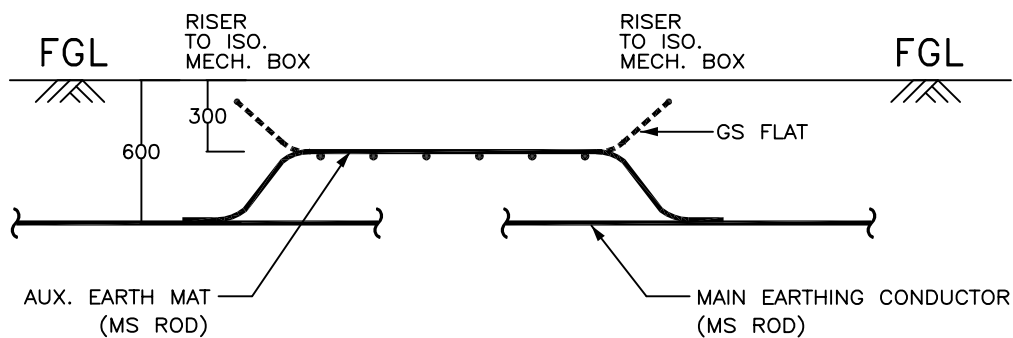
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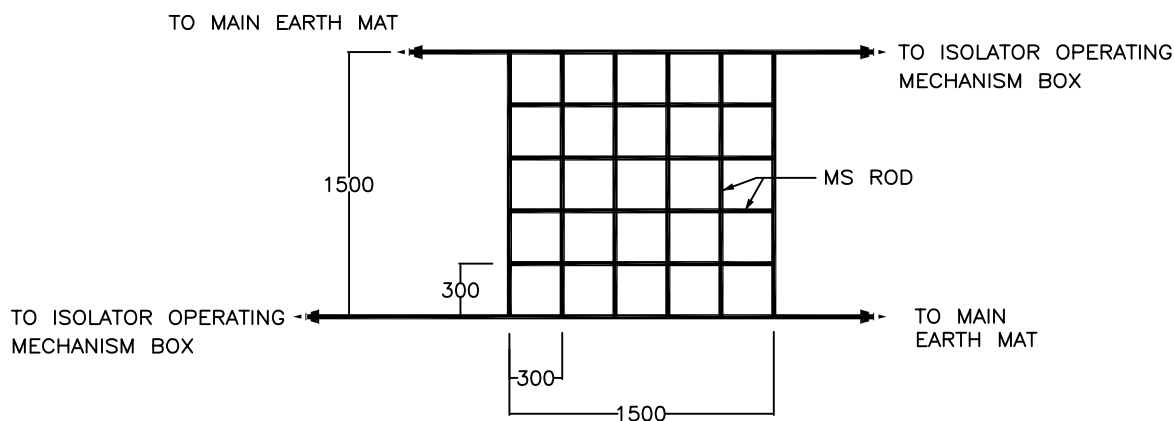
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SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

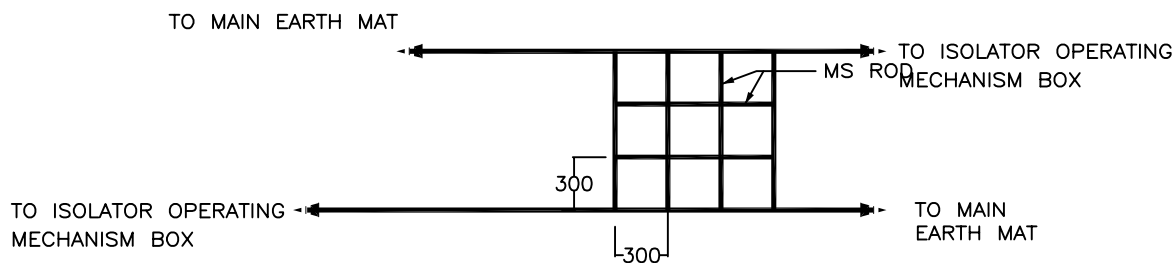
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CKD BY	PRPD BY	Date	C/ENG/STD/EARTHINGS/09
			SHEET # 3



ELEVATION



PLAN (For 220kV & above class isolators)



PLAN (For 132kV & below class isolators)

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PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

KK Parkar

KK Parkar

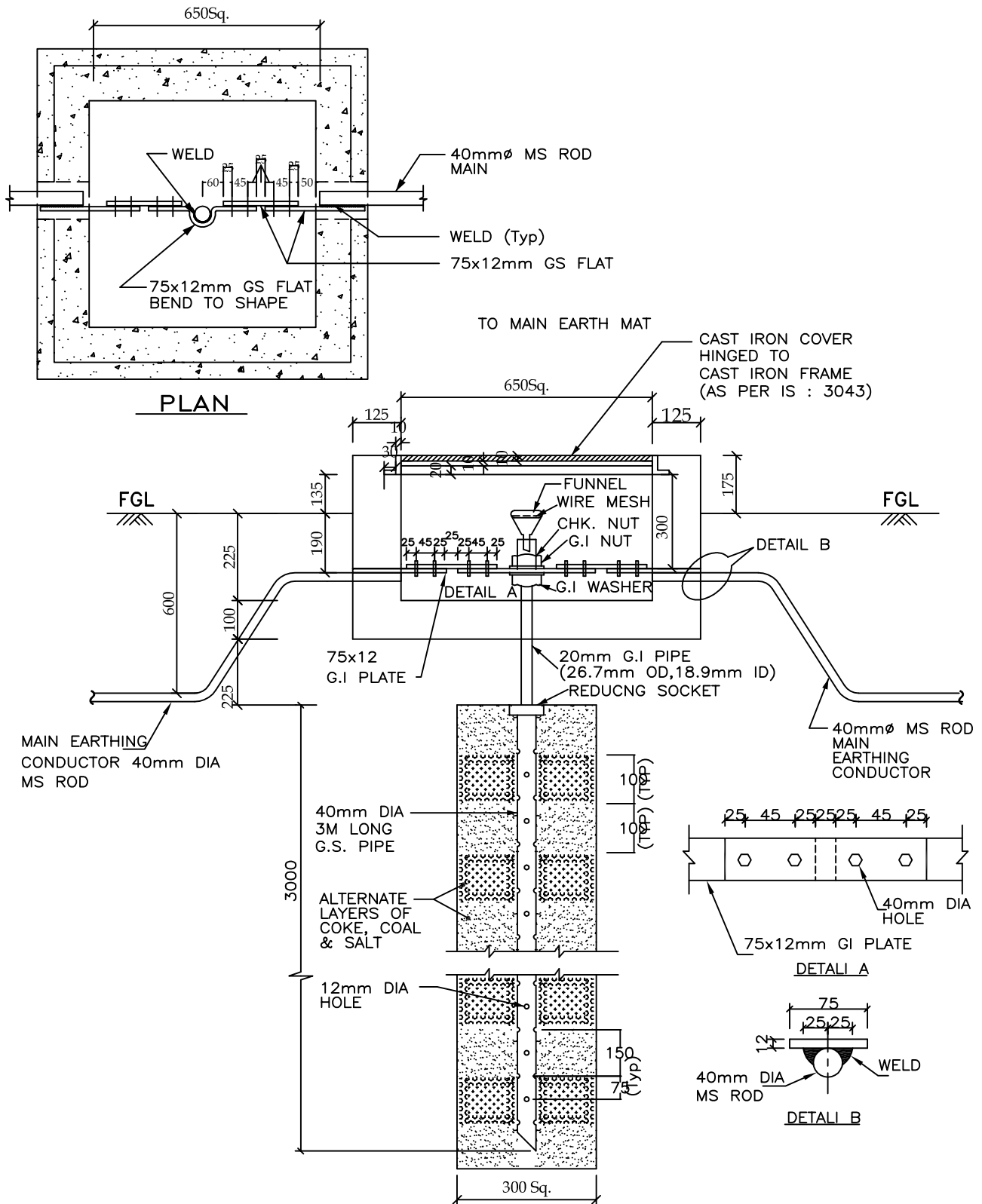
Dec-2013

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SWITCHYARD ERECTION

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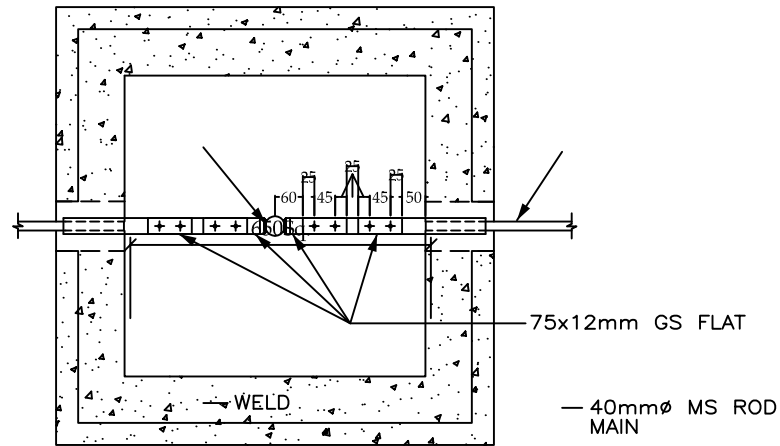
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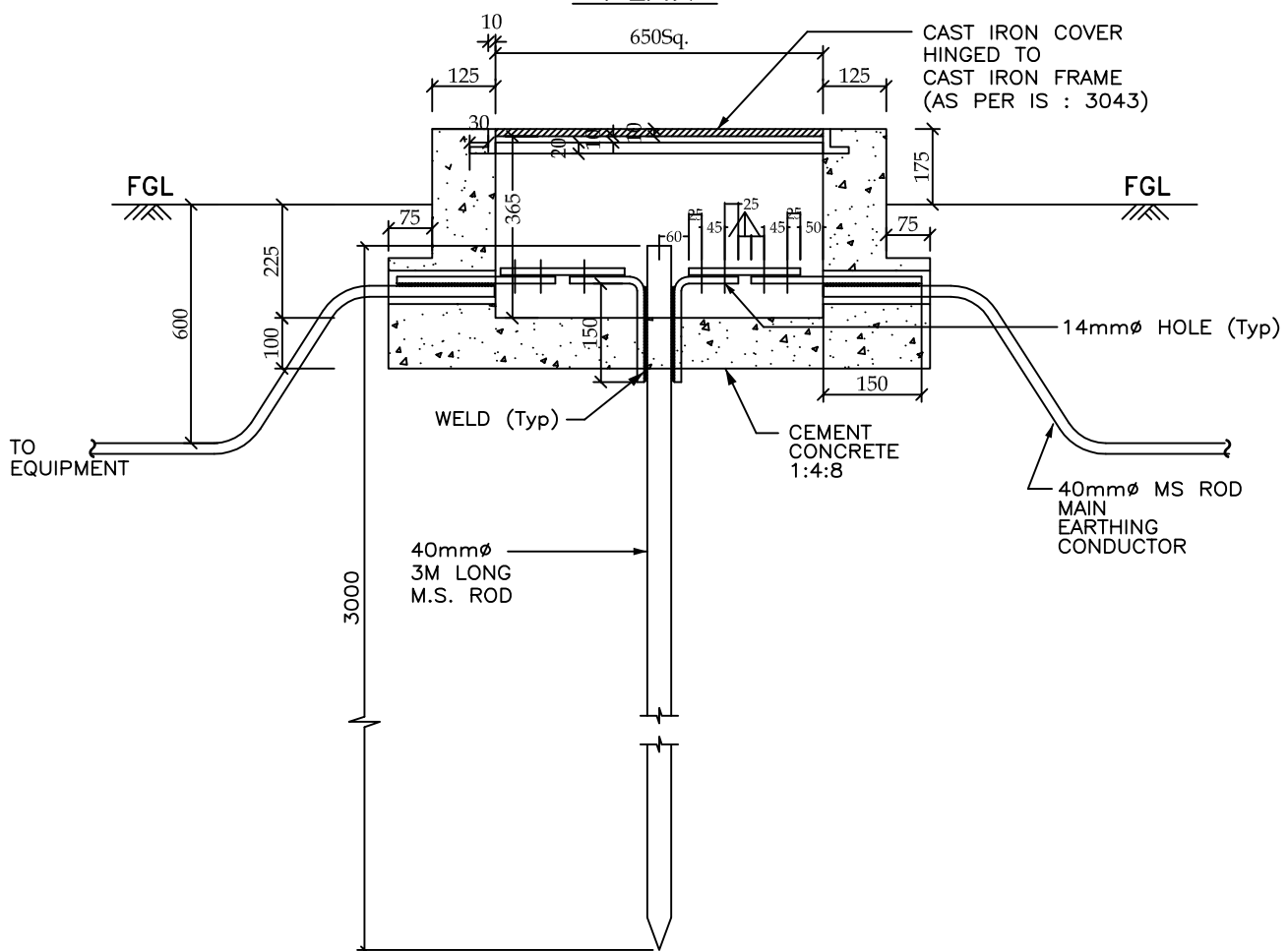
Date

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C/ENG/STD/EARTHINGS/09
SHEET # 5

ROD ELECTRODE WITH TEST LINK FOR LM, TOWER WITH PEAK, CVT, LA



PLAN



ELEVATION

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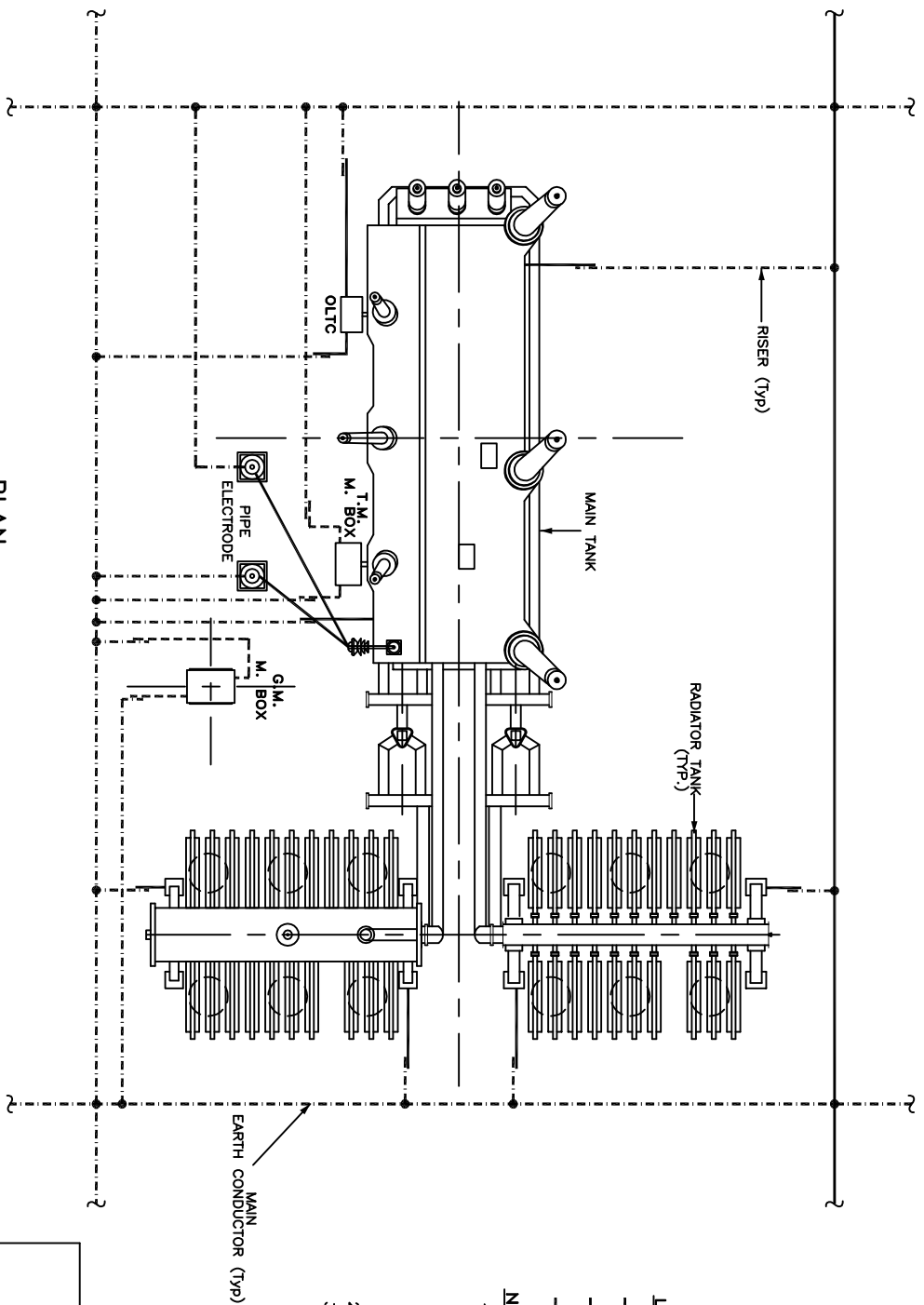


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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KKPurkar	KKPurkar	Dec-2013	

EARTHING OF TRANSFORMER/ REACTOR



MAIN
EARTH CONDUCTOR (Typ)

1. NO. OF RISERS :-
- | | | |
|----------------------------|---|-------------------|
| MAIN TANK | - | 2 Nos. |
| RADIATOR TANK | - | 4 Nos. |
| OLTC | - | 2 Nos. (ICT only) |
| M. BOX | - | 2 Nos./M. BOX |
| NEUTRAL EARTH
ELECTRODE | - | 2 Nos. |
2. No. OF PIPE ELECTRODE REQUIRED = 2 Nos.
3. Pylon supports shall be earthed to the main earthing conductor by GS flat.

LEGEND

----	40mmø MS ROD
_____	75 x 12 mm GS FLAT
-----	50 x 6 mm GS FLAT

NOTES :-

1. No. OF RISERS :-

MAIN TANK	—	2 Nos.
RADIATOR TANK	—	4 Nos.
OLTC	—	2 Nos. (ICT only)
M. BOX	—	2 Nos./M. BOX
NEUTRAL EARTH	—	2 Nos

RODE REQUIRED = 2 Nos.

3. PYLON SUPPORTS SHALL BE EARTHED TO THE MAIN EARTHING CONDUCTOR BY GS FLAT.

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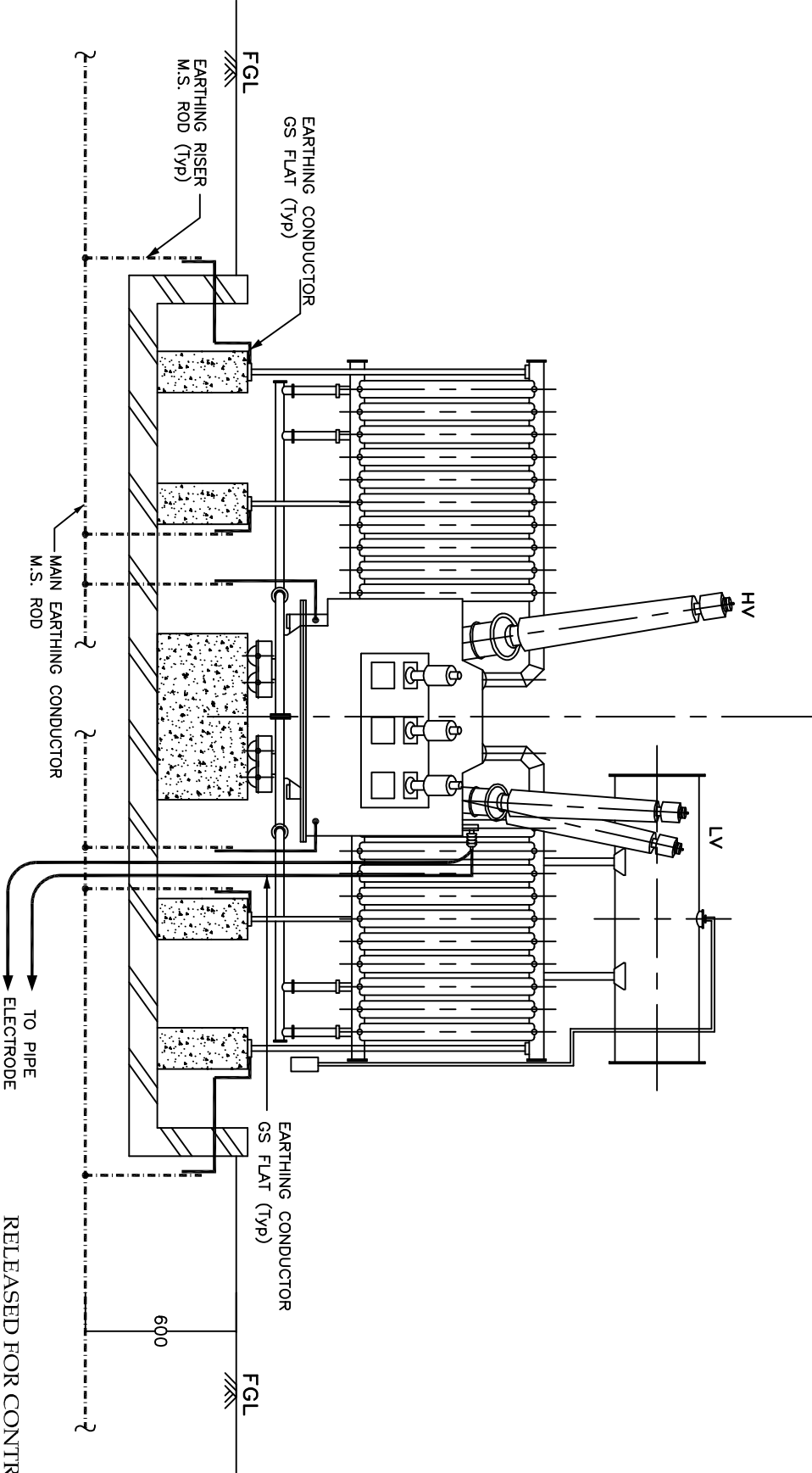
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PROJECT :- TECHNICAL SPECIFICATION-SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

		Drawing No.: C/ENG/STD/EARTHINGS/09 SHEET # 7
36%Shadows	36%Shadows	
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	Date	

EARTHING OF TRANSFORMER / REACTOR



LEGEND

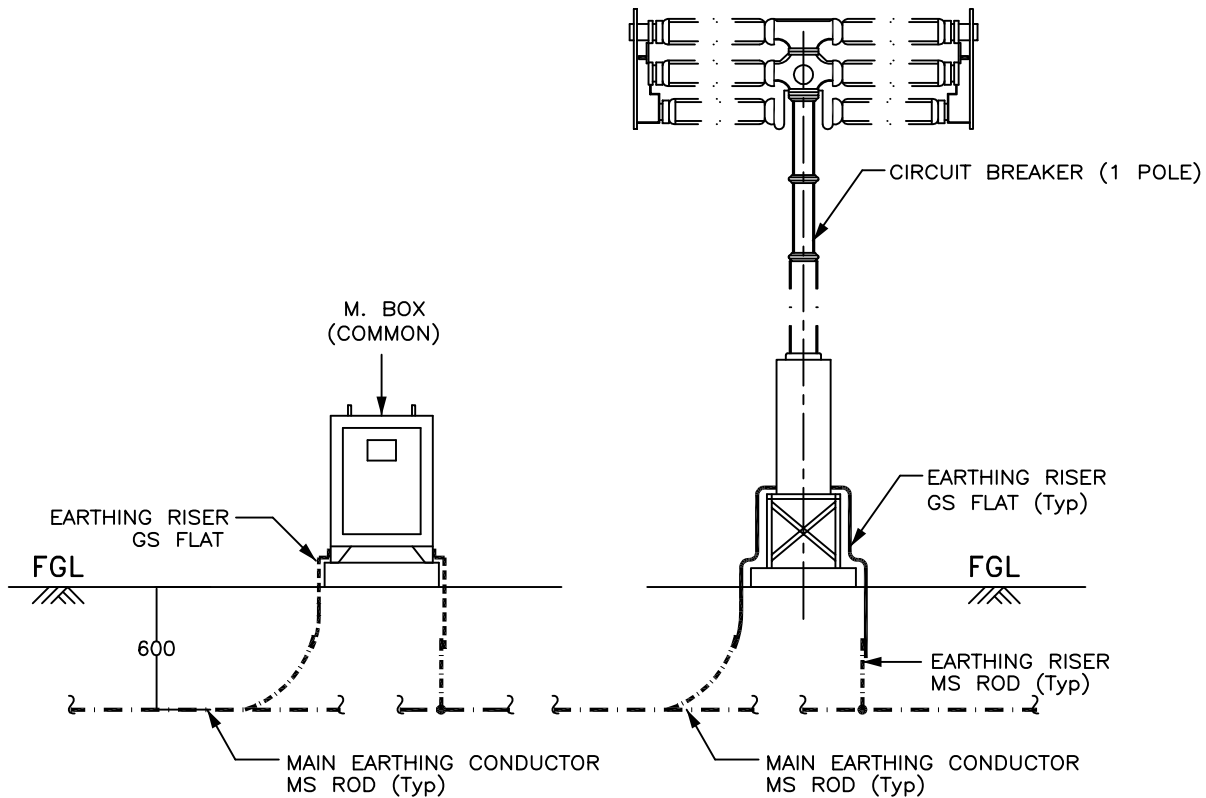
- 40mm ϕ MS ROD
- 75 x 12 mm GS FLAT
- 50 x 6 mm GS FLAT

END VIEW

POWER GRID CORPORATION OF INDIA LIMITED (A Government of India Enterprise) पुनर्विभाग			
PROJECT :- TECHNICAL SPECIFICATION- SWITCHYARD ERECTION			
TITLE:- STANDARD EARTHING DETAILS			
CKD BY	PRPD BY	Date	Drawing No.: C/ENG/STD/EARTHINGS/09 SHEET # 8
JK/Grades	JK/Grades	Dec-2013	

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EARTHING OF CIRCUIT BREAKER



ELEVATION

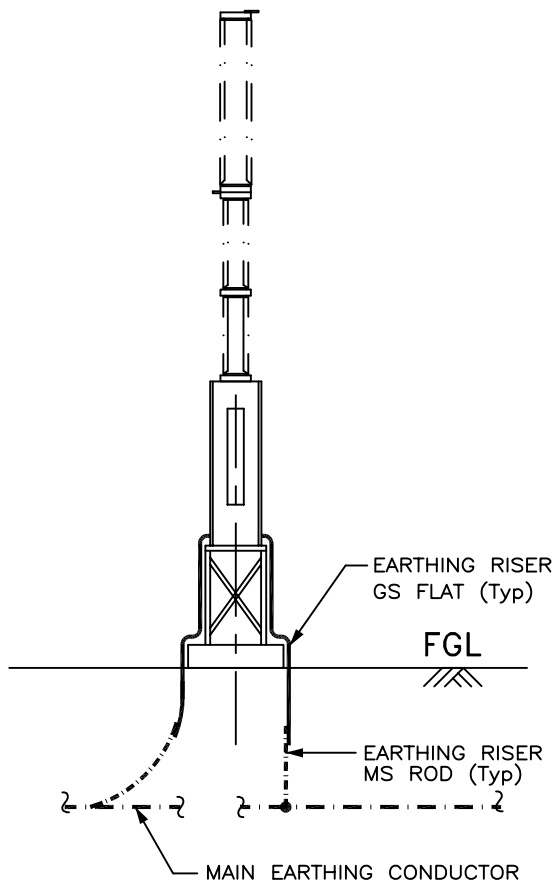
NOTES :-

1. No. OF RISERS FOR CIRCUIT BREAKER = 2 Nos. / PHASE
1. No. OF RISERS FOR LADDER (IF Applicable) = 2 Nos.
2. No. OF RISERS FOR MAR. BOX = 2 Nos.
3. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

LEGEND

— · — · — · —	40mm ϕ MS ROD
—————	75 x 12 mm GS FLAT
-----	50 x 6 mm GS FLAT

RELEASED FOR CONTRUCTION



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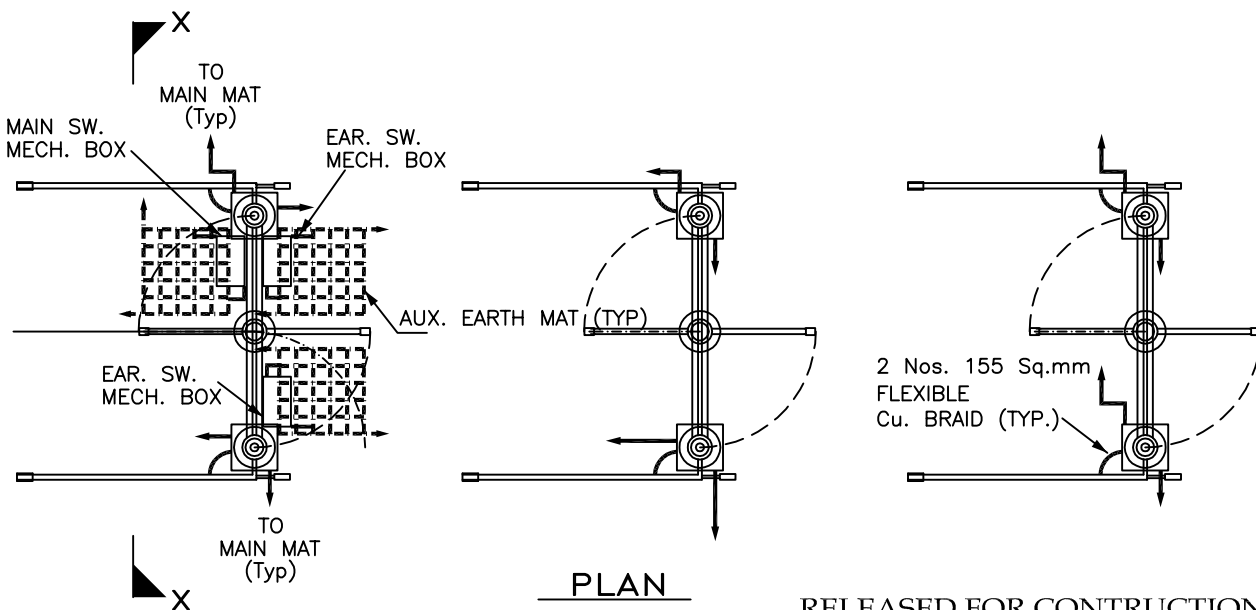
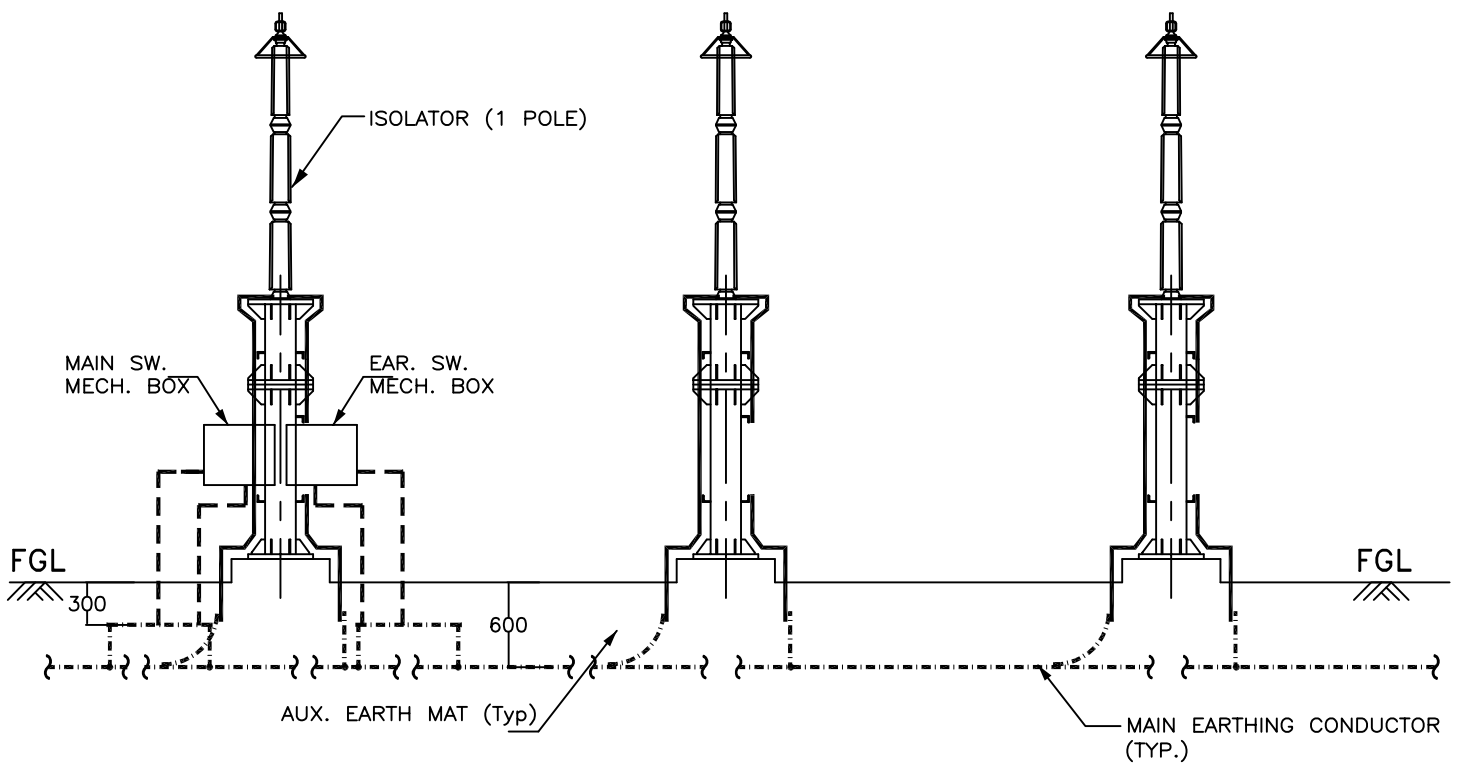
पावरग्रिड

**PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION**

TITLE:- STANDARD EARTHING DETAILS

<i>KKPurkhar</i>	<i>KKPurkhar</i>	Dec-2013	Drawing No.:
CKD BY	PRPD BY	Date	C/ENG/STD/EARTHINGS/09
			SHEET # 9

EARTHING OF ISOLATOR



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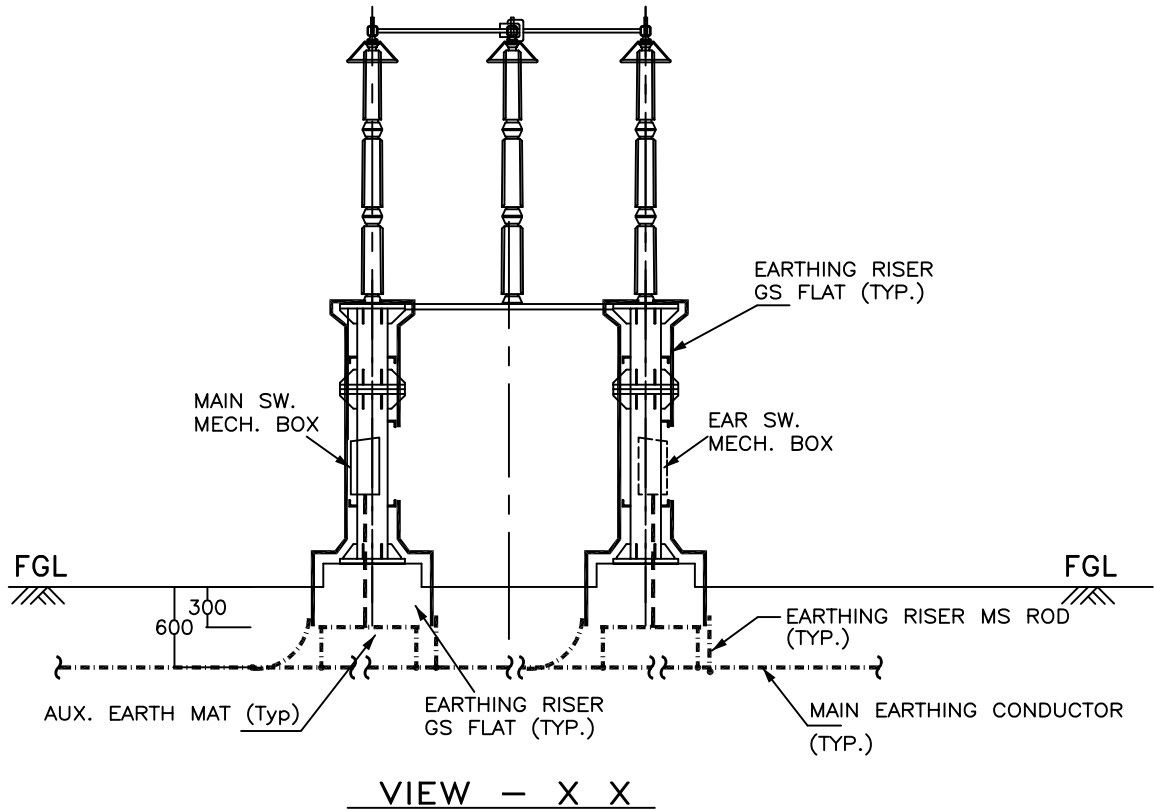


**PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION**

TITLE:- STANDARD EARTHING DETAILS

<i>KK Parhar</i>	<i>KK Parhar</i>	Dec-2013	Drawing No.:
CKD BY	PRPD BY	Date	C/ENG/STD/EARTHINGS/09
			SHEET # 10

EARTHING OF ISOLATOR (1 PH)



LEGEND

	40mm ϕ MS ROD
	75 x 12 mm GS FLAT
	50 x 6 mm GS FLAT

NOTES :-

1. No. OF RISERS FOR ISOLATOR = 4 Nos. / PHASE.
2. No. OF RISERS FOR MAIN MECH. BOX = 2 Nos.
3. No. OF RISERS FOR EARTH SW. MECH. BOX = 2 Nos. / BOX.
4. No. OF AUXILIARY EARTH MAT = 1 Nos. FOR EACH MB
5. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.
6. NO. OF AUX. EARTH MAT IS INDICATIVE ONLY. IT SHALL BE EXECUTED AS PER ACTUAL NUMBER/POSITION OF EARTH SWITCHES.

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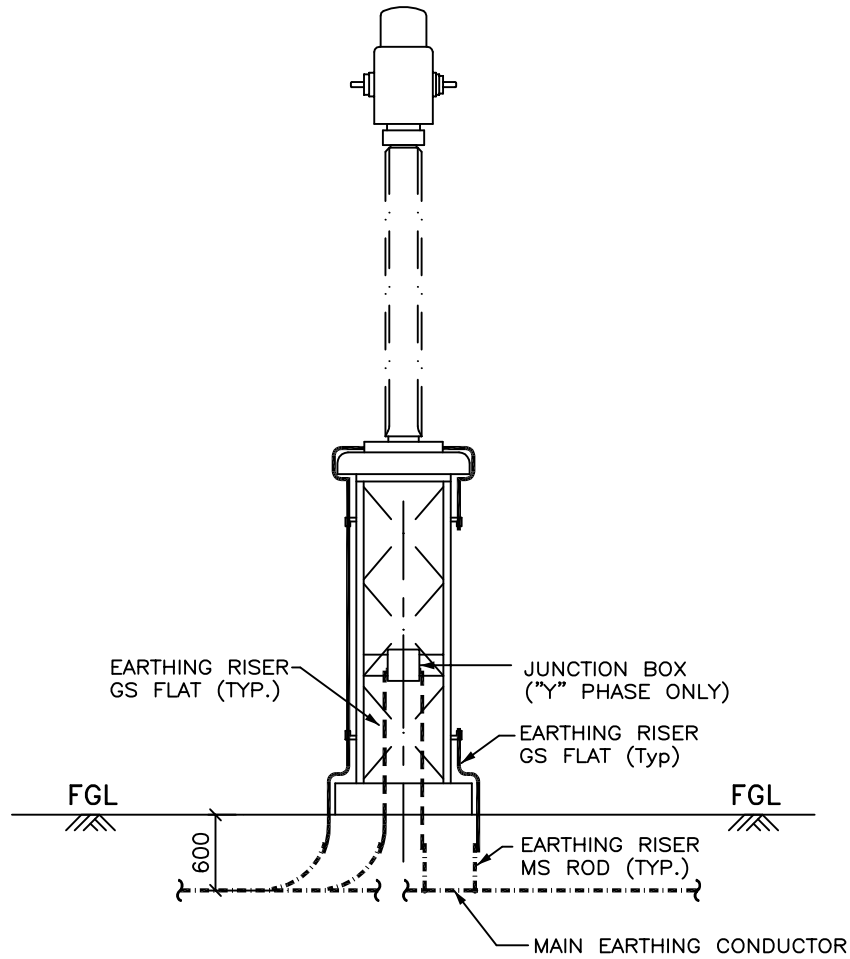


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

<i>KK Parhar</i>	<i>KK Parhar</i>	Dec-2013	Drawing No.:
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EARTHING OF CURRENT TRANSFORMER (1 PH)



ELEVATION

LEGEND

	40mm ϕ MS ROD
	75 x 12 mm GS FLAT
	50 x 6 mm GS FLAT

NOTES :-

1. No. OF RISERS = 2 Nos. / PHASE.
2. No. OF RISERS FOR JUN. BOX = 2 Nos.
3. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

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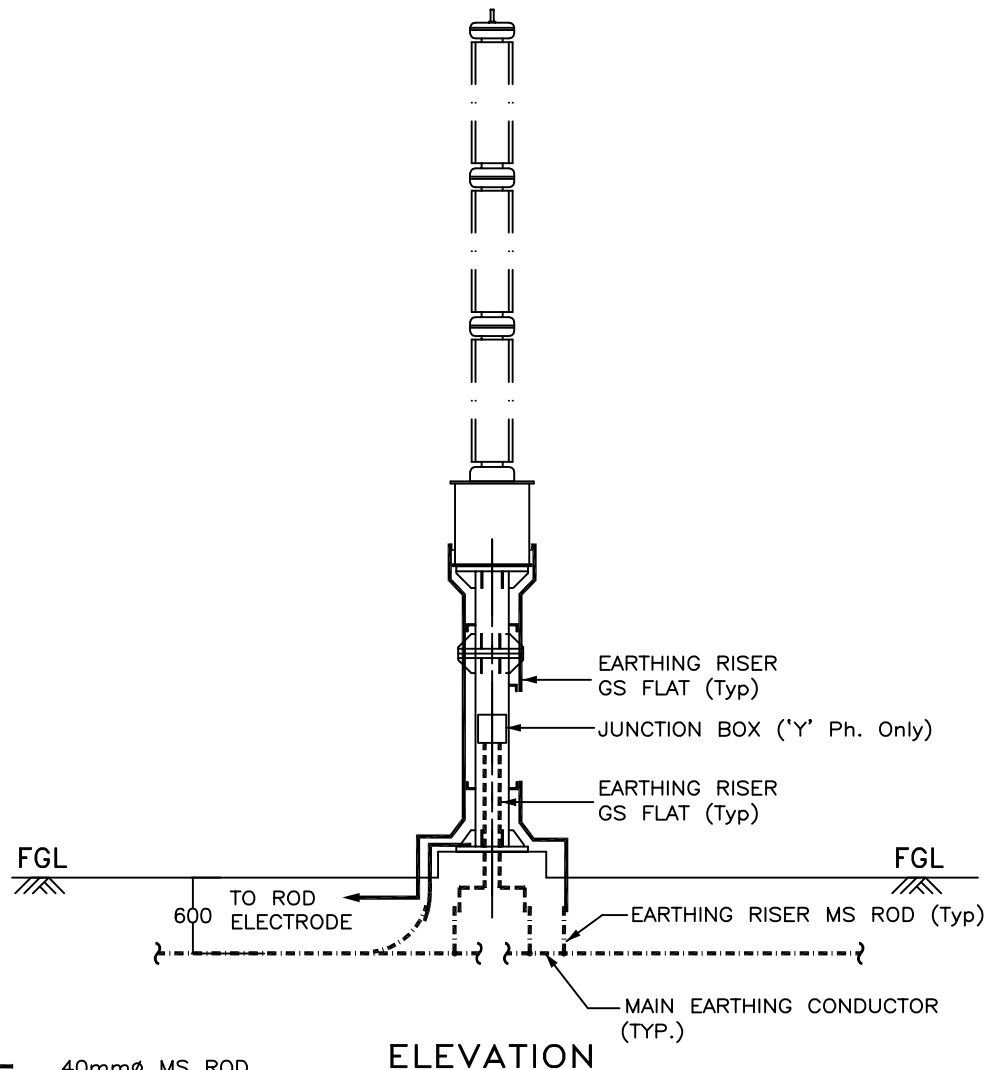


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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EARTHING OF CAPACITIVE VOLTAGE TRANSFORMER (1 PH)



LEGEND

	40mm ϕ MS ROD
	75 x 12 mm GS FLAT
	50 x 6 mm GS FLAT

NOTES :-

1. No. OF RISERS = 3 Nos. / PHASE.
2. No. OF RISERS FOR J. BOX = 2 Nos.
3. No. OF ROD ELECTRODE REQUIRED = 1 No. / PHASE.
4. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

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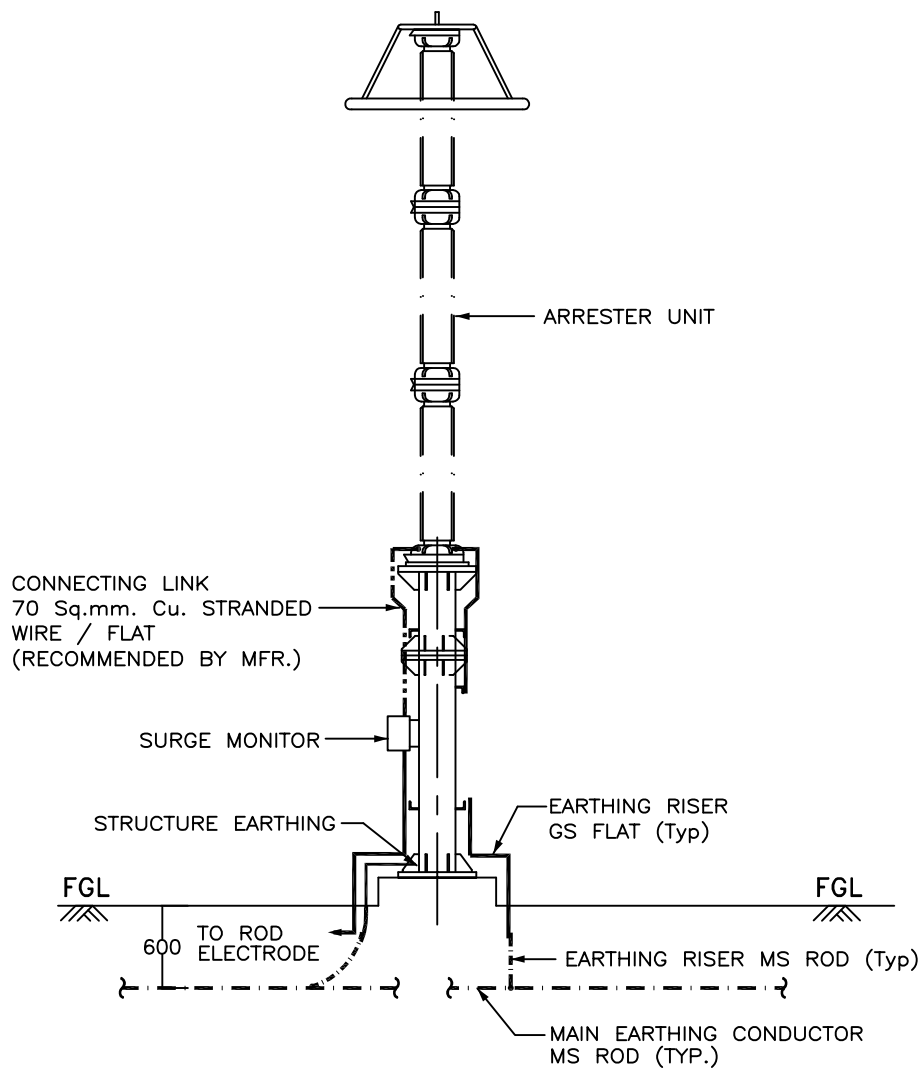


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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EARTHING OF SURGE ARRESTER (1PH)



ELEVATION

LEGEND

- · — · — 40mm ϕ MS ROD
- 75 x 12 mm GS FLAT

NOTES :-

- 1 . No. OF RISERS = 3 Nos. / PHASE.
- 2 . No. OF ROD ELECTRODE REQUIRED = 1 No. / PHASE.
- 3 . CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

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PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

KK Parkar

CKD BY

KK Parkar

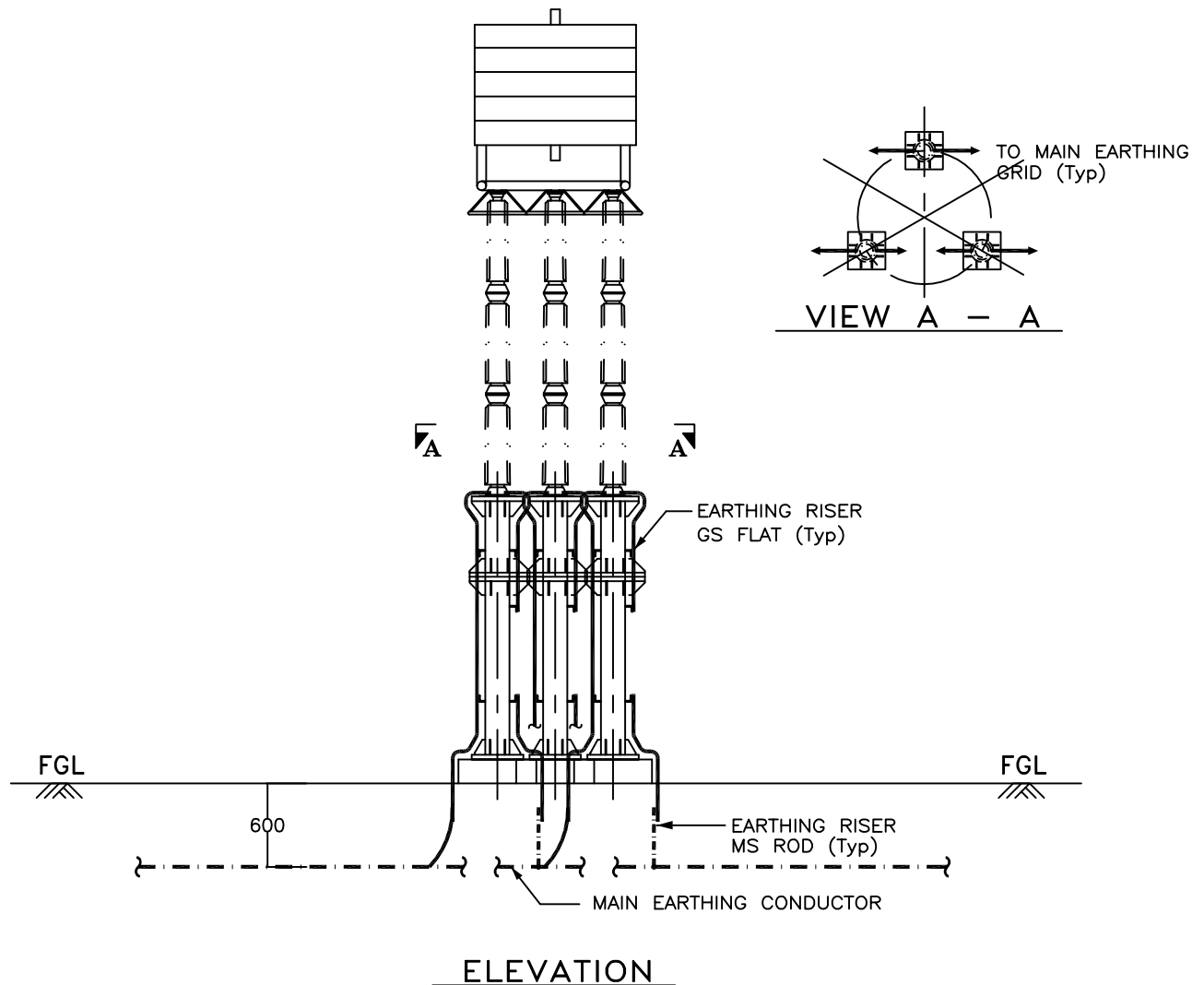
PRPD BY

Dec-2013

Date

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EARTHING OF WAVE TRAP (1PH)




LEGEND

- 40mm ϕ MS ROD
 75 x 12 mm GS FLAT

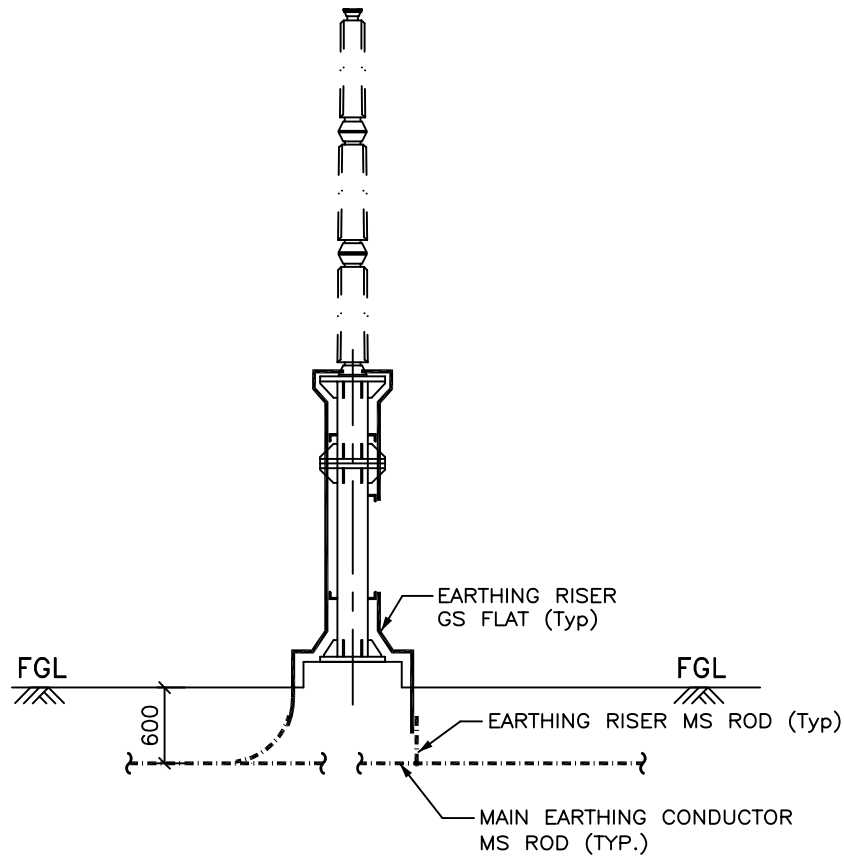
NOTE :-

1. No. OF RISERS = 6 Nos. / PHASE.
2. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

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PROJECT :- TECHNICAL SPECIFICATION- SWITCHYARD ERECTION			
TITLE:- STANDARD EARTHING DETAILS			
<i>KK Parshar</i>	<i>KK Parshar</i>	Dec-2013	Drawing No.: C/ENG/STD/EARTHINGS/09 SHEET # 15
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EARTHING OF POST INSULATOR (1PH)



ELEVATION

LEGEND

- · — · — 40mm ϕ MS ROD
———— 75 x 12 mm GS FLAT

NOTES :-

1. No. OF RISERS = 2 Nos. / PHASE.
2. CLEAT CLAMP SHALL BE PROVIDED AT 1000mm INTERVAL.

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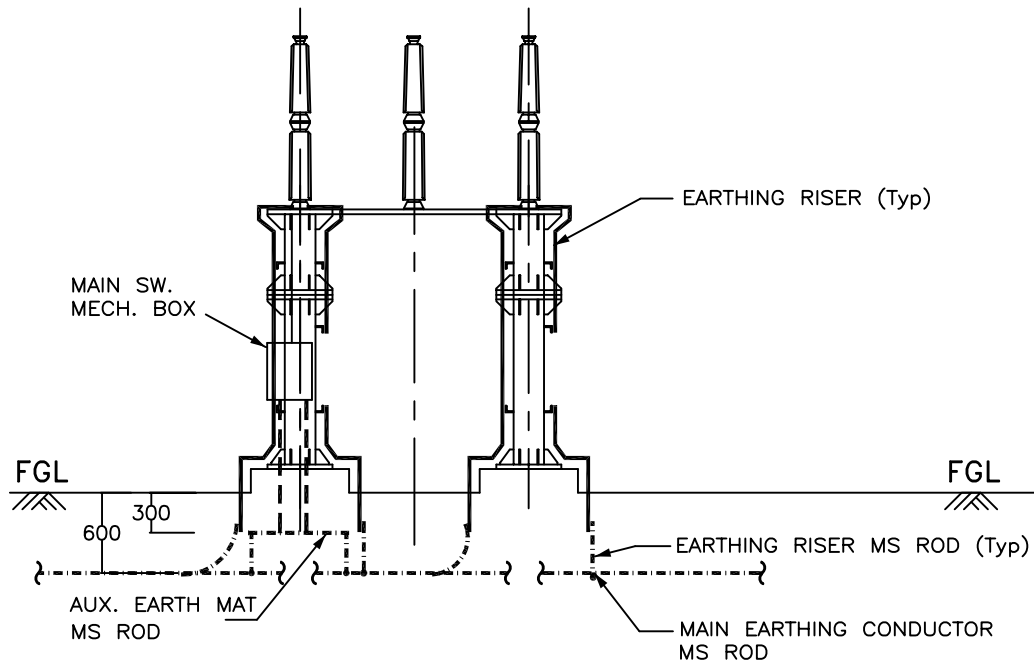


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

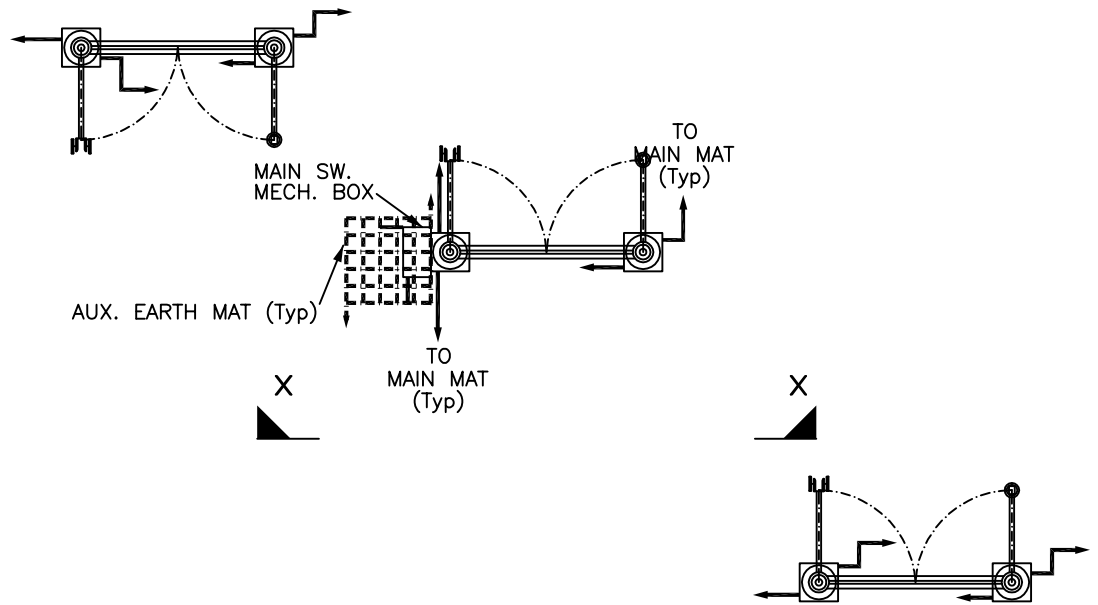
TITLE:- STANDARD EARTHING DETAILS

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TANDEM ISOLATOR



VIEW - X X



PLAN

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SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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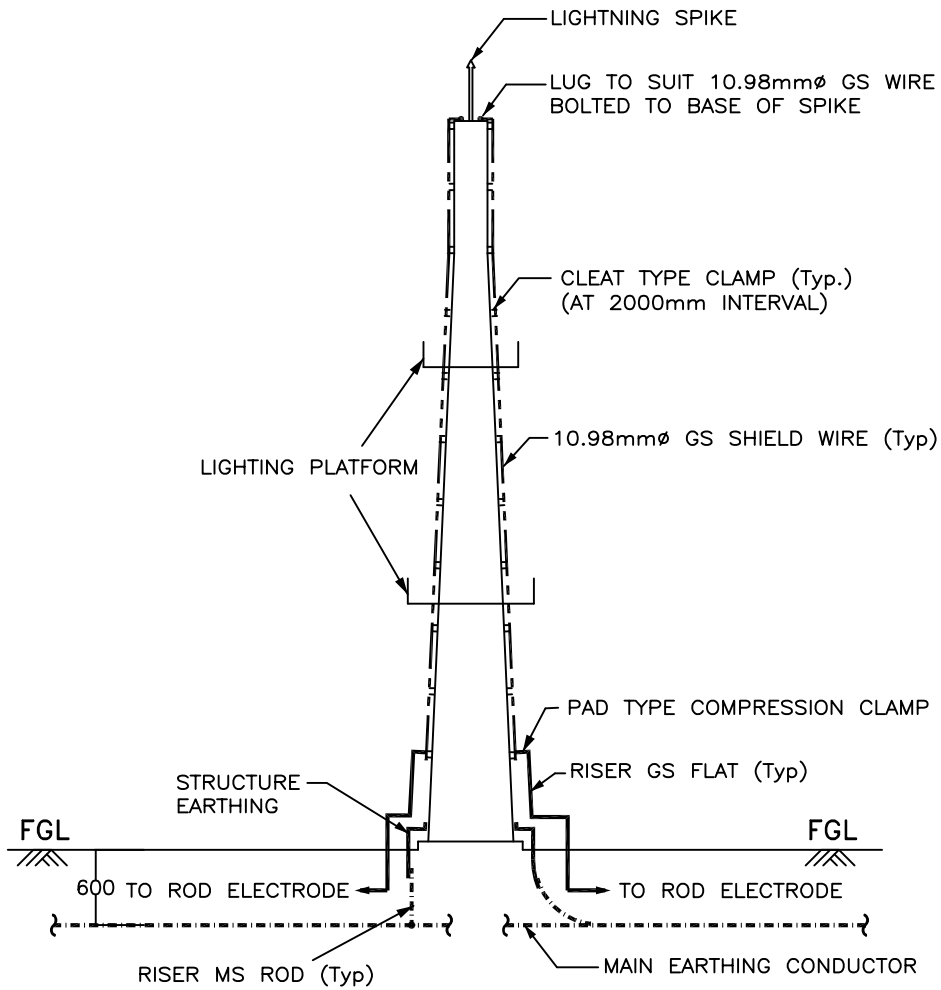
PRPD BY

Dec-2013

Drawing No.:
C/ENG/STD/EARTHINGS/09
SHEET # 17

Date

EARTHING OF LIGHTNING MAST



ELEVATION

NOTES :-

1. No. OF RISERS = 4 Nos.
2. No. OF ROD ELECTRODE REQUIRED = 2 Nos.
3. No. OF PAD TYPE CLAMP = 2 Nos.

LEGEND

- · — · — 40mm ϕ MS ROD
- 75 x 12 mm GS FLAT

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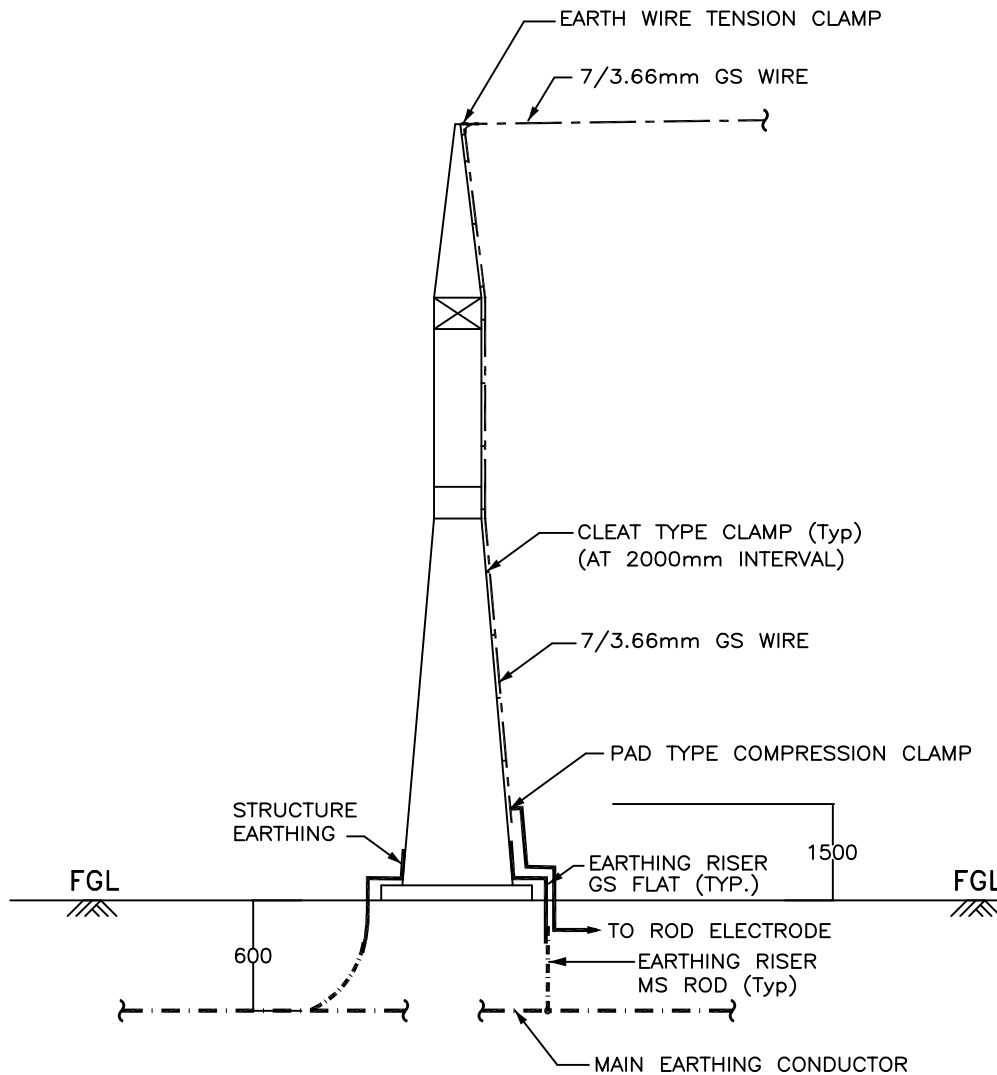


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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			SHEET # 18

EARTHING OF TOWER WITH PEAK



ELEVATION

LEGEND

- 40mm ϕ MS ROD
— 75 x 12 mm GS FLAT

NOTES :-

1. No. OF RISERS = 3 Nos.
2. No. OF ROD ELECTRODE REQUIRED = 1 No.
3. No. OF PAD TYPE CLAMP = 1 No.

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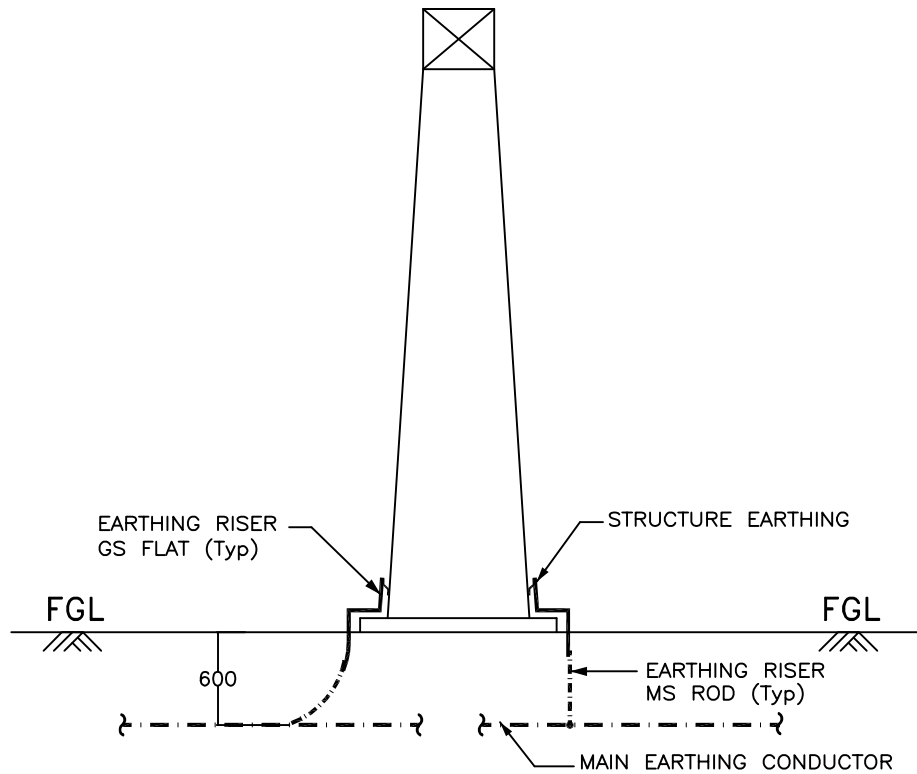


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS



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<i>KK Parhar</i>	<i>KK Parhar</i>	Dec-2013	

EARTHING OF TOWER WITHOUT PEAK



ELEVATION

LEGEND

	40mm ϕ MS ROD
	75 x 12 mm GS FLAT

NOTES :-

1. No. OF RISERS = 2 Nos.

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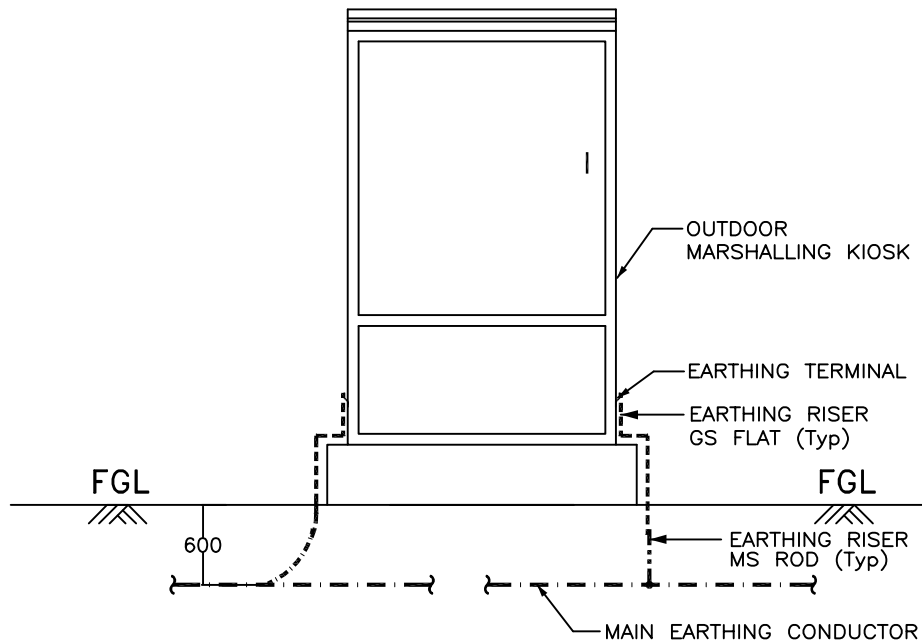


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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EARTHING OF BAY MARSHALLING BOX



ELEVATION

LEGEND

— · — · — · —	40mm \varnothing MS ROD
—————	75 x 12 mm GS FLAT
-----	50 x 6 mm GS FLAT

NOTE :-

- No. OF RISERS = 2 Nos.

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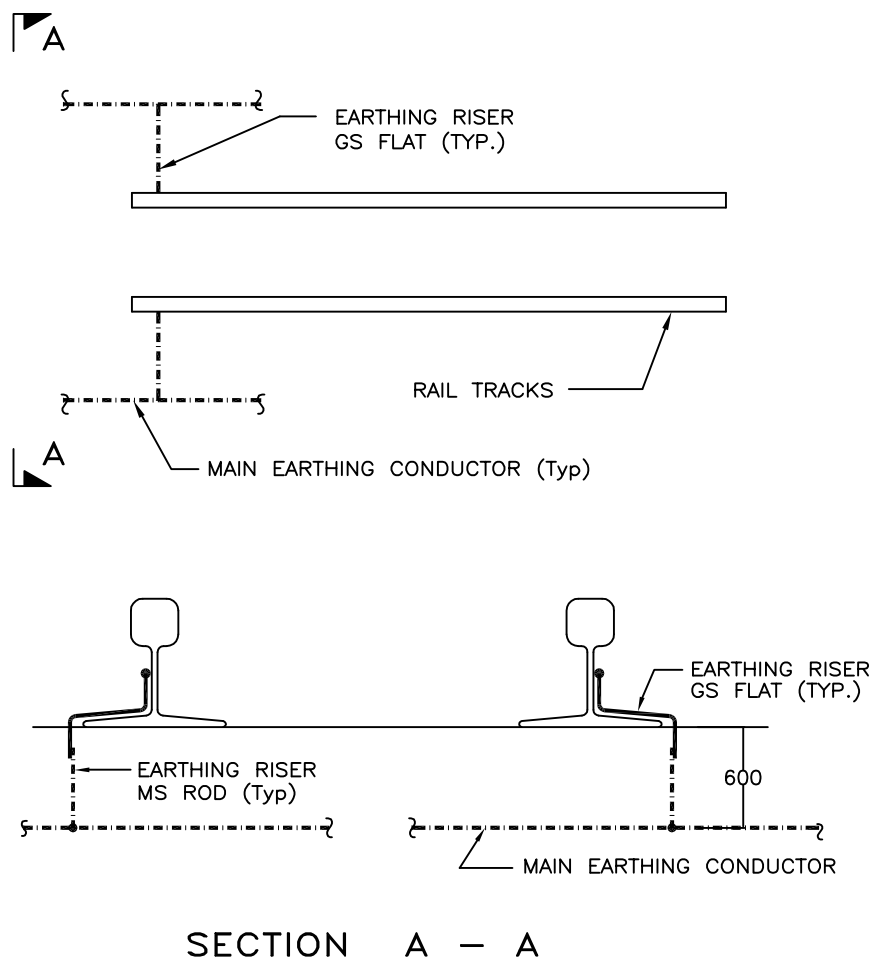


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SWITCHYARD ERECTION

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EARTHING OF RAIL TRACK



LEGEND

	40mm \varnothing MS ROD
	75 x 12 mm GS FLAT

NOTES :-

1. EACH RAIL SHALL BE EARTHED AT 30M INTERVAL AND ALSO AT BOTH ENDS.

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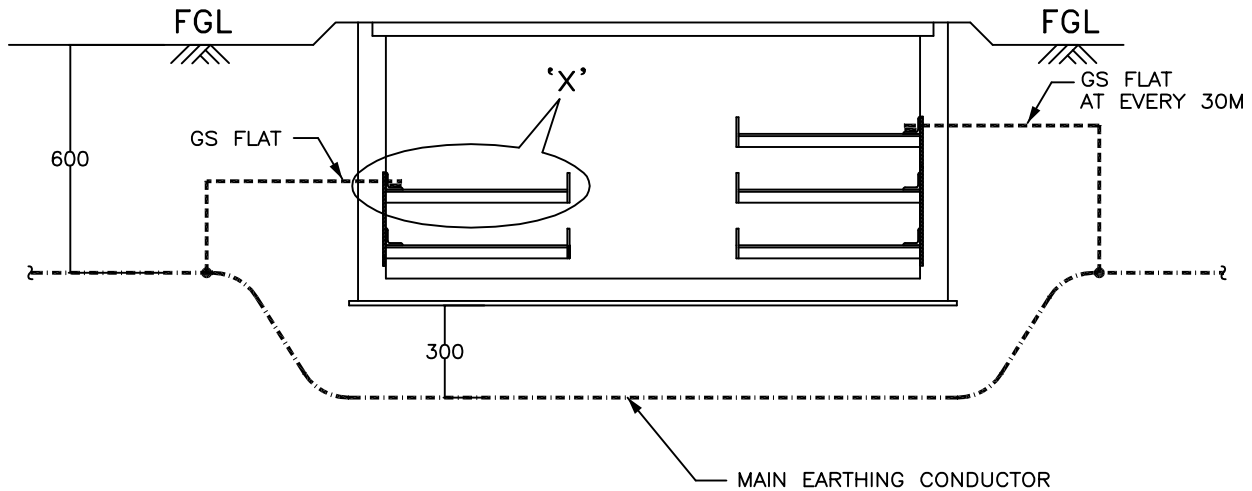


PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

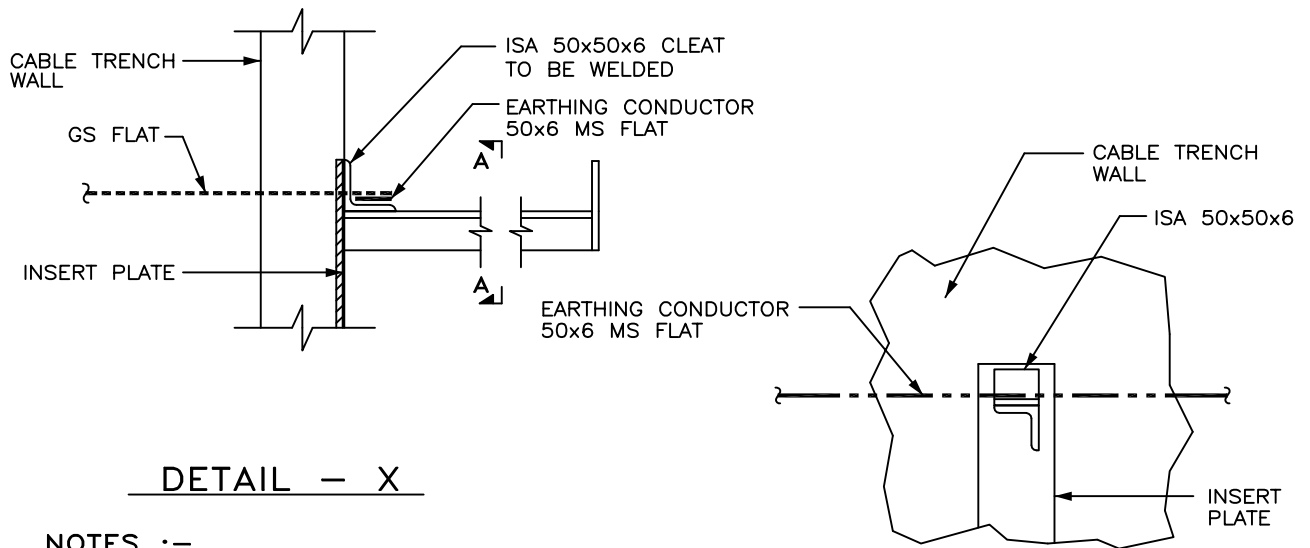
TITLE:- STANDARD EARTHING DETAILS

<i>CKD BY</i>	<i>PRPD BY</i>	Dec-2013	Drawing No.:
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EARTHING OF CABLE TRENCH



TYPICAL CROSS SECTION OF CABLE TRENCH



DETAIL - X

NOTES :-

1. MS FLAT SHALL RUN ON TOP TIER ALL ALONG THE CABLE TRENCHES & WELDED TO EACH OF THE RACKS.
2. MS FLAT SHALL BE EARTHED AT 30M INTERVAL AND ALSO AT BOTH ENDS.

SECTION A - A

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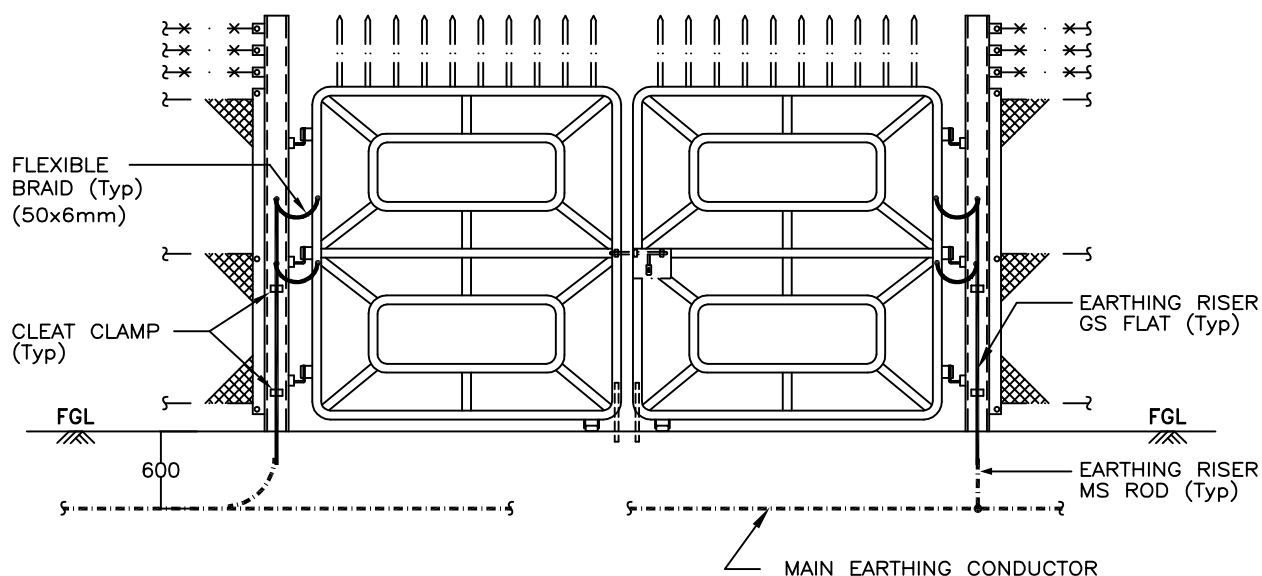


**PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION**

TITLE:- STANDARD EARTHING DETAILS

<i>KK Parhar</i>	<i>KK Parhar</i>	Dec-2013	Drawing No.:
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EARTHING OF GATES



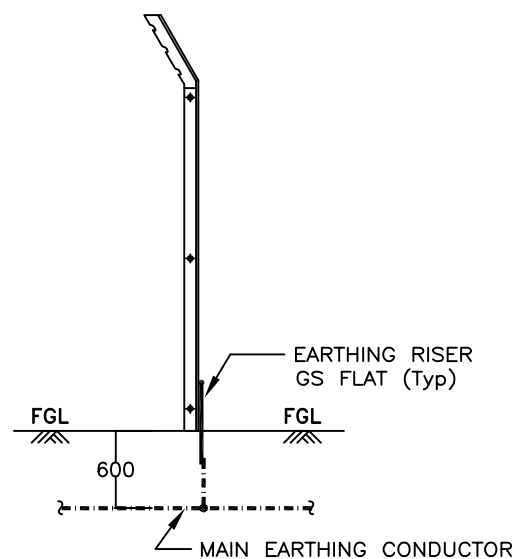
MAIN GATE

LEGEND

	40mm \varnothing MS ROD
	75 x 12 mm GS FLAT
	50 x 6 mm MS FLAT

NOTES :-

	FENCE POST	MAIN GATE
1 . No. OF RISERS REQUIRED	1	2
2 . No. OF FLEXIBLE BRAID	—	4
3. ALL GATES & EVERY ALTERNATE FENCE SHALL BE CONNECTED TO EARTHING GRID.		



FENCE POST (ALTERNATE FENCE POST)

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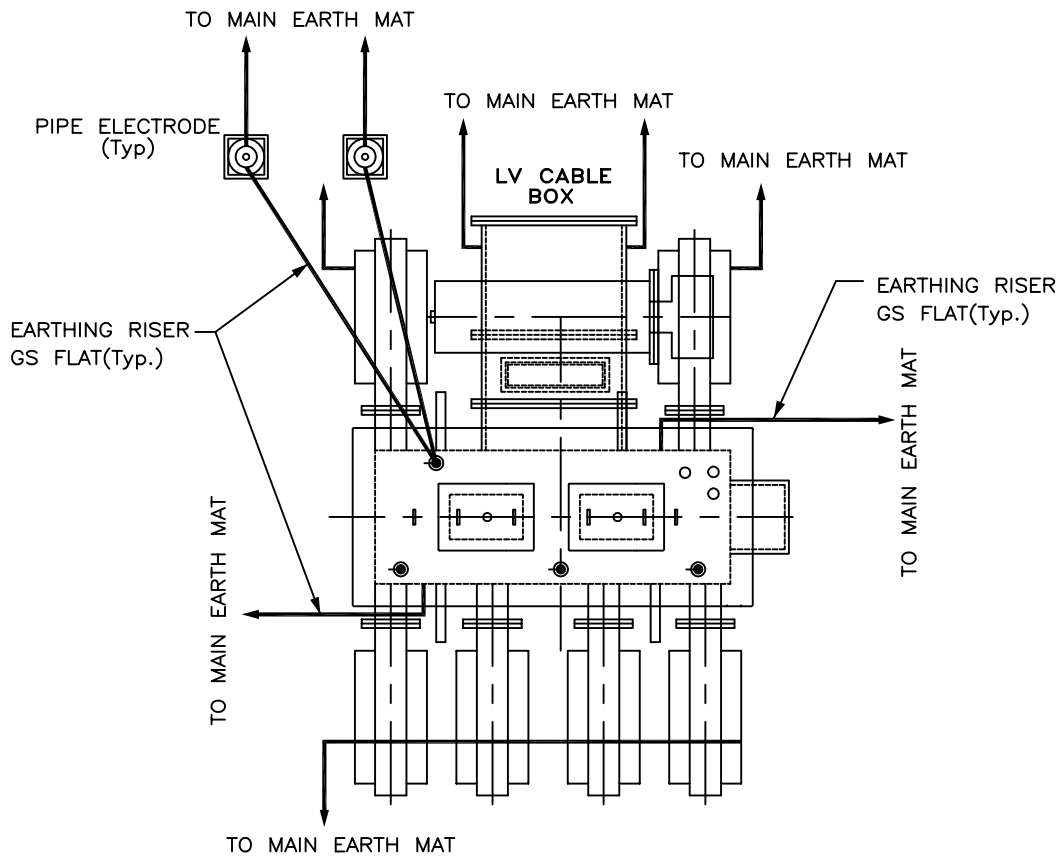


**PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION**

TITLE:- STANDARD EARTHING DETAILS

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EARTHING OF LT TRANSFORMER



PLAN

LEGEND

— · — · — · —	40mm ϕ MS ROD
—————	75 x 12 mm GS FLAT
-----	50 x 6 mm GS FLAT

NOTES :-

1. No. OF RISERS FOR MAIN TANK & T.M. MAR. BOX = 4 Nos.
2. No. OF RISERS FOR LV CABLE BOX & RADIATOR = 4 Nos.
3. No. OF RISERS FOR PIPE ELECTRODE = 2 Nos.
4. No. OF PIPE ELECTRODES REQUIRED = 2 Nos.

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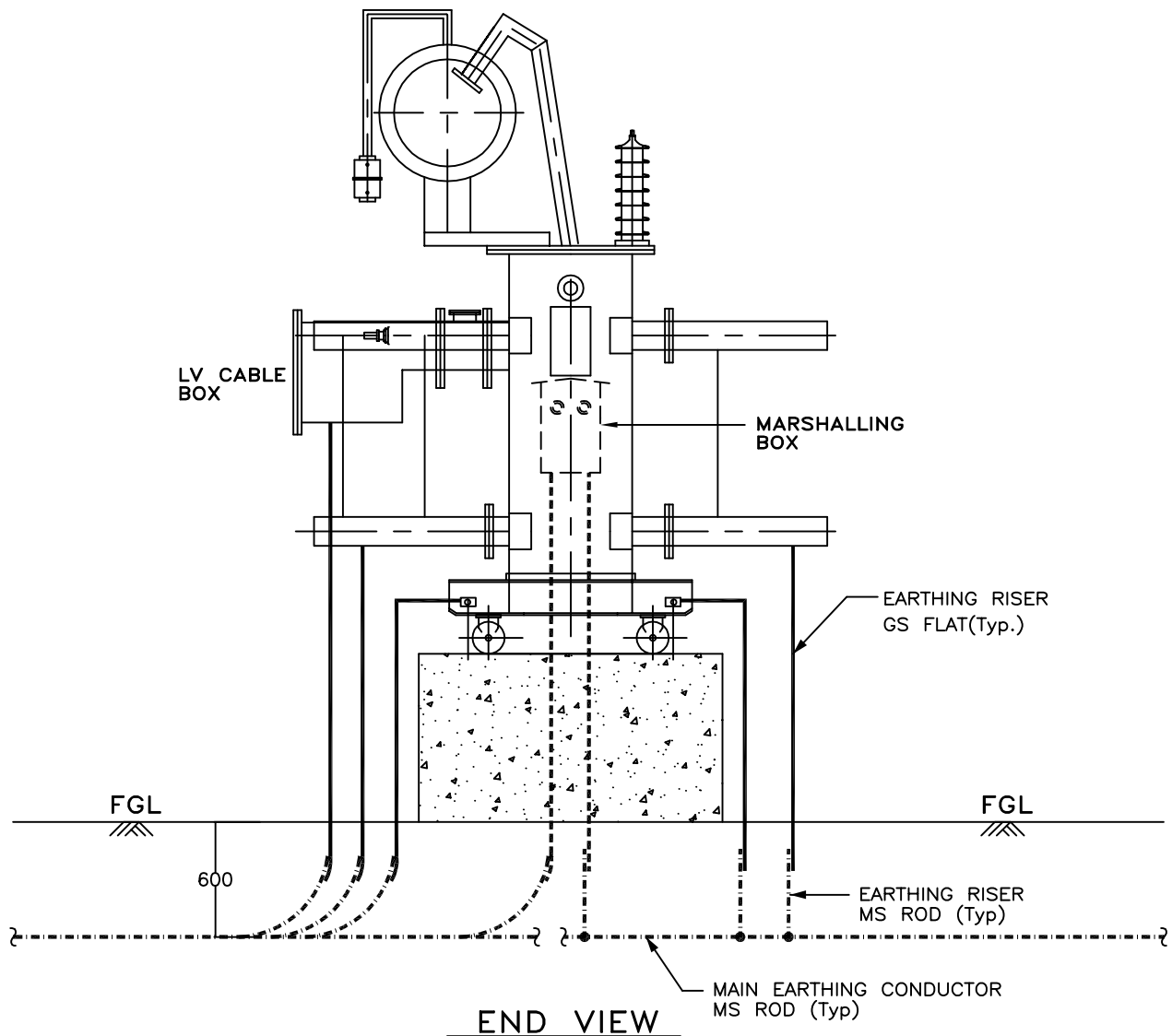


**PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION**

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EARTHING OF LT TRANSFORMER



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PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

TITLE:- STANDARD EARTHING DETAILS

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<i>KK Parshar</i>	<i>KK Parshar</i>	Dec-2013	

EARTHING OF PYLON SUPPORTS

Pylon supports shall be grounded through 50x6mm GI flat to the ring around the Pylon supports of 75x12mm GI flat which in turn is connected to the main grid (40 mm dia MS rod) at 2 to 3 points as available.

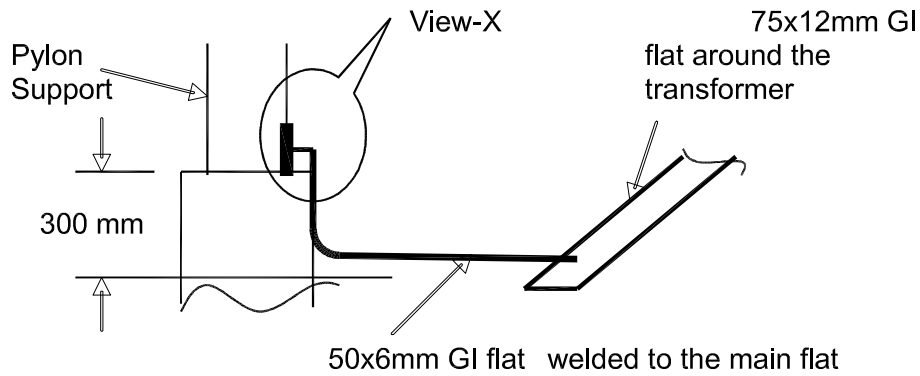


Fig.- Elevation (Earthing of Pylon Supports)

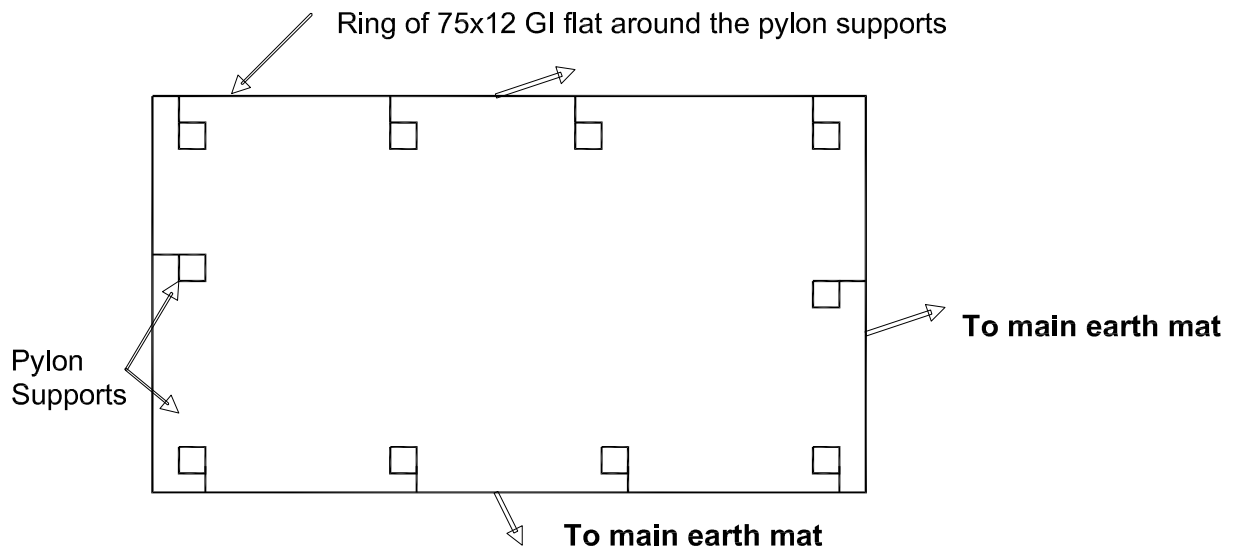


Fig.- Layout (Earthing of Pylon Supports)

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PROJECT :- TECHNICAL SPECIFICATION-
SWITCHYARD ERECTION

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HK Pashar	HK Pashar	Dec-2013	

EARTHING OF HYDRANT/ HVW SPRAY PIPING

These pipes shall be grounded at pump house through 50x6mm GI flat connected to the main flat, 75x12mm running around the room.

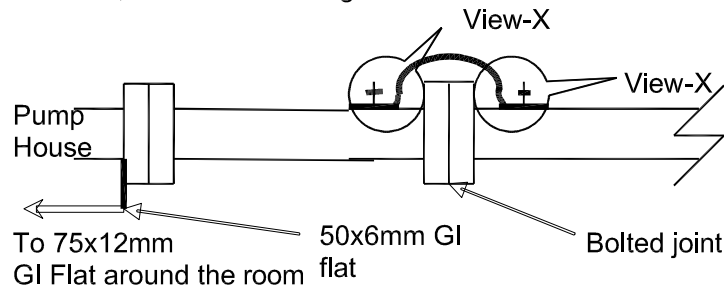


Fig.-Earthing of Hydrant / HVW Spray Piping

EARTHING OF HYDRANT POST/ HOSE BOX

A bolt shall be welded to these structures at the time of installation which can be used to connect them to the nearest riser or main 75x12mm GI flat through 50x6mm GI flat.

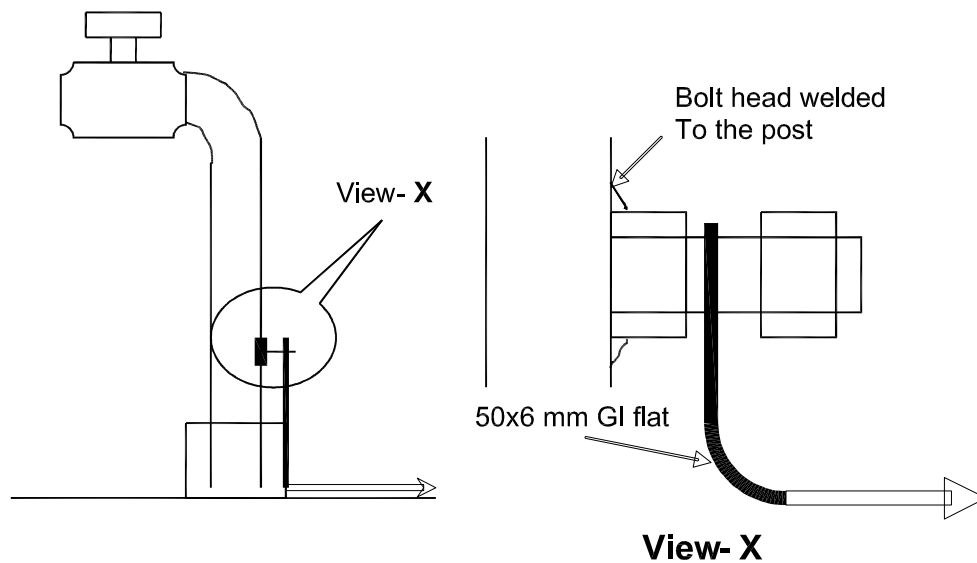


Fig.- Earthing of hydrant box / hose box

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SWITCHYARD ERECTION

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<i>AKPashar</i>	<i>AKPashar</i>	Dec-2013	

8.0 PRE-COMMISSIONING TESTS

8.1 An indicative list of tests is given below.

- (a) Operation check of LA counters.
- (b) Insulation resistance measurement
- (c) Capacitance and Tan delta measurement of individual stacks.
- (d) Third harmonic resistive current measurement (to be conducted after energisation.)
- (e) Contractor shall perform any additional test based on specialties of the items as per the field Q.P./Instructions of the equipment **manufacturer** or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates **at his own cost**.

For pre-commissioning procedures and formats for Surge Arresters, Doc.No.: CF/SA/08/R-4 dtd-01/04/2013 under POWERGRID Document no. D-2-01-03-01-04 will be reference document. **This document will be available at respective sites and shall be referred by the contractor.**

TECHNICAL SPECIFICATION SECTION-SWITCHYARD ERECTION



पावरग्रिड

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड

(भारत सरकार का उद्यम)

Power Grid Corporation of India Limited

(A Government of India Enterprises)

TECHNICAL SPECIFICATION

**SECTION- SWITCHYARD ERECTION
REVISION - 10**

SECTION-(SE)
SWITCHYARD ERECTION

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SECTION - (SE) **SWITCHYARD ERECTION**

		(EH Type)	(EH Type)	(EH Type)	(H Type)
2.	Outer diameter	88.9 mm	114.2 mm	120.00 mm	141.30 mm
3.	Thickness	7.62 mm	8.51 mm	12.00 mm	9.53 mm
4.	Cross-sectional area of aluminium	1945.76 sq.mm	2825.61 sq.mm	4071.50 sq.mm	3945.11 sq.mm
5.	Weight	5.25 kg/m	7.7 kg/m	11.034 kg/m	10.652 kg/m

Sl. No.	Description	6" AL. TUBE	8" AL. TUBE	10" AL. TUBE
1.	Type	6" IPS (H Type)	8" IPS (H Type)	10" IPS (H Type)
2.	Outer diameter	150 mm	202 mm	252 mm
3.	Thickness	10 mm	16 mm	17 mm
4.	Cross-sectional area of aluminium	4398.2 Sq mm	9349.3 sq.mm	12550.6 sq.mm
5.	Weight	11.875 kg/m	25.243 kg/m	33.887 kg/m

6.0 **EARTHING CONDUCTORS**

6.1 **General**

All conductors buried in earth and concrete shall be of mild steel. All conductors above ground level and earthing leads shall be of galvanised steel, except for cable trench earthing. The minimum sizes of earthing conductor to be used are as indicated in clause 9.4 of this Section.

6.2 **Constructional Features**

6.2.1 **Galvanised Steel**

- a) Steel conductors above ground level shall be galvanised according to IS:2629.
- b) The minimum weight of the zinc coating shall be **610 gm/sq.m for normal area and 900 gm/sq.m for coastal area as specified in Section-Project** and minimum thickness shall be 85 microns.
- c) The galvanised surfaces shall consist of a continuous and uniformly thick coating of zinc, firmly adhering to the surfaces of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

6.3 **Tests**

In accordance with stipulations of the specifications galvanised steel shall be subjected to four one minute dips in copper sulphate solution as per IS : 2633.

SECTION - (SE)

SWITCHYARD ERECTION

instructions/instruction manual.

13.8 Handling equipment, sling ropes etc. should be tested periodically before erection for strength.

13.9 The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc.

14.0 STORAGE

14.1 The Contractor shall provide and construct adequate storage shed as per the Filed Quality Plan for proper storage of equipments, where sensitive equipments shall be stored indoors. All equipments during storage shall be protected against damage due to acts of nature or accidents. The storage instructions of the equipment manufacturer/Employer shall be strictly adhered to. POWERGRID approved Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.

15.0 CABLING MATERIAL

15.1 CABLE TAGS AND MARKERS

15.1.1 Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

15.1.2 The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS:280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.

15.1.3 Location of cables laid directly underground shall be clearly indicated with cable route marker made of galvanised iron plate.

15.1.4 Location of underground cable joints shall be indicated with cable **route** marker with an additional inscription –Cable joints”.

15.1.5 The **cable route** marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings as per relevant standard.

15.1.6 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/trench runs. Cable tags shall be provided inside the switchgear, motor control centres, control and relay panels etc., wherever required for cable identification, where a number of cables enter together through a gland plate.

15.2 Cable Supports and Cable Tray Mounting Arrangements

15.2.1 The Contractor shall provide embedded steel inserts on concrete floors/walls to secure supports by welding to these inserts or available building steel structures.

15.2.2 The supports shall be fabricated from standard structural steel members.

15.2.3 Insert plates will be provided at an interval of 750 mm wherever cables are to be supported without the use of cable trays, such as in trenches, while at all other

SECTION - (SE)

SWITCHYARD ERECTION

places these will be at an interval of 2000 mm.

- 15.2.4 Vertical run of cables on equipment support structure shall be supported on perforated cable trays of suitable width which shall be suitably bolted/clamped with the equipment support structure.

15.3 Cable Termination and Connections

- 15.3.1 The termination and connection of cables shall be done strictly in accordance with cable and termination kit manufacturer's instructions, drawing and/or as directed by the Employer.
- 15.3.2 The work shall include all clamping, fittings, fixing, plumbing, soldering, drilling, cutting, taping, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job.
- 15.3.3 Supply of all consumable material shall be in the scope of Contractor.
- 15.3.4 The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for drilling of gland plates, painting and touching up. Holes shall not be made by gas cutting.
- 15.3.5 Control cable inside control panel/switchgear/MCCB/MCC/ miscellaneous panels shall be neatly bunched, clamped and tied with nylon strap or PVC perforated strap to keep them in position.
- 15.3.6 The Contractor shall use printed ferrules for control cable cores at all terminations, as instructed by the Employer. Each cable wire shall be identified with a number and detailed cable schedule may be prepared indicating the wire numbers.
- 15.3.7 Spare cores shall be similarly encased & tagged with cable numbers and coiled up with end cap.
- 15.3.8 All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively closed.
- 15.3.9 Double compression type nickel plated (coating thickness not less than 10 microns) brass cable glands shall be provided by the Contractor for all power and control cables to provide dust and weather proof terminations.
- 15.3.10 The cable glands shall conform to BIS:6121. They shall comprise of heavy duty brass casting, machine finished and nickel plated, to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and of tested quality. Cable glands shall be of approved make.
- 15.3.11 The cable glands shall also be suitable for dust proof and weather proof termination.
- 15.3.12 If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires modification, the same shall be carried out by the Contractor, as directed by the Employer.
- 15.3.13 Crimping tool used shall be of approved design and make.
- 15.3.14 Control Cable lugs shall be tinned copper solderless crimping type conforming to

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IS-8309 & 8394. Aluminium Bimetallic lugs for power cables as required shall be used depending upon type of cables and terminations.

- 15.3.15 Solderless crimping of terminals shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided.

15. 4 Storage and handling of Cable Drums

- 15.4.1 Cable drums shall be unloaded, handled and stored in an approved manner and rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

16.0 DIRECTLY BURIED CABLES

- 16.1 The Contractor shall construct the cable trenches required for directly buried cables. The scope of work shall include excavation, preparation of sand bedding, soil cover, supply and installation of brick or concrete protective covers, back filling and ramming, supply and installation of route markers and joint markers.

- 16.2 The cable (power and control) between LT station, DG set location and fire lighting pump house and control room shall be laid in the buried cable trenches. In addition to the above, for lighting purpose also, buried cable trench can be used in outdoor area.

- 16.3 Power cables from Main Switchboard to colony shall be laid in buried cable trench. Location of cable termination point at colony shall be as per site condition and shall be decided in consultation with Employer's site-in-charge. Power Cables for oil filtration plant shall be laid in open cable trench or buried trench upto transformer/reactor area and can be looped from adjacent receptacles provided for power supply of oil filtration plant.

- 16.4 Cable route and joint markers and RCC warning covers shall be provided wherever required. The voltage grade of cables shall be engraved on the marker. Cable markers shall be grounded in a concrete base.

17.0 INSTALLATION OF CABLES

- 17.1 Cabling in the control room shall be done on ladder type cable trays for vertical runs while cabling in switchyard area shall be done on angles in the trench.

- 17.2 All cables from bay cable trench to equipments including and all interpolate cables (both power and control) for all equipment, shall be laid in PVC pipes of minimum 50 mm nominal outside diameter of class 4 as per IS 4985 which shall be buried in the ground at a depth of 250mm below finish formation level. Separate PVC pipes shall be laid for control and power cables. Cable pull boxes of adequate size shall be provided if required. **For vertical runs on equipments, perforated cable trays shall be provided for all equipments under scope of the contract or any equipment to be provided by the owner (including for owner supplied circuit breakers).**

- 17.3 Cables shall be generally located adjoining the electrical equipment through the pipe insert embedded in the floor. In the case of equipments located away from cable trench either pipe inserts shall be embedded in the floor connecting the cable trench and the equipment or in case the distance is small, notch/opening on the wall shall be provided. In all these cases necessary bending radius as

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recommended by the cable manufacturer shall be maintained. Embedded pipes shall be dressed properly at the equipment termination points.

- 17.4 Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminium paint. The red oxide and zinc chromate shall conform to IS:2074.
- 17.5 Suitable arrangement should be used between fixed pipe/cable trays and equipment terminal boxes, where vibration is anticipated.
- 17.6 Power and control cables in the cable trench shall be laid in separate tiers. The order of laying of various cables shall be as follows, for cables other than directly buried.
- a) Power cables preferably on top tiers.
 - b) Control instrumentation and other service cables in bottom tiers.
 - c) For cabling from control room to switchyard in main cable trench, cable shall be laid such that bottom tiers are preferably filled first and top tiers are kept for filling future cables as per the instructions of Engineer-In-Charge.
- 17.7 For Single core cables in trefoil formation shall be laid with a distance of three times the diameter of cable between trefoil centre lines. Further, for horizontal cables a minimum centre to centre distance equal to twice the diameter of the cable of higher size of cables shall be maintained.
- 17.8 Trefoil clamps for single core cables shall be of pressure die cast aluminium (LM-6), Nylon-6 or fibre glass and shall include necessary fixing GI nuts, bolts, washer etc. These are required at every 2 metre of cable runs.
- 17.9 Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 metre interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminium strip clamps at every 2m.
- 17.10 Cables shall not be bent below the minimum permissible limit. The permissible limits are as follows:
- | Table of Cable and | Minimum bending radius |
|--------------------|------------------------|
| Power cable | 12 D |
| Control cable | 10 D |
- D is overall diameter of cable
- 17.11 Where cables cross roads, drains and rail tracks, these shall be laid in reinforced spun concrete or steel pipes buried at not less than one metre depth. The size of hume/steel pipe shall be such that approximately 70% area is only occupied. For meeting future requirement, additional hume/steel pipe shall be laid for future bay provision.
- 17.12 In each cable run some extra length shall be kept at a suitable point to enable one (for LT cables)/ two (for H.T. cables) straight through joints to be made in case the cable develop fault at a later date.
- 17.13 Selection of cable drums for each run shall be so planned as to avoid using straight through joints. Cable splices will not be permitted except where called for

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by the drawings, unavoidable or where permitted by the Employer. If straight through joints are unavoidable, the Contractor shall use the straight through joints kit of reputed make.

- 17.14 Control cable terminations inside equipment enclosures shall have sufficient lengths so that changing of termination in terminal blocks can be done without requiring any splicing.
- 17.15 Metal screen and armour of the cable shall be bonded to the earthing system of the station, wherever required by the Employer.
- 17.16 Rollers shall be used at intervals of about two metres while pulling cables to avoid damage.
- 17.17 All due care shall be taken during unreeling, laying and termination of cable to avoid damage due to twist, kinks, sharp bends, etc.
- 17.18 Cable ends shall be kept sealed to prevent damage. In cable vault, fire resistant seal shall be provided underneath the panels.
- 17.19 Inspection on receipt, unloading and handling of cables shall generally be in accordance with IS:1255 and other Indian Standard Codes of practices.
- 17.20 Wherever cable pass through floor or through wall openings or other partitions, GI/PVC wall sleeves with bushes having a smooth curved internal surface so as not to damage the cable, shall be supplied, installed and properly sealed by the Contractor at no extra charges.
- 17.21 In case the outer sheath of a cable is damaged during handling/installation, the Contractor shall repair it at his own cost to the satisfaction of the Employer. In case any other part of a cable is damaged, the same shall be replaced by a healthy cable at no extra cost to the Employer, i.e. the Contractor shall not be paid for installation and removal of the damaged cable.
- 17.22 All cable terminations shall be appropriately tightened to ensure secure and reliable connections. The Contractor shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve or paint.
- 17.23 **Cable trays**
- i) The cable trays shall be of G.S Sheet and minimum thickness of sheet shall be 2mm.
 - ii) The Contractor shall perform all tests and inspection to ensure that material and workmanship are according to the relevant standards. Contractor shall have to demonstrate all tests as per specification and equipment shall comply with all requirements of the specification.
 - a) Test for galvanising (Acceptance Test)
The test shall be done as per approved standards.
- 17.24 **Conduits, Pipes and Duct Installation**
- 17.24.1 Contractor shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes etc. including all necessary sundry materials such as tees, elbows, check nuts, bushing, reducers, enlargers, coupling cap, nipples, gland

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sealing fittings, pull boxes etc as required. The size of the conduit/pipe shall be selected on the basis of 40% fill criterion.

- 17.24.2 Contractor shall have his own facility for bending, cutting and threading the conduits at site. Cold bending should be used. All cuts & threaded ends shall be made smooth without leaving any sharp edges. Anticorrosive paint shall be applied at all field threaded portions.
- 17.24.3 All conduit/pipes shall be extended on both sides of wall/floor openings. The fabrication and installation of supports and the clamping shall be included in the scope of work by Contractor.
- 17.24.4 Installation of optical cables/ special cables:**
- GI pipe (light grade) of suitable size (minimum 25 mm) along with required bends, joints etc. shall be used for special cables such as cables for visual monitoring system (VMS), substation automation system (SAS). Further, single pipe can be used for laying multiple cables.**
- 17.24.5 All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed in an approved manner to prevent damage to threaded portions and entrance of moisture and foreign material.
- 17.24.6 All unarmoured cables shall run within the conduits from lighting panels to lighting fixtures, receptacles etc.
- 17.24.7 Size of conduit for lighting shall be selected by the Contractor during detailed engineering.
- 17.24.8 Exposed conduits shall be run in straight lines parallel to building columns, beams and walls. Unnecessary bends and crossings shall be avoided to present a neat appearance.
- 17.24.9 Conduit supports shall be provided at an interval of 750mm for horizontal runs and 1000mm for vertical runs.
- 17.24.10 Conduit supports shall be clamped on the approved type spacer plates or brackets by saddles or U- bolts. The spacer plates or brackets in turn, shall be securely fixed to the building steel by welding and to concrete or brick work by grouting or by nylon rawl plugs. Wooden plug inserted in the masonry or concrete for conduit support is not acceptable.
- 17.24.11 Embedded conduits shall be securely fixed in position to preclude any movement. In fixing embedded conduit, if welding or brazing is used, extreme care should be taken to avoid any injury to the inner surface of the conduit.
- 17.24.12 Spacing of embedded conduits shall be such as to permit flow of concrete between them.
- 17.24.13 Where conduits are placed alongwith cable trays, they shall be clamped to supporting steel at an interval of 600mm.
- 17.24.14 For directly embedding in soil, the conduits shall be coated with an asphalt-base compound. Concrete pier or anchor shall be provided wherever necessary to support the conduit rigidly and to hold it in place.

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- 17.24.15 Conduit shall be installed in such a way as to ensure against trouble from trapped condensation.
- 17.24.16 Conduits shall be kept, wherever possible, at least 300mm away from hot pipes, heating devices etc. when it is evident that such proximity may reduce the service life of cables.
- 17.24.17 Slip joints shall be provided when conduits cross structural expansion joints or where long run of exposed conduits are installed, so that temperature change will cause no distortion due to expansion or contraction of conduit run.
- 17.24.18 For long conduit run, pull boxes shall be provided at suitable intervals to facilitate wiring.
- 17.24.19 Conduit shall be securely fastened to junction boxes or cabinets, each with a lock nut inside and outside the box.
- 17.24.20 Conduits joints and connections shall be made thoroughly water-tight and rust proof by application of a thread compound which insulates the joints. White lead is suitable for application on embedded conduit and red lead for exposed conduit.
- 17.24.21 Field bends shall have a minimum radius of four (4) times the conduit diameter. All bends shall be free of kinks, indentations or flattened surfaces. Heat shall not be applied in making any conduit bend. Separate bends may be used for this purpose.
- 17.24.22 The entire metallic conduit system, whether embedded or exposed, shall be electrically continuous and thoroughly grounded. Where slip joints are used, suitable bonding shall be provided around the joint to ensure a continuous ground circuit.
- 17.24.23 After installation, the conduits shall be thoroughly cleaned by compressed air before pulling in the wire.
- 17.24.24 Lighting fixtures shall not be suspended directly from the junction box in the main conduit run.

17.25 Cable Sealing System

Modular multi-diameter cable sealing system consisting of frames, blocks and accessories shall be installed where the underground and over ground cables enter or leave concrete bay kiosks/switchyard panel room & control rooms in the substations. Cable sealing system shall consist of multi-diameter type peel-able or adjustable blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system. Solid blocks shall not be used on frame. Frames & stay-plate material shall be of galvanized steel and for compression, single piece wedge with galvanized steel bolts shall be used. 30% spare blocks on the frame shall be provided for expansion in future. Cable sealing system should have been tested for fire/water/smoke tightness.

Cable sealing system having earthing strip can alternately be used in place of cable gland arrangement for indoor panels such as LCC, C&R, PLCC panels etc.

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18.0 LIGHTING JUNCTION BOX

The Contractor shall supply and install ISI marked junction boxes complete with terminals as required. The brackets, bolts, nuts, screws etc required for erection are also included in the scope of the Contractor.

19.0 TESTING AND COMMISSIONING

19.1 All pre/commissioning activities and works work for substation equipment shall be carried out in accordance with Employer's "Pre- Commissioning procedures for Switchyard Equipments (Doc. No. D-2-01-03-01-03)" by the contractor. This document shall be provided to the successful contractor during detailed engineering stage. Test results in the prescribed formats shall be duly filled by the contractor and shall be submitted to the Owner in soft form (CD or Pen Drive)

The Contractor shall arrange all equipments instruments and auxiliaries required for testing and commissioning of equipments alongwith calibration certificates.

19.2 GENERAL CHECKS

- (a) Check for physical damage.
- (b) Visual examination of zinc coating/plating.
- (c) Check from name plate that all items are as per order/specification.
- (d) Check tightness of all bolts, clamps and connecting terminals using torque wrenches.
- (e) For oil filled equipment, check for oil leakage, if any. Also check oil level and top up wherever necessary.
- (f) Check ground connections for quality of weld and application of zinc rich paint over weld joint of galvanised surfaces.
- (g) Check cleanliness of insulator and bushings.
- (h) All checks and tests specified by the manufacturers in their drawings and manuals as well as all tests specified in the relevant code of erection.
- (i) Check for surface finish of grading rings (Corona control ring).

19.3 STATION EARTHING

- a) Check soil resistivity
- b) Check continuity of grid wires
- c) Check earth resistance of the entire grid as well as various sections of the same.
- d) Check for weld joint and application of zinc rich paint on galvanised surfaces.
- e) Dip test on earth conductor prior to use.

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19.4 AAC/ACSR STRINGING WORK, TUBULAR BUS WORK AND POWER CONNECTORS

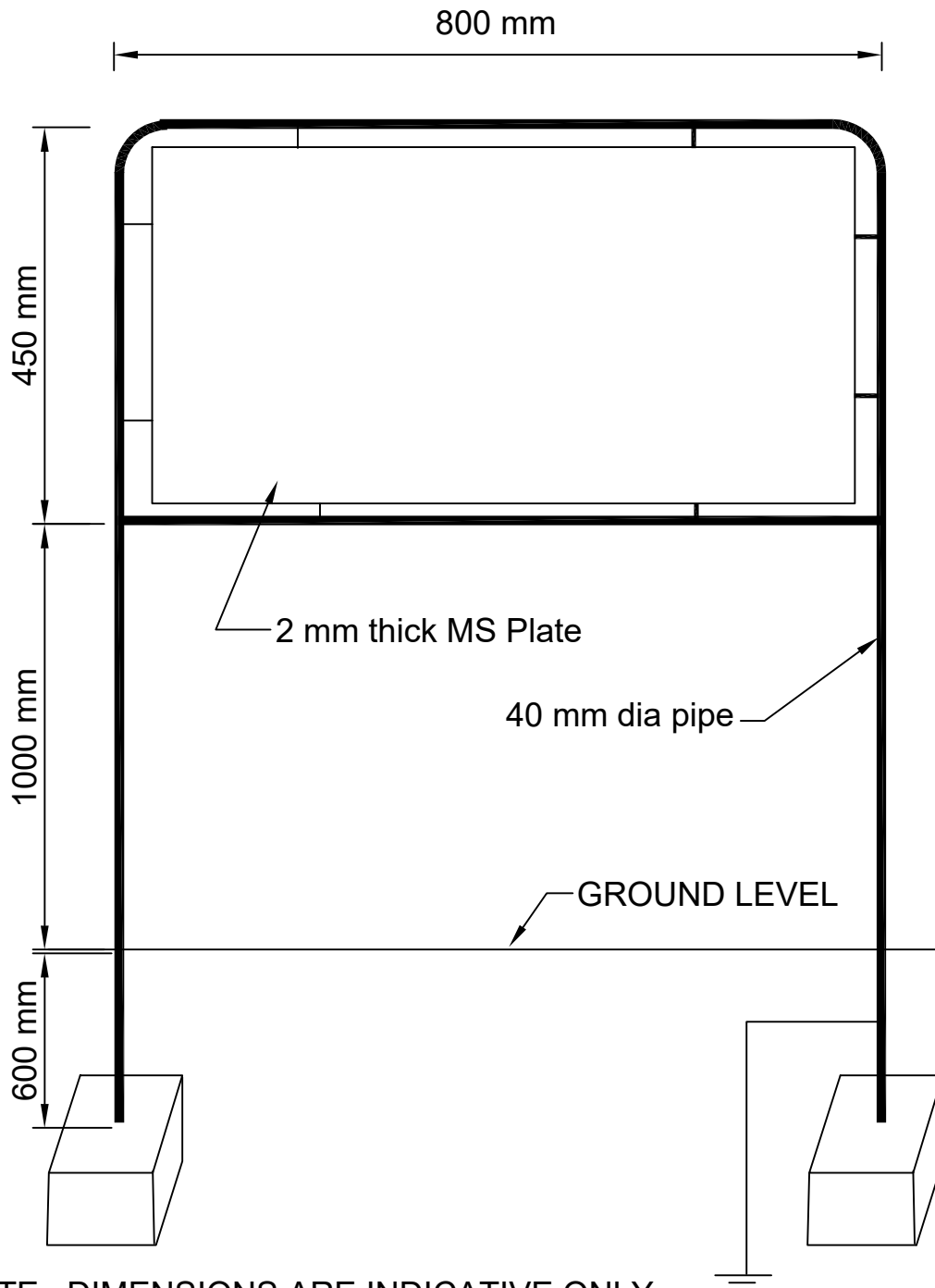
- a) Physical check for finish
- b) Electrical clearance check
- c) Testing of torque by torque wrenches on all bus bar power connectors and other accessories.
- d) Millivolt drop test on all power connectors.
- e) Sag and tension check on conductors.

19.5 ALUMINIUM TUBE WELDING

- a) Physical check
- b) Millivolt drop test on all joints.
- c) Dye penetration test & Radiography test on 10% sample basis on weld joints.
- c) Test check on 5% sample joints after cutting the weld piece to observe any voids etc.

19.6 INSULATOR

Visual examination for finish, damage, creepage distance etc.



NOTE : DIMENSIONS ARE INDICATIVE ONLY.
IT MAY VARY AS PER SITE REQUIREMENT.

**POWER GRID CORPORATION
OF INDIA LIMITED**
(A Government of India Enterprise)



PROJECT :- STANDARD

TITLE:- STANDARD BAY NAME PLATE

<i>NDPankar</i>	<i>NDPankar</i>	18/02/2008	Drawing No.:	Rev.
CKD BY	PRPD BY	Date	C/ENG/STD/BAY NAME PLATE	00

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Substation Package - Substation Package -SS01 for Construction of 765/400/220kV **Bhuj Pool (New) S/S** and **Extension of 765kV Banaskantha S/S** under Green Energy Corridors: Inter-State Transmission Scheme (ISTS) - Part C

7/9 SWG (10.98mm O.D) GS earth wire

Doc. No. TB-385-316-126 Section- 2

4.0 Galvanised Steel Earth wire

4.1 Details of Earth wire

4.1.1 The galvanised steel earth wire shall generally conform to the specification of ACSR core wire as mentioned in IEC:60888/IS: 398 (Part-II)-1976 except where otherwise specified herein.

The contractor shall supply the earthwire as per the standard guaranteed technical particulars enclosed in Annexure-E of the technical specification, Section – Switchyard Erection and separate approval **for guaranteed technical particulars** is not required during detailed engineering.

4.2 Workmanship

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- 4.2.1 All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.
- 4.2.2 The finished material shall have minimum brittleness as it will be subjected to appreciable vibration while in use.
- 4.2.3 The steel strands shall be hot dip galvanized and shall have minimum Zinc coating after stranding, as stipulated in guaranteed technical particulars attached with. The zinc coating shall be smooth, continuous, of uniform thickness, free from imperfections. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristics as prescribed in ASTM designation B498-74.
- 4.2.4 The steel strands shall be preformed and post formed in order to prevent spreading of strands while cutting of composite earth wire. Care shall be taken to avoid damage to galvanisation during preforming and postforming operation.
- 4.2.5 To avoid susceptibility towards wet storage stains (white rust), the finished material shall be provided with a protective coating of boiled linseed oil.

4.3 Joints in Wires

There shall be no joints of any kind in the finished steel wire strand entering into the manufacture of the earth wire. There shall be no strand joints or strand splices in any length of the completed stranded earth wire.

4.4 Tolerances

The manufacturing tolerance to the extent of the limits as stipulated in guaranteed Technical Particulars attached with this specification shall only be permitted in the diameter of the individual steel strands and lay length of the earth wire.

4.5 Materials

4.5.1 Steel

The steel wire strands shall be drawn from high carbon steel rods and the chemical composition shall conform to the requirements as stipulated in Guaranteed Technical Particulars attached with.

4.5.2 Zinc

The zinc used for galvanising shall be electrolytic High Grade Zinc. It shall conform to and satisfy all the requirements of IS: 209 -1979.

4.6 Standard Length

- 4.6.1 The standard length of the earth wire shall be as stipulated in Guaranteed Technical Particulars attached with, with the specified tolerance on standard length.

4.8 TESTS

- 4.8.1 The following type, routine & acceptance tests and tests during manufacturing shall be carried out on the earthwire.

4.8.2 TYPE TESTS

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In accordance with the stipulation of specification, the following type tests reports of the earthwire shall be submitted for approval as per clause 9.2 of Section - GTR.

- | | | | |
|----|--------------------|---|---------------------|
| a) | UTS test |) | |
| | |) | |
| b) | DC resistance test |) | As per Annexure - B |

4.8.3 ACCEPTANCE TESTS

- | | | | |
|----|---|---|--------------------------|
| a) | Visual check for joints, scratches etc. and length of Earthwire |) | |
| | |) | |
| | |) | |
| b) | Dimensional check |) | As per Annexure - B |
| | |) | |
| c) | Galvanising test |) | |
| | |) | |
| d) | Lay length check |) | |
| | |) | |
| e) | Torsion test |) | |
| | |) | |
| f) | Elongation test |) | |
| | |) | |
| g) | Wrap test |) | |
| | |) | |
| h) | DC resistance test |) | |
| | |) | |
| i) | Breaking load test |) | IS:398 (Part-III) - 1976 |
| | |) | |
| j) | Chemical Analysis of steel |) | |

4.8.4 ROUTINE TESTS

- | | |
|----|---|
| a) | Check that there are no cuts, fins etc. on the strands. |
| b) | Check for correctness of stranding. |

4.8.5 TESTS DURING MANUFACTURE

- | | | | |
|----|--|---|---------------------|
| a) | Chemical analysis of zinc used for galvanising |) | As per Annexure - B |
| | |) | |
| | |) | |
| b) | Chemical analysis of steel |) | |

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ANNEXURE "B"

(Testing procedure for Galvanised Steel Earthwire)

1. UTS TEST

Circles perpendicular to the axis of the earthwire shall be marked at two places on a sample of earthwire of minimum 5m length suitably compressed with dead end clamps at either end. The load shall be increased at steady rate upto 50% of UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter, the load shall be increased at a steady rate to 100% of UTS and held for one minute. The earthwire sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and value recorded.

2. D.C. RESISTANCE TEST

On an earthwire sample of minimum 5m length, two contact clamps shall be fixed with a predetermined Bolt torque. The resistance shall be measured by a Kelvin double-bridge by placing the clamps initially zero meter and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20°C shall conform to the requirements of this specification.

3. Visual check for joints, scratches etc. and length of earthwire

Earthwire drums shall be rewound in the presence of the inspector. The inspector shall visually check for joints, scratches etc. and see that the earthwire generally conforms to the requirements of this specification. The length of earthwire wound on the drum shall be measured with the help of counter meter during rewinding.

4. TORSION TEST

The minimum number of twists which a single steel strand shall withstand during torsion test shall be eighteen for a length equal to 100 times the standard diameter of the strand. In case the test sample length is less or more than 100 times the standard diameter of the strand, the minimum number of twists will be proportionate to the length and if number comes in the fraction then it will be rounded off to next higher whole number.

5. DIMENSIONAL CHECK

The individual strands shall be dimensionally checked to ensure that they conform to the requirements of this specification.

6. LAY LENGTH CHECK

The lay length shall be checked to ensure that they conform to the requirements of this specification.

7. GALVANISING TEST

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The test procedure shall as specified in IS:4826-1968. The material shall conform to the requirements of this specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.

8. CHEMICAL ANALYSIS OF ZINC USED FOR GALVANIZING

Samples taken from zinc ingots shall be chemically/spectrographically analysed. The same shall be in conformity to the requirements stated in this specification.

9. CHEMICAL ANALYSIS OF STEEL

Samples taken from steel ingots/coils/strands shall be chemically/spectrographically analysed. The same shall be in conformity to the requirements stated in this specification.

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ANNEXURE-E

Sl.	Description	Unit	ACSR ZEBRA	ACSR PANTHER
		km		
c)	Maximum	kg/ km	1653	993
5.13	Modulus of Elasticity	Kg/sq. mm		8158
5.14	Co-efficient of Linear Expansion	Per Deg. C	19.3×10^{-6}	17.8×10^{-6}
5.15	Minimum Corona Extinction Voltage	KV (rms)	154	92
5.16	RIV at 1 Mhz	Micro volts	Less than 1000 at 154 kV (rms)	Less than 500 at 92 kV (rms)
6.0	Drum Dimensions		Generally conforms to IS:1778	
a)	Flange Diameter	mm	1850	1850
b)	Traverse width	mm	925	925
c)	Barrel Diameter	mm	650	650
d)	Flange thickness	mm	50x50	50x50

1.2

Guaranteed technical particulars of Galvanised Steel Earthwire

	Description	Unit	Standard Values
1.0	Raw Materials		
1.1	Steel wires / rods		
a)	Carbon	%	Not more than 0.55
b)	Manganese	%	0.40 to 0.90
c)	Phosphorous	%	Not more than 0.04
d)	Sulphur	%	Not more than 0.04
e)	Silicon	%	0.15 to 0.35
1.2	Zinc		
a)	Minimum purity of Zinc	%	99.95
2.0	Steel strands		
2.1	Diameter		
a)	Nominal	mm	3.66
b)	Maximum	mm	3.74
c)	Minimum	mm	3.58
2.2.	Minimum breaking load of strand		
a)	After stranding	KN	10.58
2.3	Galvanising		
a)	Minimum weight of zinc coating per sq.m. after stranding	gms.	275
b)	Minimum number of dips that the galvanized strand can withstand	Nos.	3 dips of 1 minute and

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ANNEXURE-E

	in the standard preece test		one dip of ½ minute
c)	Minimum number of twists in a gauge length equal to 100 times diameter of wire which the strand can withstand in the torsion test, after stranding	Nos.	18
3.0	Stranded Earth wire		
3.1	UTS of Earth wire	KN	68.4 (min.)
3.2	Lay length of outer steel layer		
a)	Standard	mm	181
b)	Maximum	mm	198
c)	Minimum	mm	165
3.3	Maximum DC resistance of earth wire at 20° C	Ohm/km	3.375
3.4	Standard length of earth wire	M	2000 or actual quantity whichever is less.
3.5	Tolerance on standard length	%	±5
3.6	Direction of lay for outside layer		Right hand
3.7	Linear mass		
a)	Standard	Kg/km	583
b)	Maximum	Kg/km	552
c)	Minimum	Kg/km	600
3.8	Overall diameter	mm	10.98

1.3

Guaranteed Technical Parameters of Aluminum Tube

A. GTP for 3" IPS & 4" IPS AL. TUBE

Sl. No.	Description	3" AL. TUBE	4" AL. TUBE
1.	Size	3" IPS (EH Type)	4" IPS (EH Type)
2.	Material	Aluminium Alloy 6101 T6 conforms to 63401 WP (range 2) of IS 5082 : 1998	
3.	Chemical Composition		
i)	Cu		0.05 Max
ii)	Mg		0.4 to 0.9
iii)	Si		0.3 to 0.7
iv)	Fe		0.5 Max
v)	Mn		0.03 Max
Vi)	Al		Remainder
4.	Outer diameter	88.90 mm	114.2 mm
5.	Tolerance on outer diameter	+2.2 mm, - 0.0 mm	+2.2 mm, - 0.0 mm
6.	Thickness	7.62 mm	8.51 mm
7.	Tolerance on thickness	+2.2 mm, - 0.0 mm	+2.2 mm, - 0.0 mm
8.	Cross-sectional area	1945.76 sq.mm	2825.61 sq.mm
9.	Weight	5.25 kg/m	7.7 kg/m
10.	Moment of Inertia	1621589.99 mm ⁴	3972577.97 mm ⁴
11.	Section Modulus	86481.21 mm ³	69572.29 mm ³

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-XXX-316-041	Rev. No.	02		Prepared	Checked	App.
TYPE OF DOC.	STANDARD TECHNICAL SPECIFICATION			NAME	NK	MK	KK
TITLE PVC PIPE & BENDS				SIGN	Sd/-	Sd/-	Sd/-
				DATE			
				GROUP	TBEM	W.O. No	
CUSTOMER							
CONSULTANT							
PROJECT	RATE CONTRACT						

SCOPE AND SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE

This technical specification covers design, manufacture, testing at works, packing and dispatch of 'PVC pipe, its fittings and bends'. The material supplied shall fully comply with relevant Indian Standard given below and the product shall be BIS certified. The sizes and types of Pipes shall be as specified below. No Technical Deviations shall be acceptable in this regard.

1.1 SPECIFIC TECHNICAL REQUIREMENT

1.1.1 UPVC Pipe

The UPVC pipes shall be of nominal diameter 50 mm and/ or 110 mm, as per the indent. The pipe shall be of Class-II & Class-IV Grade as per IS 4985: 2000 and shall be of standard length of 6 meters. The pipe shall fully comply with specified standard and carry the BIS certification marking.

1.1.2 Sockets

The sockets shall fully comply with the requirements of IS 7834 (Part-6)-1977.



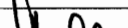
1.1.3 For Bends

The bends shall be of 45°, 60°, 90° and Tee as specified, for above mentioned pipes. The bends shall, in general, comply with the requirement of IS 10124. The specific requirements and BIS certification marking of these bends shall be as per IS 10124 (Part-9) and IS 10124 (Part-10) respectively.

1.2 BILL OF MATERIAL

As per enclosed Annexure-1.

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02	06.09.13				90° Bends added.	
01	30.11.10	-SD-	-SD-	-SD-	Document revised.	
Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS	
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IS : 10124 (Part 10) - 1988

2.2.2 Dimensions — The dimensions of 45° bends shall comply with Table 1 read with Fig. 1.

2.2.3 The bends may either be plain at both ends or socketed either at one end or at both ends as agreed to between the manufacturer and the purchaser. In the case of socketed bends, the socket measurements shall comply with IS : 10124 (Part 1)-1988*.

NOTE 1 — For 0.25 MPa pressure class, fabricated bends should not be made from 0.25 MPa pressure class pipes. For this, bends made from 0.4 MPa pressure class pipe should be used.

NOTE 2 — The drawing is only intended to define the terms used in Table 1 and is not intended to illustrate specific design features.

3. MARKING

3.1 Each 45° bend fitting shall be marked with the following information:

- a) Manufacturer's name or identification mark,

- b) The size of the bend and the appropriate class (working pressure) of IS : 4985-1988* to which the pressure rating of the fitting corresponds,

- c) The degree of bend, and

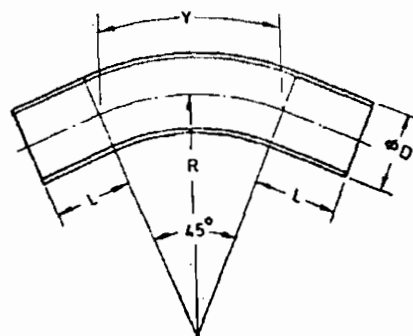


FIG. 1 45° BEND

*Specification for fabricated PVC fittings for potable water supplies: Part 1 General requirements.

*Specification for unplasticized PVC pipes for potable water supplies (second revision).

TABLE 1 DIMENSIONS OF 45° BENDS
(Clauses 2.2.2 and 2.2.3, and Fig. 1)

All dimensions in millimetres.

Size	Y* Min	L Min (Only for plain ends)	R† Min	MINIMUM WALL THICKNESS (t) FOR WORKING PRESSURE		
				0.4 MPa (Class 2)	0.6 MPa (Class 3)	1.0 MPa (Class 4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
63	149	63	189	1.4	2.0	3.2
75	177	75	225	1.7	2.4	3.8
90	212	90	270	1.9	2.8	4.5
110	259	110	330	2.3	3.4	5.5
125	295	125	375	2.7	3.9	6.3
140	330	140	420	2.9	4.4	7.0
160	377	160	480	3.4	4.9	8.0
180	424	180	540	3.8	5.5	9.0
200	471	200	600	4.2	6.2	10.0
225	530	225	675	4.7	6.9	11.2
250	589	250	750	5.2	7.7	12.5
280	660	280	840	5.8	8.6	13.9
315	742	315	945	6.5	9.7	15.6
355	837	355	1 065	7.3	10.8	17.7
400	842	400	1 200	8.2	12.2	19.8
450	1 060	450	1 350	9.3	13.7	22.4
500	1 178	500	1 500	10.3	15.3	24.8
560	1 319	560	1 680	11.6	17.2	27.8
630	1 484	630	1 890	13.0	19.2	31.3

NOTE — Minimum wall thickness if calculated on the basis of 90 percent of the minimum wall thickness of the corresponding size and pressure class of pipe rounded off to the next higher 0.1 mm.

*Y is calculated from $\frac{45^\circ}{360^\circ} \times 2\pi R$.

†R, radius of the bend, is equal to 3 times the nominal outside diameter (D).

IS : 10124 (Part 8) - 1988

2.2.2 Dimensions — The dimensions of 90° bends shall comply with Table 1 read with Fig. 1.

2.2.3 The bends may either be plain at both ends or socketed either at one end or at both ends as agreed between the manufacturer and the purchaser. In the case of socketed bend, the socket measurements shall comply with IS : 10124 (Part 1)-1988*.

NOTE — For 0.25 MPa pressure class, fabricated bends should not be made from 0.25 MPa pressure class pipes. For this, bends made from 0.4 MPa pressure class pipe should be used.

NOTE — The drawing is only intended to define the terms used in Table 1 and is not intended to illustrate specific design features.

3. MARKING

3.1 Each 90° bend fitting shall be marked with the following information:

- Manufacturer's name identification mark,
- The size of the bend and the appropriate class (working pressure) of IS : 4985-1988* to which the pressure rating of the fitting corresponds,
- The degree of bend, and
- The bend shall be marked in colour as indicated below for different classes of fittings:

<i>Class of Fitting</i>	<i>Colour</i>
Class 2 (0.4 MPa)	Blue
Class 3 (0.6 MPa)	Green
Class 4 (1.0 MPa)	Yellow

*Specification for fabricated PVC fittings for potable water supplies: Part 1 General requirements (*first revision*).

*Specification for unplasticized PVC pipes for potable water supplies (*second revision*).

TABLE 1 DIMENSIONS OF 90° BENDS

(*Clauses 2.2.2, 2.2.3 and Fig. 1*)


All dimensions in millimetres.

SIZE	Y* Min	L Min (Only for plain ends)	R† Min	MINIMUM WALL THICKNESS (t) FOR WORKING PRESSURE		
				0.4 MPa (Class 2)	0.6 MPa (Class 3)	1.0 MPa (Class 4)
				(5)	(6)	(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
63	297	63	189	1.4	2.0	3.2
75	354	75	225	1.7	2.4	3.8
90	424	90	270	1.9	2.8	4.5
110	519	110	330	2.3	3.4	5.5
125	589	125	375	2.7	3.9	6.3
140	660	140	420	2.9	4.4	7.0
160	754	160	480	3.4	4.9	8.0
180	848	180	540	3.8	5.5	9.0
200	942	200	600	4.2	6.2	10.0
225	1 060	225	675	4.7	6.9	11.2
250	1 178	250	750	5.2	7.7	12.5
280	1 319	280	840	5.8	8.6	13.9
315	1 484	315	945	6.5	9.7	15.6
355	1 673	355	1065	7.3	10.8	17.7
400	1 884	400	1200	8.2	12.2	19.8
450	2 120	450	1350	9.3	13.7	22.4
500	2 355	500	1500	10.3	15.3	24.8
560	2 638	560	1680	11.6	17.2	27.8
630	2 968	630	1890	13.0	19.2	31.8

NOTE — Minimum wall thickness is calculated on the basis of 90 percent of the minimum wall thickness of the corresponding size and pressure class of pipe rounded off to the next higher 0.1 mm.

*Y is calculated from $\frac{90^\circ}{360^\circ} \times 2\pi R$.

†R, radius of the bend, is equal to 3 times the nominal outside diameter (D).

		BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION PROJECTS ENGINEERING MANAGEMENT NEW DELHI					
	DOCUMENT No.	TB xxx 618 002a		Rev 04	Prepared	Checked	Appd
	TYPE OF DOC.	TECHNICAL SPECIFICATION		NAME	BVG	PLK	RMS
	TITLE G I HARDWARES		SIGN	-SD-	-SD-	-SD-	
			DATE				
			GROUP	TBEM			
			W.O. No				
CUSTOMER/CONSULTANT							
PROJECT							
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	04	18.11.10				Unit wt of hardware added	
	02	13.4.06.	BVG	PLK	RMS	Eqpt mounting hardwares added.	
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SECTION - 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES

1.1 SCOPE

The scope of this specification is to specify all details required by a supplier for supply of galvanized hardware for projects being executed by BHEL on turnkey basis for NTPC, PGCIL, SEBs and other Customers.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

The specific technical requirements shall be as per Standard Technical Specification (Refer Section 2).

1.3 QUANTITIES

The quantities shall be as per attached BOQ.

SECTION - 2

2.0 GENERAL

This section covers the standard technical specification for GI Hardware.

2.1 BOLTS:

M16 bolts shall be used in all types of structures except equipment mounting/ earthing bolts which shall be as per equipment requirement.

All bolts for member connections in towers, beams & equipment support structures shall conform to IS: 12427 - 2001 and for step bolts shall conform to IS: 10238 - 1982.

The mechanical properties shall conform to property class 5.6 of IS:1367 (part 3) - 1991.

All bolt heads shall have hexagonal shape, the heads being forged out of the solid material truly concentric and square with the shank, which must be perfectly straight.

Fully threaded bolts should not be used.

All bolts shall be threaded with metric standard thread to take the full depth of the nut and permit firm grip of the member.

All bolts shall be hot dip galvanized as per IS: 1367 (Part 13) - 1983.

2.2 NUTS:

All nuts shall conform to IS: 1363 (Part 3) -1992.

The mechanical properties shall conform to property class 5 of IS:1367 (part 6) - 1980.

The nuts shall be capable of being worked with fingers along the entire threaded portion of the bolt with a neat fit capable of developing the full strength of the bolt.

All nuts shall be hot dip galvanized as per IS: 1367 (Part 13) - 1983.

2.3 PLAIN WASHERS:

All plain washers shall be punched washers, A type conforming to IS: 2016-1967.

These shall be hot dip galvanized as per IS: 4759 - 1984.

2.4 SPRING WASHER:

All spring washers shall be of spring steel, positive lock type and conforming to type B of IS: 3063-1972. The thickness of spring washer shall be as specified under:

<u>Bolt Diameter</u>	<u>Thickness of Spring washers</u>
16 mm	3.5 mm
12 mm	2.5 mm

These shall be electro-galvanized as per IS: 1573 – 1986.

2.5 UNIT WEIGHT OF BOLTS I/C NUT, PLAIN AND SPRING WASHERS:

For purpose of payment, following unit weights as indicated below shall be considered.

A.) STANDARD BOLTS I/C ONE NUT UNIT WEIGHTS

S. NO.	TYPE	SIZE OF BOLTS	TOTAL WT (KG)
1	M16	16 ϕ X 35 LG	0.117
2	M16	16 ϕ X 40 LG	0.125
3	M16	16 ϕ X 45 LG	0.133
4	M16	16 ϕ X 50 LG	0.141
5	M16	16 ϕ X 55 LG	0.149
6	M16	16 ϕ X 60 LG	0.157
7	M16	16 ϕ X 65 LG	0.164
8	M16	16 ϕ X 70 LG	0.172
9	M16	16 ϕ X 75 LG	0.180
10	M16	16 ϕ X 80 LG	0.188
11	M16	16 ϕ X 85 LG	0.196
12	M16	16 ϕ X 90 LG	0.204
13	M16	16 ϕ X 95 LG	0.212
14	M16	16 ϕ X 100 LG	0.220
15	M12	12 ϕ X 35 LG	0.0620
16	M12	12 ϕ X 40 LG	0.0664
17	M12	12 ϕ X 45 LG	0.0708
18	M12	12 ϕ X 50 LG	0.0753
19	M12	12 ϕ X 55 LG	0.0797
20	M12	12 ϕ X 60 LG	0.0842

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B.) SPRING WASHER

S. NO.	TYPE	TOTAL WT (KG)
1	3.5mm thk (M16 bolt)	0.00891
2	2.5mm thk (M12 bolt)	0.00382

C.) For supplies of bolts i/c nuts, plain washers and spring washer other than those listed above, payment shall be made based on unit weights worked out considering theoretical dimensions & density of steel as 7850kg/cum.

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PRE-COMMISSIONING CHECKS/TESTS FOR OTHER SWITCHYARD EQUIPMENTS

Once erection is completed, various pre-commissioning checks/ tests are performed to ensure the healthiness of the switchyard equipments prior to their energisation. Various major electrical tests to be performed and their significance are given below:

Sr. No.	Name of Test / Check point	Purpose of test/ check
6.1	Tan δ & Capacitance measurement of CT, each stack of CVT & total capacitance, CB voltage grading capacitor & each stack of Surge Arresters	The purpose of the dissipation factor measurement of high voltage insulation is to detect incipient weaknesses in HV insulation. The most important benefit to be gained from this measurement is to obtain a “benchmark reference reading” on costly and high voltage equipment when the equipment is new and insulation is clean, dry and free from impurities. Tan delta & Capacitance values shall be comparable with factory test results and in no case shall be more than 0.5 %.
6.2	Checks/ Tests applicable for CTs	
6.2.1	Polarity test for CT	To ascertain whether the polarity markings are correct or not as per drawing.
6.2.2	Magnetization characteristics of CT	To prove that the turns of CTs secondary windings are not short circuited and to check healthiness of CT cores. The magnetizing currents at KPV (Knee point voltage) shall be less than the specified value. The ratio of secondary and primary voltage shall also be measured.
6.2.3	Ratio test for CT	The ratio errors of the primary to the secondary currents should within specified ratio errors.
6.2.4	IR measurement of CT (Primary & Secondary windings)	Changes in the normal IR value of CT indicate abnormal conditions such as presence of moisture, dirt, dust, crack in insulator of CT and degradation of insulation.
6.2.5	DGA test of CT oil	This test shall be conducted after 30 days of commissioning. The purpose is to identify evolving faults in the CT and DGA values shall be comparable with factory values (if available)
6.3	Checks/ Tests applicable for Circuit Breakers	
6.3.1	Dew point measurement of SF ₆ gas	Dew point of SF ₆ gas is to measure moisture content in SF ₆ gas which shall indicate whether CB evacuation is done properly or not. This test shall be carried out preferably at rated pressure of SF ₆ gas.
6.3.2	Measurement of Circuit	To measure closing/ tripping/ CO timings. These timings



Sr. No.	Name of Test / Check point	Purpose of test/ check
	Breaker Operating Timings including PIR Timings	should be within permissible limits and shall be comparable with factory values. Pole discrepancies and Break to Break discrepancies shall be less than specified values.
6.3.3	DCRM Contact Travel Measurement / DC injected currents and trip/ close coil currents.	DCRM is the technique for measuring Contact Resistance during operation (Close/ Trip) of a circuit breaker with a delay Tco of 300ms. A DC current of at least 100 Amp is injected through the circuit breaker. The current and voltage drop are measured and resistance is calculated. The resistance and travel versus time data provides useful information on the condition of the circuit breaker contacts and is used as a diagnostic tool. DCRM test signatures shall be approved by Corporate OS.
6.3.4	Operational lockout checking for EHV Circuit Breakers	To ensure various lockout operation of CB by simulating the actual conditions at the specified pressure of oil/ air/ operating medium.
6.3.5	Measurement of static contact resistance	This test is conducted to evaluate healthiness of Main contacts. 100 Amp DC is injected and voltage drop is measured across each CB contact to compute contact resistance.
6.3.6	Checking the Anti-Pumping feature	By giving simultaneous close/ trip commands, CB hunting shall not take place by operation of Mechanical/ Electrical anti pumping feature.
6.3.7	Checking the Anti-Condensation Heaters	To check correct operation of Thermostat provided for anti condensation heaters.
6.3.8	Pole discrepancy relay testing	To test tripping of CB in case of pole discrepancy more than 2.5 seconds or specified value.
6.3.9	Checking the N2 priming pressure	This test is to check healthiness of N2 accumulators provided in Hydraulic drive mechanisms. N2 priming pressure shall be as per the rated pressure.
6.4	Checks/ Tests applicable for CVTs	
6.4.1	CVT polarity, Ratio test	This test is conducted in the same manner as for CT to determine correct CVT polarity, ratio and phasor group.
6.4.2	Insulation resistance measurement of Primary & secondary winding	Changes in the normal IR value of CVT indicate abnormal conditions such as presence of moisture, dirt, dust, crack in insulator of CVT and degradation of insulation.
6.5	Checks/ Tests applicable for Isolators	
6.5.1	MILLIVOLT Drop test	The voltage drop gives a measure of resistance of current carrying part and contacts by injecting minimum 100 A DC current.

Sr. No.	Name of Test / Check point	Purpose of test/ check
6.5.2	50 operation tests	To test operation of contacts etc with jumpers connected and contact resistance to be measured after 50 operations. There shall not be any change from the previous value.
6.6	Checks/ Tests applicable for Surge Arrestors	
6.6.1	Third Harmonic Resistive Current (THRC) for surge arrestors	To monitor healthiness of Surge arrestors by monitoring third harmonic resistive current from the leakage current. This test is to be conducted after charging of Las. The value of THRC shall be less than 30 μ A.
6.6.2	IR measurement of each stack of LA	Changes in the normal IR value of LA indicate abnormal conditions such as presence of moisture, dirt, dust, crack in insulator of LA and degradation of insulation.
6.6.3	Checking of operation of LA counter	This test is done to check the healthiness of LA counter.
6.7	Checks/ Tests for other areas/ equipments	
6.7.1	Earth resistance measurement	To ensure value of earth resistance is below 1 ohm.
6.7.2	Secondary current injection test	Conducted for testing of protecting devices, circuit breakers, trip coils, motor overloads etc.
6.7.3	Contact Tightness check of Bay contacts by Primary injection method	Since complete bay contact resistance measurement is practically not possible because DC current may not be injected in CT primary, hence contact tightness check by primary injection method has been introduced to check overall contact tightness.
6.7.4	Stability check for Bus Bar	This test is performed to check the proper operation of Bus Bar protection by simulating actual conditions. Any problem in CT connection, wrong cabling, relay setting can be detected by this test.

6.1 TAN DELTA & CAPACITANCE MEASUREMENT OF CT, CVT, CB VOLTAGE GRADING CAPACITORS AND LA STACKS

To measure dissipation factor/loss factor (Tan delta) and Capacitance measurement of EHV class CTs, CVTs, CB Voltage Grading Capacitors & LA stacks by applying test voltages up to 10kV.

A) CURRENT TRANSFORMERS

CTs with test taps

1. Tan delta tap to be disconnected from ground.
2. High voltage lead from tan delta kit to be connected to primary(HV) Terminal and LV lead to be connected to the Tan delta test tap.
3. P1 and P2 to be shorted
4. Porcelain surface to be thoroughly cleaned.
5. Measurements have to be taken in UST mode with fully automatic test kit.
6. Standard procedure(as specified by kit supplier) for measuring capacitance and tan delta in charged switchyard/induced voltage conditions should be followed for measurement of capacitance and tan delta values.
7. It is to be ensured to connect the test tap to ground terminal after carrying out the test.

B) CB VOLTAGE GRADING CAPACITOR

1. Connect LV cable to the middle of the double interrupter.
2. Connect HV cable to the other end of the Grading capacitor to be tested.
3. The opposite end of the grading capacitor has to be grounded using earth switch.
4. Measurements have to be taken in UST Mode with fully automatic test kit.
5. Disconnect the HV cable and connect the same to the other grading capacitor and ground the previous grading capacitor. Now the second grading capacitor is ready for testing.
6. Standard procedure (as specified by kit supplier) for measuring capacitance and tan delta in charged switchyard/induced voltage conditions should be followed
7. Measurements are to be carried out at 10 kV/ 12 KV.

C) CAPACITOR VOLTAGE TRANSFORMERS

1. Testing procedure for Top and Middle Stacks:
 - (a) Apply 10 KV between flanges of Top/Middle stacks (whichever is being tested)
 - (b) Carry out measurements in UST mode at 10.0 KV
 - (c) While measuring Middle/ Bottom stacks, Top/ middle stacks to be shorted.
2. Testing procedure for Bottom Stack connected to EMU PT
 - (a) Connect HV of the test kit at the top flange of bottom stack. HF point to be grounded. Earth connection of the neutral of the PT to be opened/ isolated from ground.
 - (b) Top of CVT to be guarded. LV lead of the kit to be connected at the top of the CVT for guarding.

- (c) Carry out measurements in GSTg mode at 10.0 KV
 - (d) Repeat the Test with neutral of PT connected to ground.
 - (e) In case Tan delta value is negative or erratic, only capacitance values are to be monitored.
 - (f) Measurement to be carried out using fully automatic kit.
3. Standard procedure (as specified by kit supplier) for measuring capacitance and tan delta in charged switchyard/ induced voltage conditions should be followed.

D) SURGE ARRESTERS

1. Testing procedure for Top, Middle and Bottom Stacks:
 - (a) Apply 10 KV between flanges of Top/Middle/ Bottom stacks (whichever is being tested)
 - (b) Carry out measurements in UST mode at 10.0 KV with fully automatic test kit.
 - (c) While measuring Middle/ Bottom stacks, the stacks above the HV lead to be shorted.
2. Standard procedure (as specified by kit supplier) for measuring capacitance and tan delta in charged switchyard/ induced voltage conditions should be followed.
3. While doing measurement of bottom stack the earth connection to be removed.

6.2 CHECKS/TESTS APPLICABLE FOR CTs

6.2.1 POLARITY TEST FOR CT

A centre zero voltmeter is connected across CT secondary. A 1.5 Volt battery is touched to primary of CT. The deflection of pointer should be similar in case of each CT core.

At any instant current entering the primary from P1 the current should leave secondary from the terminal marked S1. A setup shown in the Figure 9 can show whether the polarity markings are correct or not.

When the key is pressed, current enters the primary through terminal P1, the voltmeter connected as shown, should read positive. A general arrangement of polarity test setup is indicated in Fig. 10.

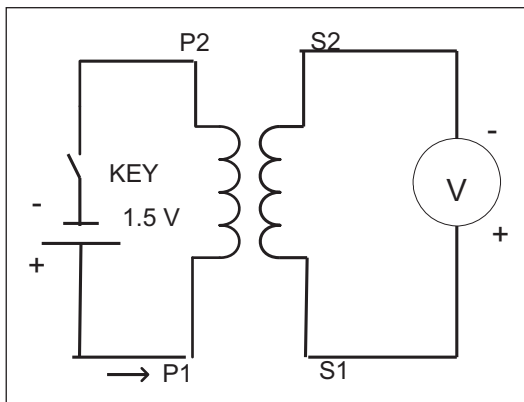


Figure - 9

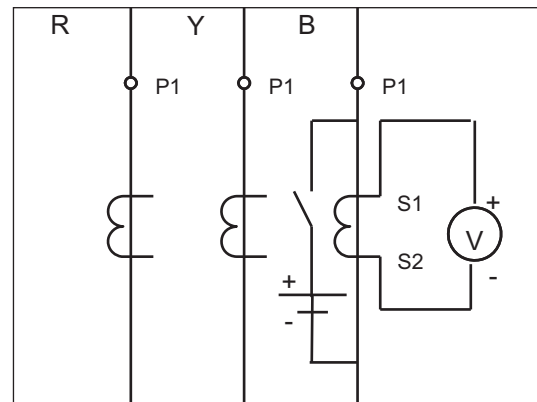


Figure - 10

6.2.2 MAGNETIZATION CHARACTERISTICS OF CTs

PRECAUTIONS

- There should be no joints in testing leads/cables.
- It should be ensured that whole testing equipment along with testing procedures are available at testing site. Testing must be carried out in presence of testing personnel only.

Test Equipment: Voltage source of 5 kV, Voltmeter of range 0 to 5 kV, Ammeter of range 0 to 500 Amps, testing leads/cables etc.

Test Procedure: Make connections as per diagram shown below (Fig- 11). After making proper connections, applied voltage is increased from zero to rated Knee Point Voltage in steps of 25%, 50%, 75% and 100%. Measure the current drawn by the CT secondary core at respective applied voltages and record the test results

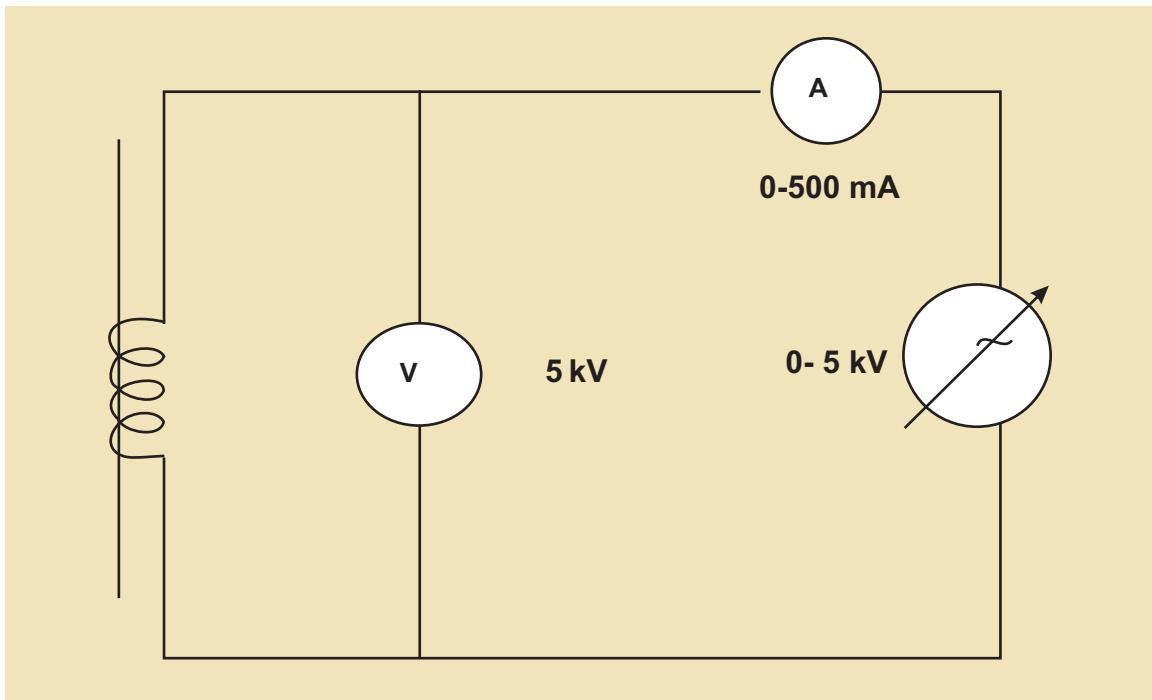


Figure - 11

Knee Point Voltage is normally defined as the voltage at which 10% increase in the applied voltage causes 30 to 50% increase in secondary current. The magnetization current at rated Knee Point Voltage should not be more than the specified/designed value. A curve can be drawn between applied voltage and magnetizing current. Typically, the curve drawn should be like the one given below in Fig.-12.

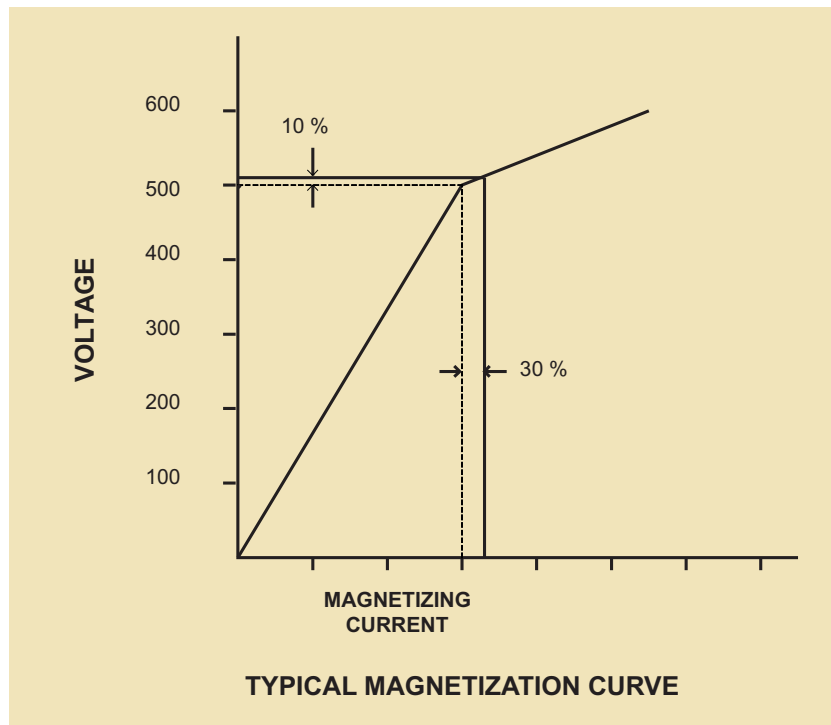


Figure - 12

From the curve it can be implied that up to rated KPV (Knee Point Voltage), the VI curve should be almost a straight line. However, if this line is not linear, this indicates that the magnetizing characteristics are not desirable. If the slope of the curve starts increasing, it indicates that magnetizing induction becomes low and total primary current is utilized in exciting the core alone. Consequently, output of CT secondary disappears.

6.2.3 RATIO TEST FOR CURRENT TRANSFORMER

The ratio check has to be carried out as indicated in Fig-13 below.

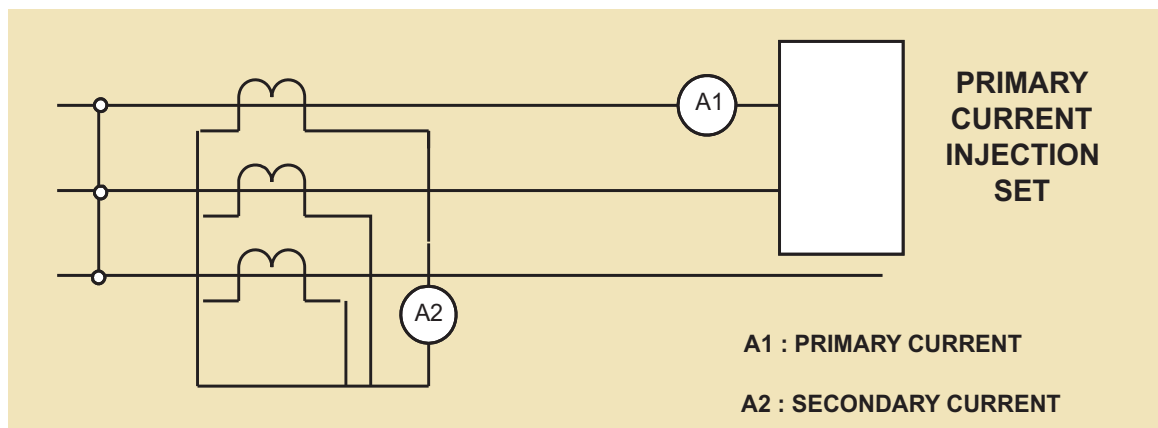


Figure - 13

It is customary to conduct this in conjunction with the primary injection test. Current is passed through the primary circuit with the secondary winding circuit to its normal circuit load. The ratio of the primary to the secondary currents should approximate closely to that stamped under CT identification plate.

Alternatively, ratio test is to be conducted as per the following method (Fig-14).

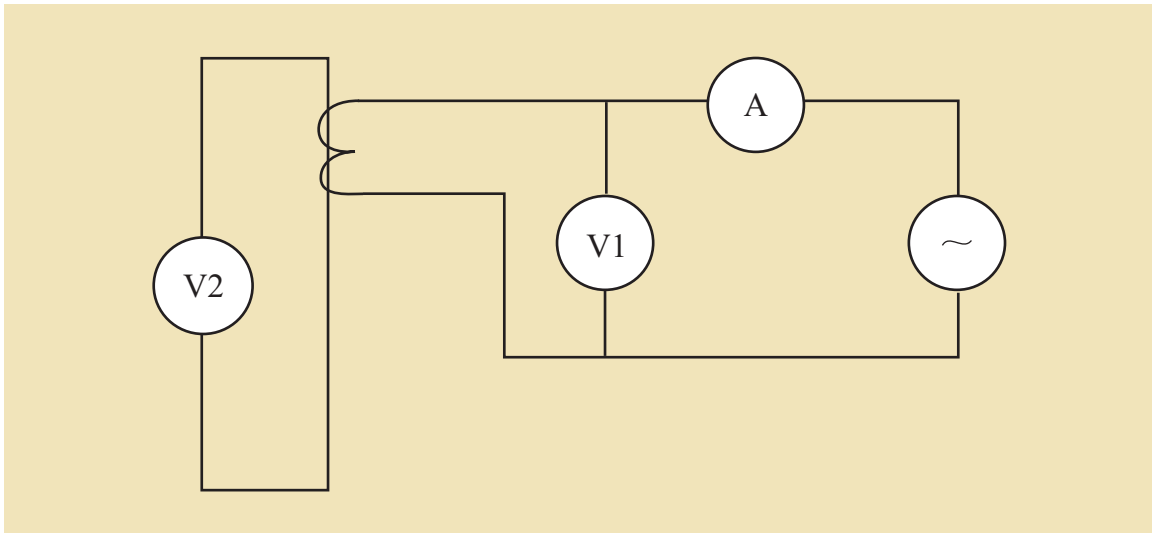


Figure - 14

Apply voltage from secondary of the CT and measure voltage in primary winding. Increase voltage in secondary up to rated KPV/ ISF and by recording Primary Voltage, compute ratio of $V1/V2$. The ratio should match with the specified value.

6.2.4 INSULATION RESISTANCE MEASUREMENT OF CURRENT TRANSFORMER

PRECAUTIONS

- There should be no joints in testing cables.
- Test leads should not touch any live part.
- Megger body should be earthed (if separate terminal is provided).
- Surface/terminals should be cleaned.
- IR measurement should be carried out preferably in dry and sunny weather.
- Never connect the test set to energized equipment.
- The ground terminal must be connected first and removed at last.
- High voltage plugs should be free from moisture during installation and operation.
- If oil traces are found on the surface of CT, the same should be cleaned by Methyl Alcohol only. Petrol or diesel should never be used.
- It should be ensured that whole testing equipment along with testing procedures are available at testing site. Testing must be carried out in presence of testing engineer only.
- After testing with high voltage, test terminals must be grounded before being touched by any personnel.
- Test leads should be properly screened/ shielded.

Connect the Megger as per figure-15 given below. Connect the HV terminal to the Primary terminal of CT by using crocodile clip for firm grip

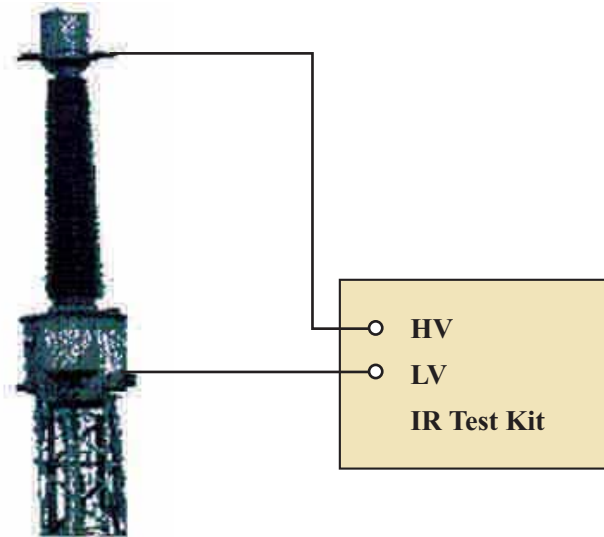


Figure-15 Typical Arrangement for IR measurement

Carry out the measurement as per standard procedure given by the kit supplier.

A test voltage as specified is applied as per the above connections and successive readings are taken. Values of IR should be recorded after 15 seconds, 60 seconds and 600 seconds. Ambient temperature and weather conditions are to be recorded.

6.2.5 DGA Test of CT Oil: Oil samples to be collected in 300ml bottles and to be sent to CIOTL Hyderabad for testing. Test results should be comparable to factory values. In case of any deviation, test results to be forwarded to CC-OS for approval.

6.3 CHECKS/TESTS APPLICABLE FOR CIRCUIT BREAKERS

6.3.1 DEW POINT MEASUREMENT OF SF₆ GAS FOR CIRCUIT BREAKER

Dew Point is the temperature at which moisture content in SF₆ gas starts condensing.

Dew Point at rated pressure of CB: Dew Point when measured keeping regulating valve in service at the outlet of dew point kit to allow required flow rate of gas, is called at rated pressure of CB. Inlet valve is opened completely.

Dew Point at atmospheric pressure : Dew Point when measured by regulating the gas flow at the inlet of dew point kit and keeping outlet regulating valve (if provided) in fully open condition so that flow rate of gas is maintained as required, is called at atmospheric pressure.

TESTING PROCEDURE

- Make the connections to the kit from CB pole ensuring that regulating valve is fully closed at the time of connections of the Dew Point kit.
- By regulating the flow rate of SF₆ gas (0.2 liter/min to 0.5 liter/min - ref. IEC 60480), the value of dew point is observed till it becomes stable.

- c) If the regulating valve is provided at outlet of the dew point kit then values as given in Doc. no. for rated pressures are to be monitored.

Dew Point of SF₆ gas varies with pressure at which measurement is being carried out. This is due to the fact that Saturation Vapour Pressure decreases with increase in Pressure of the SF₆ gas. Hence, dew point of SF₆ gas at higher pressure is lower than dew point at atmospheric pressure. Therefore, it is to be ensured that if measurement has been done at a pressure other than the atmospheric pressure, same is to be converted to the atmospheric pressure as given in the table below used at the time of commissioning for various CB manufacturers: Method for converting dew point at different gas pressures, is given/described in IEC-60480.

Sl. No.	Make of CB	Dew point at rated pressure	Dew point at Atmospheric Pressure (Limit)
1	BHEL	(-) 15° C	- 36° C
2	M & G	-	- 39° C
3	CGL	(-) 15° C	- 35° C
4	ABB	(-) 15° C	- 35° C
5	NGEF	(-) 15° C	- 36° C

6.3.2 MEASUREMENT OF CIRCUIT BREAKER OPERATING TIMINGS INCLUDING PRE INSERTION RESISTOR TIMINGS

PRECAUTIONS

- There should not be any joint in testing cables.
- Test leads should not touch any live part.
- Never connect the test set to energised equipment.
- The ground cable must be connected first and removed at last.
- High voltage plugs should be free from moisture during installation and operation.
- Circuit Breaker Analyser body should be earthed (if separate earth is provided).
- It should be ensured that whole testing equipment along with testing procedures are available at testing site. Testing must be carried out in presence of testing personnel only.
- Surface/terminals should be cleaned where the connections for testing are to be made.
- Clean earth point with sand paper/wire brush where earth terminal is to be provided.
- Ensure that all the poles trip simultaneously through single close/trip command.

TESTING PROCEDURE

- Make connections as shown in the figure-16 below. It is to be ensured that R, Y, B phase marking cables are connected with the proper place in the CB analyser and colour codes are to be maintained for all the three poles of CB.
- Make connections for recording operating timings of Auxiliary contacts.
- Extend power supply to Circuit Breaker Analyzer.
- Give closing command to closing coil of CB and note down the PIR and main contact closing time. Take the print out from the Analyzer.

- e) Give tripping command to trip coil-I of CB & note down the main contact tripping time.
- f) Give tripping command to trip coil-II of CB & note down the main contact closing time.
- g) Note down the timings for 'CO', and 'OCO' by giving respective commands. CO command to be given without time delay but 300ms time delay to be given between O and CO operation in testing for OCO.
- h) To find out opening time of PIR contacts, PIR assembly has to be electrically isolated from Main contacts and then PIR contacts are to be connected to separate digital channels of the Analyzer.

EVALUATION OF TEST RESULTS

A) CLOSING TIMINGS

Closing timings and Discrepancy in operating times of PIR and main contacts should not exceed the permissible limits as specified in the DOC NO: D-5-02-XX-01-03. In any case, main contacts should not close prior to closing of PIR contacts and PIR contacts should not open prior to closing of main contacts. In case, contact bouncing is observed in operating timings for PIR and main contacts, same should be rectified by tightening the cable connections.

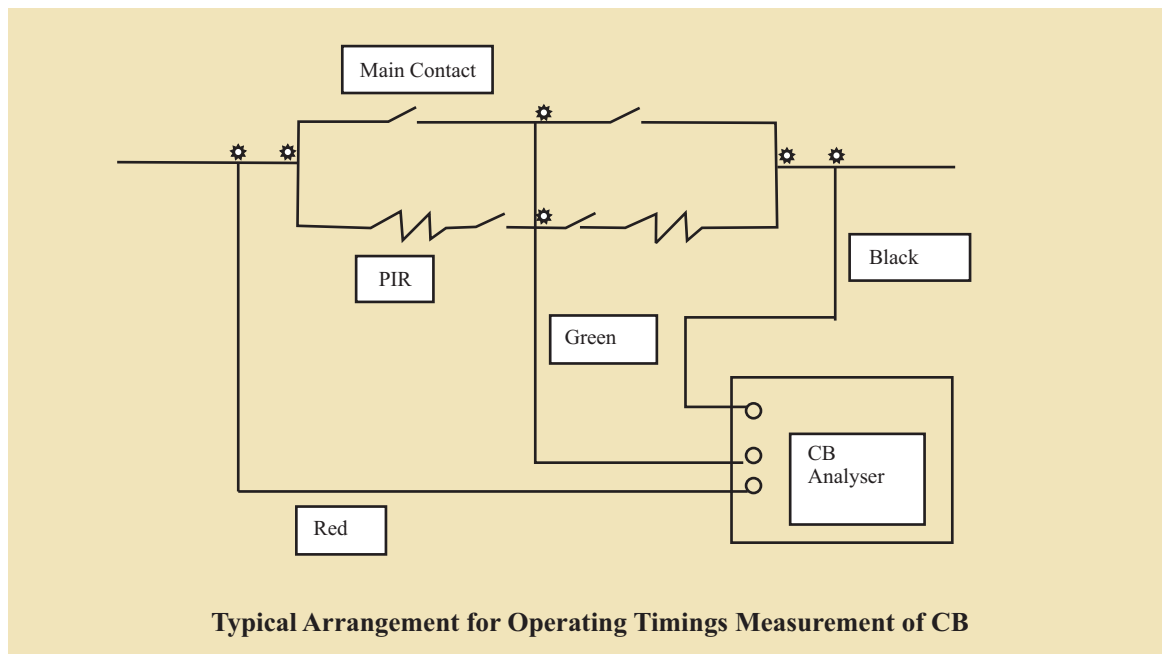


Figure - 16

B) TRIPPING TIMINGS

Trip time and pole discrepancy in operating timings should not exceed beyond permissible value given in Doc. No. D-5-02-XX-01-03. In case of ABB, NGEF and CGL make CBs, while tripping, PIR contacts should not open after opening of main contacts.



C) 'CO' TIMINGS

CO timings should be within permissible limits as specified by different manufacturers.

If operating timings of CB poles are not within limits, same may be corrected by:

1. Equalizing the SF6 gas pressure in all the poles
2. Adjusting plunger movement of trip/ close coils
3. Adjustment in operating mechanism
4. Changing of trip/ close coils (if required)

It is also important to measure timings of auxiliary contacts from the point of view of variations w.r.t. the main contacts.

6.3.3 DYNAMIC CONTACT RESISTANCE MEASUREMENT (DCRM) AND CONTACT TRAVEL MEASUREMENT OF EHV CIRCUIT BREAKERS

Test Equipment: 100 Amp. DCRM kit with CB operational analyzer with 10k Hz sampling frequency.

Isolation Required

- a) CB should be in open position.
- b) Isolator of both sides of CB should be in open position.
- c) Earth switch of one side of CB should be in open position.

Precautions

- a) There should be no joints in testing leads/cables.
- b) It should be ensured that whole testing equipment along with testing procedures are available at testing site. Testing must be carried out in presence of testing personnel only.
- c) Current leads should be connected such that voltage leads are not outside area of current flow.

Testing Procedure

1. Follow the standard procedure as given in instruction manual of DCRM kit.
2. The tightness of connections at CB flanges is most important to ensure error free measurement. CB during CO operation generates lot of vibrations and failure of connections during this period can dramatically change the dynamic signature of CB resistance.
3. DCRM signatures should be recorded for CO operation. Open command should be extended after 300 ms from the close command.
4. Clean portions of incoming and outgoing flanges of CB with polish paper to remove paint, oxidation etc, at points where Current clamps are mounted.
5. Select this point of connection, as close as possible to the end of porcelain insulator to ensure that minimum resistance is offered by flanges, bolts, terminal connectors etc.
6. It should be ensured that Travel Transducers are properly fitted.
7. Sampling frequency during measurement should be 10 KHz.
8. Resistance, travel, injected current and Trip/ Close coil currents are to be recorded.

The variations in the measured resistance versus time will be seen as a finger print for the breaker contacts and can be used as a bench mark for comparing with future measurements on the same breaker. This provides information on the condition of the breaker contacts, driving mechanism, operating levers etc.

Dynamic Contact Resistance Measurement for CB healthiness

By application of Dynamic Contact Resistance Measurement, condition of arcing contact, main contact, operating levers, driving mechanism can be predicted. If DCRM signature shows wide variations and also there is change in arcing contact insertion time, it indicates erosion of the arcing contacts to main contacts and subsequent failure.

Contact Travel Measurement

Transducers are attached to the operating rod or interrupting chamber in order to record the contact travel. When CB closes, contact travel is recorded. Contact bounces or any other abnormality is also clearly indicated by the Contact Travel Measurement.

If contact travel, contact speed and contact acceleration signature are compared with the original signatures, then it may indicate problems related with the operating mechanism, operating levers, main/ arcing contacts, alignments etc.

DCRM along with Contact Travel measurement is useful in monitoring length of Arcing contacts. Erosion of Arcing contacts may lead to commutation failures and current may get transferred to Main contacts. Due to heat of arc, main contacts may get damaged.

6.3.4 OPERATIONAL LOCKOUT CHECKING FOR EHV CIRCUIT BREAKERS

6.3.4.1 TESTING PROCEDURE:

A. SF₆ GAS PRESSURE LOCKOUT

a) LOW PRESSURE ALARM

Close Isolation Valve between CB Pole(s) and density monitor. Start releasing SF₆ gas from density monitor till the low pressure gas alarm contacts are actuated which is detected by Multimeter. Note down the pressure and temperature at which the contacts get actuated.

b) OPERATIONAL LOCKOUT:

Continue releasing SF₆ gas from isolated zone till the operational lockout Alarm Contacts are actuated which are detected by Multimeter. Note down the pressure and temperature at which the contacts get actuated. This is called operational lockout pressure.

B. PNEUMATIC OPERATING SYSTEM LOCKOUT

a) COMPRESSOR START/STOP SWITCH

Close the isolating valve of CB. Release air into atmosphere from the compressor. Note down the value of pressure at which Compressor starts building up air pressure and pressure at which Compressor stops.



b) CBAUTO RECLOSE LOCKOUT

Close isolation valve between pneumatic system and pressure switches. Release air from the isolated zone to atmosphere. Note down pressure at which A/R L/O contacts of pressure switch get actuated which are detected by Multimeter. The leads of the Multimeter should be connected to the contactor where the AR L/O of CB are made.

c) CB CLOSING LOCKOUT

Release air from the isolated zone to atmosphere. Note down pressure at which CB Closing L/O contacts of pressure switch get actuated which are detected by Multimeter.

d) CB OPERATIONAL LOCKOUT

Release air from the isolated zone to atmosphere. Note down pressure at which CB Operational L/O contacts of pressure switch get actuated which are detected by Multimeter.

e) MECHANICAL CLOSING INTERLOCK (FOR ABB & BHEL CBs ONLY)

CB should be in closed position. Release air from pneumatic system of CB to atmosphere and observe whether CB poles start opening, if so, note down the pressure at which tie rod starts coming down. In such case the closing interlock is to be opened for inspection and if required, replace the closing interlock.

C. HYDRAULIC OPERATING SYSTEM LOCKOUT

a) Pump START/STOP

By opening pressure release valve, note down the pressure at which Pump starts building up oil pressure and pressure at which pump stops.

b) CBAUTO RECLOSE LOCKOUT

Close Isolation valve between hydraulic system and pressure switches. Release oil from the isolated zone to oil tank. Note down pressure at which A/R L/O contacts of pressure switch get actuated which are detected by Multimeter.

c) CB CLOSING LOCKOUT

Release oil from the isolated zone to oil tank. Note down pressure at which CB Closing L/O contacts of pressure switch get actuated which are detected by Multimeter.

d) CB OPERATIONAL LOCKOUT

Release oil from the isolated zone to container. Note down pressure at which CB Operational L/O contacts of pressure switch get actuated which are detected by Multimeter.

D. OPERATING PRESSURE DROP TEST:

For Pneumatic/ Hydraulic operating system, operating pressure drop test to be performed during OCO operation of CB, keeping AC supply of Hydraulic pump/ Compressor in off condition. Hydraulic/ Pneumatic pressure drop should be within limits (as recommended by Manufacturer)

6.3.4.2 EVALUATION OF TEST RESULTS

A. SF6 GAS PRESSURE LOCKOUT

All the SF6 gas pressure switches settings should be checked and corrected with ambient temperature. Settings of SF6 gas pressure switches should be within ± 0.1 bar/ Kg/cm² of the set value (after taking into account the temperature correction factor).

B. AIR PRESSURE LOCKOUT

All the air pressure switches settings should be checked and corrected and should be within ± 0.3 bar/ Kg/cm² of the set value.

C. OIL PRESSURE LOCKOUT

All the oil pressure switches settings should be checked and corrected and should be within ± 0.3 bar/ Kg/cm² of the set value.

6.3.5 MEASUREMENT OF STATIC CONTACT RESISTANCE

The Static contact resistance of main circuit of each pole of a circuit breaker is of the order of a few tens of micro ohms. 100 A DC is injected and milli volt drop is measured across each CB contact to compute contact resistance. The values should be within specified limits.

6.3.6 CHECKING THE ANTI-PUMPING FEATURE

When the breaker is in open position and closing and opening commands are given simultaneously the breaker first closes and then opens, but does not reclose even though the closing command is maintained.

6.3.7 CHECKING THE ANTI-CONDENSATION HEATERS

Check the supervisory circuit of the anti-condensation heaters for correct functioning. With the heaters switched ON, measure their current output.

6.3.8 POLE DISCREPANCY RELAY TESTING

Pole Discrepancy is defined as the difference in closing & opening timings of different poles of CB.

A. WHEN CB IN OPEN POSITION

Closing Command is extended to close one pole, say R-Pole, of CB. After closing R-Pole of CB, this Pole should automatically open after 2.5 seconds (as per pole discrepancy timer settings). Repeat the test for remaining two poles of CB.

B. WHEN CB IN CLOSED POSITION

Tripping Command is extended to trip one pole, say R-Pole, of CB. Remaining Y and B- Poles of CB should automatically open after 2.5 seconds. Repeat the same test for remaining two poles of CB.

C. EVALUATION OF TEST RESULTS

Permissible value of pole discrepancy between two poles of CB is 3.33 msec. from system point of view and it should not be confused with the setting of pole discrepancy timer which is generally 1.0 or 2.5 sec. depending on Auto-reclose scheme.

6.3.9 CHECKING THE NITROGEN PRIMING PRESSURE

Close the pressure release valve. Shortly after the oil pump starts, the priming pressure (200 bar at 20 °C) in the accumulator can be read. The relationship between the pressure and temperature is indicated in Fig. 17.

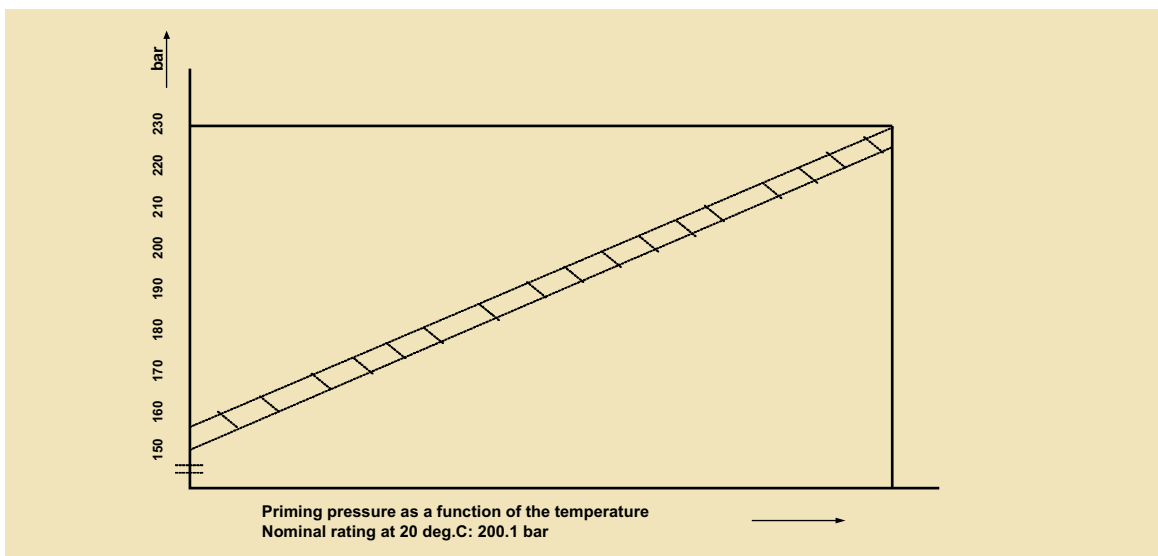


Figure - 17

6.4 CHECKS/TESTS APPLICABLE FOR CVTs

6.4.1 CVT POLARITY, RATIO TEST

CVT polarity is checked in the same manner as for CT, taking care to ensure that the battery is connected to the primary winding. In case of star/star winding configuration care has to be taken to ensure that the primary and secondary neutral points are not connected together. It is necessary to verify that the phase rotation sequence of the 3 phase CVT is correct. The secondary voltage between phases and neutral are measured and then phase rotation meter is connected across the three phase terminal.

6.4.2 INSULATION RESISTANCE MEASUREMENT OF PRIMARY & SECONDARY WINDING

6.5 CHECKS/TESTS APPLICABLE FOR ISOLATORS

6.5.1 MILLIVOLT DROP TESTS

The milli volt drop across the isolator is measured using DC current. The voltage drop gives a measure of resistance of current carrying part and contacts.

The DC current should be equal to or more than 100 A. The resistance of isolator should be measured at ambient air temperature. The temperature of specimen/environmental temperature should be recorded. The value of measured resistance should be converted to the value of temperature at which factory test results are taken. Temperature corrected value of resistance should be comparable to the factory value.

6.5.2 50 OPERATION TESTS

6.6 CHECKS/TESTS APPLICABLE FOR SURGE ARRESTERS

6.6.1 MEASUREMENT OF THIRD HARMONIC RESISTIVE CURRENT FOR SURGE ARRESTERS

Testing Procedure

- Make the connections as per the diagram given below (Fig.18)
- The kit should be properly earthed.
- Clamp On type CT should be placed above the surge monitor to pick up the total leakage current.
- Carryout the measurements as per standard procedure supplied by the test kit manufacturer.
- Note down the system voltage and ambient temperature along with the test current value.
- Avoid measurement during monsoon.

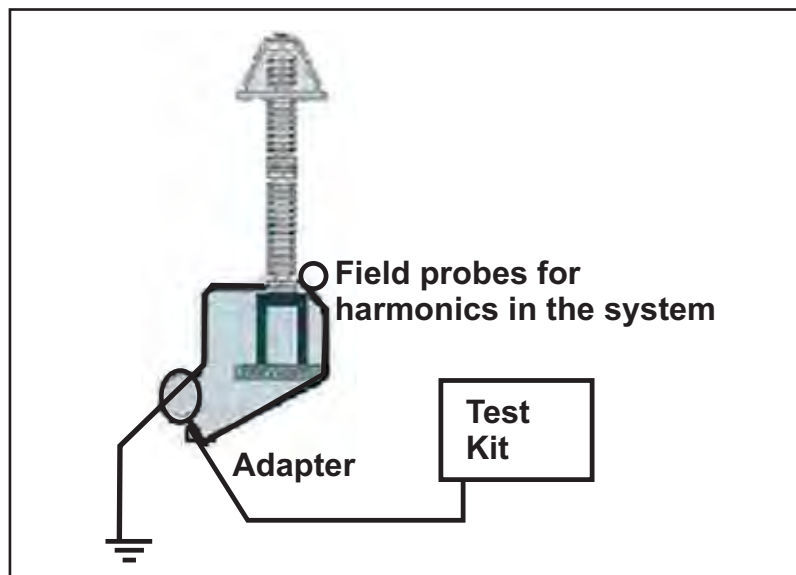


Figure- 18 Typical arrangement for THRCM Test

EVALUATION OF TEST RESULTS

- A. ZnO Surge Arrester continuously conducts a small leakage current (Fig.19). The resistive component of this leakage current may increase with time due to different stresses causing ageing and finally cause arrester failure.
- B. If Harmonics are present in the system voltage, it affects the value of measured third harmonic current. Compensating device provided to be used to nullify the effect. The value of Third Harmonic Resistive current shall be less than 30 μA

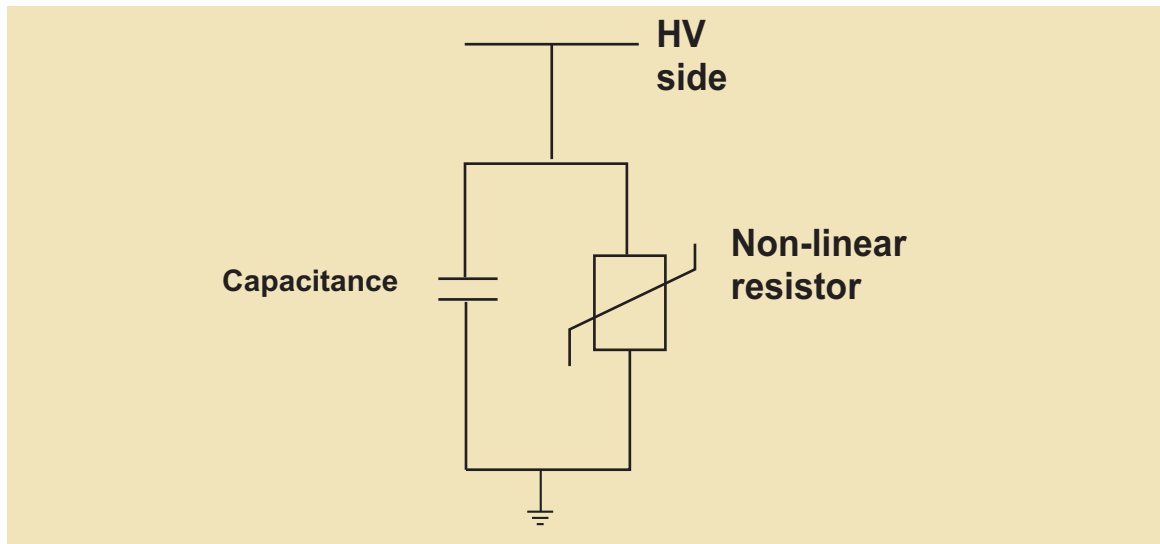


Figure-19 Arrester equivalent circuit

6.7 CHECKS/ TESTS FOR OTHER AREAS/ EQUIPMENTS

6.7.1 EARTH RESISTANCE MEASUREMENT

Normally Earth tester is used for measuring

- (a) Soil resistivity
 - (b) Earth resistance
- a. Prior to the testing of soil resistivity and earth resistance the operation manual of the testing instrument available at site may be referred for procedures to be adopted for measurement of soil resistivity and earth resistance.
A typical earth tester has 4 terminals. C1, P1, C2, P2 and 4 similar electrodes are driven in the ground at equal distances and connected to the instruments in the order of C1, P1 and P2, C2. Then the handle is rotated or button is pressed and the reading of the resistance is read on the scale of the instrument. If R is the resistance measured then

$$\text{Specific Resistivity} = 2\pi a R$$

Where 'a' is the distance between the electrode

And R is the resistance in ohms measured on the earth tester.

- b. In order to measure earth resistance of the electrode of the substation, it could be connected to C1 and the value of R could be read in the scale with the rotation of the handle of the Insulation tester. This will give the earth resistance. The value as far as possible should be around 1 ohm. To improve the value, water should be spread at the earth pit.

6.7.2 SECONDARY CURRENT INJECTION TEST SETS

The primary test is essential when commissioning and new installation as a test the whole protection system and will detect current transformers connected with incorrect polarity or relays that have been set in the wrong sequence in differential system. Secondary current injection sets are very useful for conducting these tests. The standard secondary current injection test equipment consists of a 1/5 A current injection set, separate wave form filter unit and a digital counter. The equipment is designed in a portable kit for on site testing of protecting devices, circuit breakers, trip coils, motor overloads, and similar apparatus. The filter unit should be used when testing saturating core type relays to ensure that the test current has a substantially sinusoidal waveform. The typical test setup is shown in fig. 20. Details of the testing will be elaborated in the relay testing.

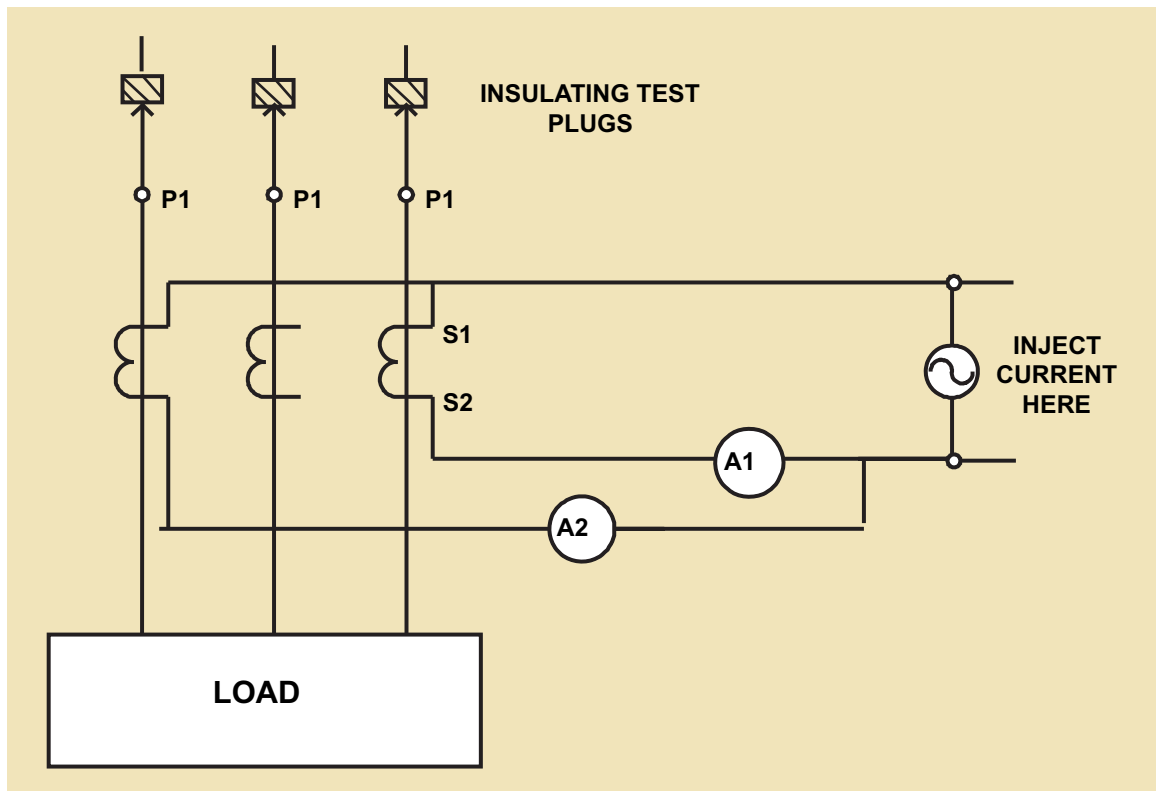


Figure - 20

6.7.3 CONTACT TIGHTNESS TEST OF BAY CONTACTS:

- Isolate the Bay from Bus–Side and line side as shown in Fig.-21.
- Ensure that all the secondary cores are connected or short if not in use.
- Inject the Current at Point 1 (200A) from primary injection kit (w r t earth) and return current via earth point at 2 as shown in Fig.-21.
- Check that we are able to inject current at point 1 and measure the current at point 2.
- Injection of current is the indication of contact tightness.
- Repeat the procedure for point 1 & 3
- Repeat the procedure for point 1 & 4

Note: Above tests can be aborted if individual contact resistances are within satisfactory limit and physical phase checking is satisfactory.

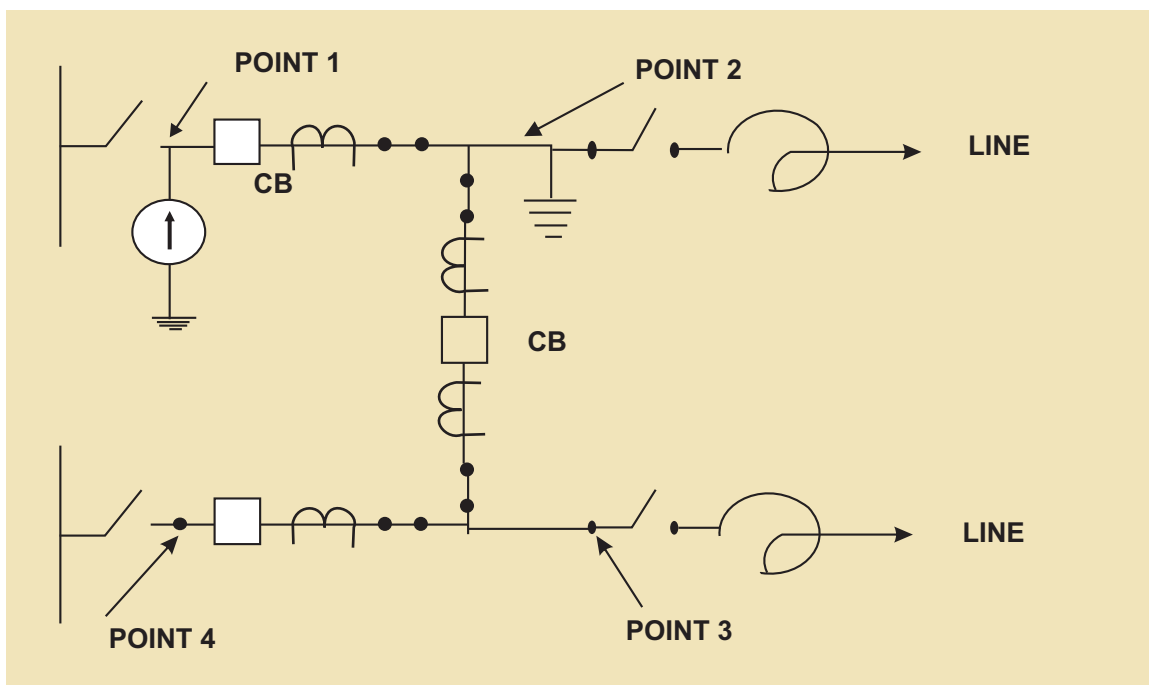


Figure-21 : Primary injection test to check contact tightness of Bay/ feeders

RISH Ducer PT 602, 1 or 2 channels **Configurable transmitter for Pt 100**

Data Sheet

Transducer for measuring
Temperature (Equivalent resistance)



Fig. 1 RISH Ducer PT 602, 1 channel version, in housing S17 clipped on to a top - hat rail.



Fig. 2 RISH Ducer PT 602, 2 channel version, in housing S17 hole mounting brackets pulled out.



Application

The transmitter RISH *Ducer* PT 602 (Fig. 1 and 2) Converts the input variable-a signal from a resistance thermometer Pt 100- to a temperature linear output signal.

The analogue output signal is either an impressed current or superimposed voltage which is processed by other devices for purposes of displaying, recording and / or regulating a constant.

Versions are available for two, three or four - wire connection.

DIP switches are provided for the coarse setting of the measuring range and the fine adjustment is accomplished using the potentiometers.

Red LED's signal an open or short-circuit feeler. In both cases, the output signal adopts its maximum value.

In the case of an current output, provision is made for switching between 0... 20 mA and 4... 20 mA.

The transmitter fulfil all the important requirements and regulations concerning electromagnetic compatibility EMS & safety (IEC 1010 resp. EN 61 010). It was developed & is manufactured & tested in strict accordance with the quality assurance standard & ISO 9001

Features / Benefits

- Measuring ranges configurable with DIP switch and potentiometer .
- Non - Standard user - specific ranges available .
- Red LED's indicator : an open or short - circuit.
- Electric isolation between input & output 2.3 kV and power supply & all other circuits 3.7 kV - Fulfils EN 61 010.
- Universal (DC / AC) power supply.
- Provision for either snapping the transmitter onto top-hat rails or securing it with screws to a wall or panel.
- Housing only 17.5 mm wide (size S17) / low space requirement

Technical data

Measuring input resp. measuring inputs—⊖

Resistance thermometer	Type Pt 100 (DIN IEC 751)
Measuring current	< 1 mA
Input resistance	R _i > 4 MΩ
Lead resistance	Two - wire connection ≤ 25 Ω per lead (total 50 Ω) Three - / four - wire connection ≤ 25 Ω per Lead
Temperature range	Two - wire connection - 150 ... 800°C Three - / four - wire connection - 170 ... 800°C
Min. span	50°C
Max. span	700°C

Example 1 : Range -150°C to 800°C

Lower side possible range is -150°C to 550°C (Span=700°C)

Higher side possible range is 100°C to 800°C (Span=700°C)

Example 2 : Range 0°C to 45°C or -20°C to 10°C

These ranges are not possible because Min span required is 50°C whereas available span is less than 50°C

Max. initial value : Two - wire connection 400°C
Three-/four - wire connection 500°C

Max. ratio between offset and span

$$\frac{T_A}{T_E - T_A} < 10 \quad (T_A \text{ and } T_E \text{ in } ^\circ\text{C})$$

Measuring range settings

— Coarse setting with DIP switches
— Fine adjustment with potentiometer "Zero" and "Span"
Dependent on temperature range, typical values :
— Span, approx. ± 60% of full scale
— Offset, approx. ± 100°C
(12 - turn helical potentiometer)

Potentiometer setting range

Measuring output resp. measuring outputs ⊕➡

DC current	0 / 4 ... 20 mA switchable by plug - in jumper
Burden voltage	10 V
Open-circuit voltage	< 20 V
External resistance	R _{ext} max. ≤ 500 Ω
Residual ripple	< 1.5% p.p., DC...10 kHz
DC voltage	0...10 V
Short-circuit current	≤ 40 mA
Load capacity	R _{ext} min. ≥ 2 kΩ
Residual ripple	< 1.5% p.p., DC...10 kHz
Response time	≤ 500 ms

Open-circuit sensor circuit and short-circuit supervision

Pick-up level	— At open - circuit approximately 1 to 400 kΩ — At short - circuit approximately 0...30 Ω
Fault signaling mode	— Frontplate signals Red LED for signaling fault — Output signal at 0 / 4...20 mA, output approx. 25 mA at 0...10V, output approx. 12.5 V

Accuracy data (acc. to DIN/IEC 770)

Basic accuracy	Max. error ≤ + 0.5% including linearity and repeatability errors for a standard range 0 ... 100° C and for reference conditions.
Additional error (additive)	< ± 0.35 % for linearised characteristic.
Influence of lead resistance	— Two - wire connection : Compensated by potentiometer — Three - wire connection : 0.15 K of measuring range per 10 Ω Lead resistance ≥ 0.375 K total — Four - wire connection : 0.1 K of measuring range per 10 Ω Lead resistance ≥ 0.375 K total
Selector switch for 0...20 / 4...20 mA	± 0.1%

Reference conditions

Ambient temperature	23°C, ± 2 K
Power supply	24 VDC $\pm 10\%$ and 230 VAC $\pm 10\%$
Output burden	Current: $0.5 \cdot R_{ext}$ max. Voltage: $2 \cdot R_{ext}$ min.
An external supply fuse must be provided for DC supply voltages supply > 125 V.	

Influencing factors

Temperature	< ± 0.2 % per 10 K
Burden	< ± 0.1 % for current output < 0.2 % for voltage output, if $R_{ext} > 2 \cdot R_{ext}$ min.
Long-term drift	< ± 0.3 % / 12 months
Switch-on drift	< ± 0.5 %

Power supply H \rightarrow ○ :

AC/DC power pack (DC and 45...400 Hz)

Table 3: Rated voltages and permissible variations

Nominal voltages U_N	Permissible variation
24... 60 V DC / AC	DC -15... + 33%
85...230 V ¹ DC / AC	AC $\pm 15\%$

Power consumption	1 Channel version ≤ 1.2 W respectively ≤ 2.3 VA 2 channel version ≤ 1.8 W respectively ≤ 3.4 VA
--------------------------	--

Environmental Conditions

Commissioning temperature	—10 to + 55 °C
Operating temperature	—25 to + 55 °C
Storage temperature	—40 to + 70 °C
Annual mean relative humidity	$\leq 75\%$

Standard

Electromagnetic Compatibility	The standard DIN EN 50 081-2 & DIN EN 50 082-2 are observed
Protection (acc. to IEC 529 resp. EN 60 529)	Housing IP 40 Terminals IP 20
Electrical standards	Acc. to IEC 1010 resp. EN 60 010
Operating voltages	< 300 V between all insulated circuit
Pollution degree	2

Electrical insulation

All circuits (measuring inputs / measuring outputs / power supply) are electrically insulated

Permissible vibrations	2 g acc. to EN 60 068-2-6
Shock	50 g 3 shocks each in 6 directions acc. to EN 60 068 - 2 - 27
Weight	1 channel approximately 180 g 2 channel approximately 200 g

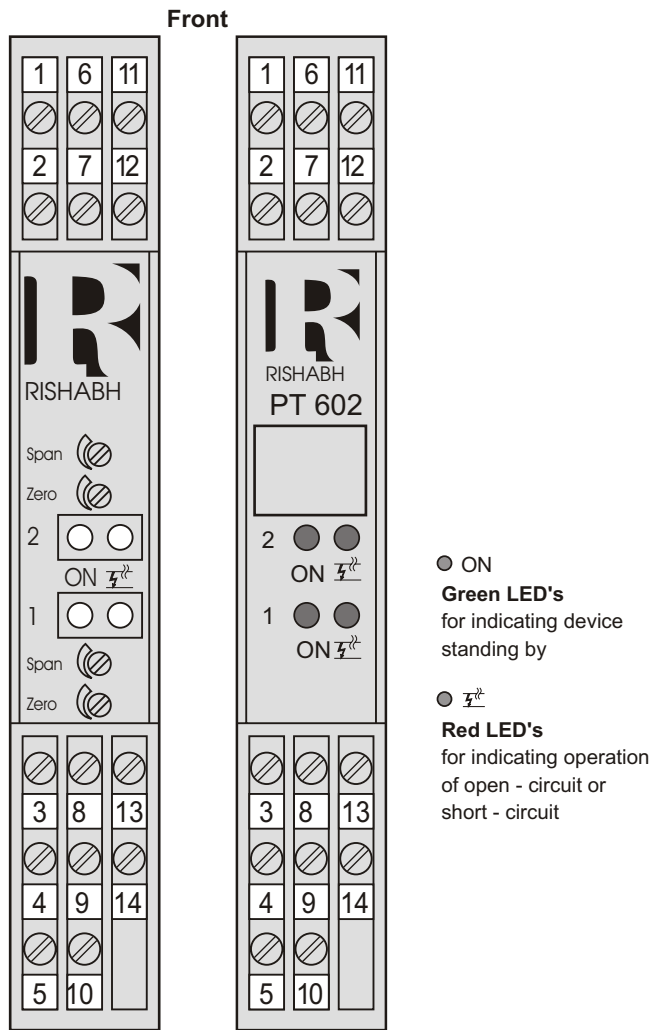
Installation Category

acc. to IEC 664	III for power supply II for measuring input and measuring output
Double insulation:	– Power supply versus all circuits – Measuring input versus measuring output
Test voltage:	Power supply versus: – all 3.7 kV, 50 Hz, 1 min. Measuring inputs versus: – measuring outputs 2.3 kV, 50 Hz, 1 min. Measuring input 1 versus: – measuring input 2 2.3 kV, 50 Hz, 1 min. Measuring output 1 versus: – measuring output 2 2.3 kV, 50 Hz, 1 min.

Installation Data

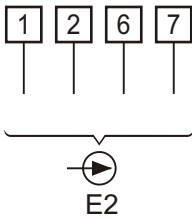
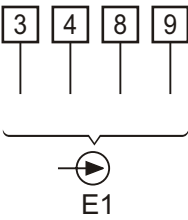
Mechanical design	Housing S17 Refer to Section "Dimensional drawings" for dimensions
Material of housing	Lexan 940 (Polycarbonate) Flammability class V-0 acc. to UL 94, self - extinguishing, non - dripping, free of halogen
Mounting	For snapping onto top - hat rail (35X15 mm or 35X7.5 mm) acc. to EN 50 022 or directly onto a wall or panel using the pull - out screw hole brackets
Mounting position	Any
Terminals	DIN / VDE 0609 Screw terminals with wire guards for light PVC wiring and max. 2 X 0.75 mm ² or 1 X 2.5 mm ²

Electrical connections



Without transparent cover

With transparent cover



E1 = Measuring input 1 } Terminal allocation acc. to
E2 = Measuring input 2 } Connection mode, see Table 4
A1 = Measuring Output 1
A2 = Measuring Output 2
H = Power supply

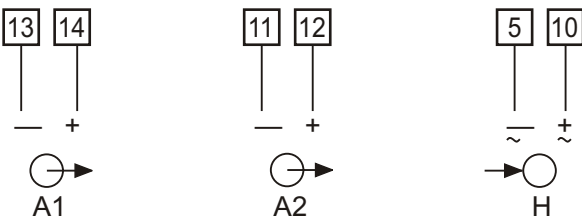


Table 4 : Connection of the measuring input leads E1 and E2

	Measuring inputs	Connection mode*	Wiring diagram Terminal arrangement
Version with 1 input	Measuring input → E1	Two-wire connection	
		Three-wire connection	
		Four-wire connection	
Version with 2 inputs	Measuring input → E1	Two-wire connection	
		Three-wire connection	
		Four-wire connection	
	Measuring input → E2	Two-wire connection	
		Three-wire connection	
		Four-wire connection	

* RISH Ducer PT 602 units with type designations 602-1XX 1 and 602-1XX 2 can operate with either two or three-wire connections, but units with the type designation 602-1XX 3 only operate with a four-wire connection.

Dimensional Drawings

(All dimensions are in mm)

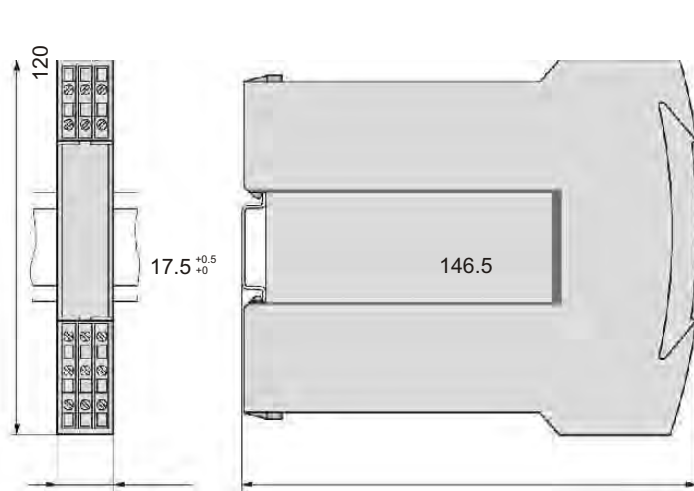


Fig. 3 **RISH Ducer** PT 602 in housing S 17 clipped onto a top-hat rail (35 X 15 mm or 35 X 7.5 mm, acc. to EN 50 022).

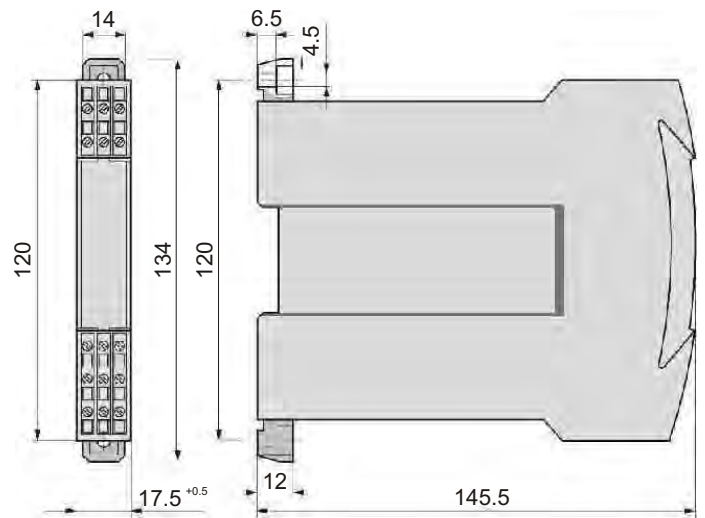


Fig. 4 **RISH Ducer** PT 602 in housing S 17 with screw hole brackets pulled out for wall mounting.

Standard Versions

Inputs (s) set to a range of 0...100°C and output (s) to a range of 4... 20 mA. Configured for three - wire connection. DIP switches enable the temperature range to be configured between a minimum of - 170°C to a maximum of + 800°C; potentiometer for fine calibration of " Zero " and " Span ".

Table 1: Standard version with 1 input 1 output

Input	Output	Power supply DC/AC
0...100 °C	0/4...20 mA	24... 60 V
configurable	$R_{ext.} \leq 500 \Omega$	85...230V

Table 2: Standard version with 2 input 2 output

Inputs 1 & 2	Outputs 1 & 2	Power supply DC/AC
0...100 °C	0/4...20 mA	24...60 V
configurable	$R_{ext.} \leq 500 \Omega$	85...230V

Standard accessories

- 1 Operating Instructions
- 2 Pull out clamp S17 (for opening the housing)
- 3 Front label

Table 5 : Ordering Information (See also Table 1 and 2 : "Standard Version")

DESCRIPTION	MARKING
1. Mechanical design Housing S17 for rail and wall mounting	602 - 1
2. Number of measuring inputs / measuring ranges 1) With 1 measuring input / measuring range 2) With 2 measuring inputs / measuring ranges	1 2
3. Version / Power supply 1) Standard, / 24 ... 60 V DC/AC 2) Standard, / 85 ... 230 V DC/AC	1 2
4. Connection mode (applies to inputs 1 and 2) 1) Two-wire connection RL1 [Ω] [REDACTED] RL2 [Ω] [REDACTED] 2) Three-wire connection 3) Four-wire connection	1 2 3
5. Measuring input 1 1) Measuring range 0...100°C 9) Measuring range [°C] [REDACTED] Line 1: Measuring ranges configurable, see Operating Instructions Line 9: —170 to + 800 °C, span min. 50 °C, max. 700 °C, see technical data	1 9
6. Measuring input 2 0) Measuring input 2 not used 1) Measuring range 0...100°C 9) Measuringrange 2 [°C] [REDACTED] Line 1: Measuring ranges configurable, see Operating Instructions Line 9: Possible measuring ranges see measuring input 1	0 1 9
7. Measuring outputs 1 or 2 (applies to outputs 1 and 2) 1) Output 0/4 ... 20 mA (configurable by plug-in jumper(s), set to 4 ... 20 mA) 2) Output 0 ... 10 V 3) Output 4/0 ... 20 mA (configurable by plug-in jumper(s) set to 4...20mA)	1 2 3
8. Certificate 0) Without test certificate 1) With test certificate	0 1

Possible special Version, e.g. increased climatic rating on inquiry.

Annexure-1

INTEGRITY PACT**Between**

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

and

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

Preamble

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

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


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

Section 1- Commitments of the Principal

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

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

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.



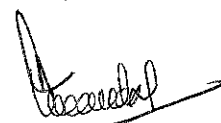
- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit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

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

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

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above, the Bidder(s)/ Contractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.



Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

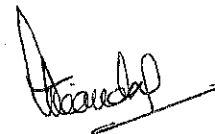
- 6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.
- 6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.
- 6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

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

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

Section 8 -Independent External Monitor(s)

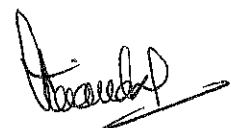
- 8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.
- 8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.
- 8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.



- 8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.
- 8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Principal should be looked into by the CVO of the Principal.
- 8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.
- 8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.
- 8.13 The word 'Monitor' would include both singular and plural.

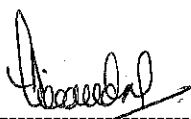
Section 9 - Pact Duration

- 9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.
- 9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.



Section 10 - Other Provisions

- 10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.
- 10.2 Changes and supplements as well as termination notices need to be made in writing.
- 10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.
- 10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.
- 10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.



For & On behalf of the Principal
(Office Seal)

Place NOIDA(UP)
Date _____

Witness: _____
(Name & Address) _____

For & On behalf of the Bidder/ Contractor
(Office Seal)

Witness: _____
(Name & Address) _____

**FORMAT OF NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)**

REF:

Dated.....

**BHARAT HEAVY ELECTRICALS LIMITED,
TRANSMISSION BUSINESS GROUP,
5th Floor, BHEL SADAN,
Plot No- 25, Sector- 16A, Noida,
Distt. Gautambudh Nagar, UP-201301**

SUB: TENDER FOR “Erection, Testing & Commissioning work (ETC) includes taking over (with verification) of already unloaded material, receipt of complete project material, unloading from truck/ trailer/ carriers, Material handling at Project Site / Project area, material reconciliation, verification, record keeping, handling, material relocating as per site / storage requirements, safe keeping, Pre-erection assembly, erection / installation, testing, pre-commissioning and commissioning Project and associated systems/equipment and reconciliation after completion of ETC & handing over surplus material & Spares to BHEL/Customer for

- 1. 765kV AIS Switchyard at PGCIL Sikar project**
- 2. 765kV AIS Switchyard at PGCIL Khetri project in Rajasthan”.**

Tender Ref.: TBSM/SIKAR-KHETRI/ETC/TENDER/24-25 dated 27.09.2024

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,
5th 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/SIKAR-KHETRI/ETC/TENDER/24-25** **Date: 27.09.2024**

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 action 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,
5th 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/SIKAR-KHETRI/ETC/TENDER/24-25 Date: 27.09.2024

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

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Bank Branch NEFT IFSC code

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(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
(Authorised 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.