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 (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

CUSTOMER

M/S ODISHA POWER TRANSMISSION CORPORATION LTD

TENDER SPEC. NO.: TBSM/ERSAMA/ETC/TENDER/24-25

DATE: 27.06.2024

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/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

SUB: TENDER FOR "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha".

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 (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha	5 (Five) month from date of LOI	Rs. 2,000,00/- As per Annexure to conditions of contract for ETC works	10.07.2024 14.30 hrs.	10.07.2024 15.30 hrs. (Technical bid only)

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

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

Offers are invited in two-parts only.

Documents Comprising the e-Tender

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

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

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

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

ii) Technical Bid (without indicating any prices).

b) <u>Price Bid:</u>

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).

The Requirement:

1. A PC with Internet connectivity &
2. DSC (Digital Signature Certificate) (**Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION**)

The contact details of the service provider are given below:
For any technical related queries please call at 24 x 7 Help Desk Number
0120-4001 002, 0120-4001 005 & 0120-6277 787
International bidders are requested to prefix 91 as country code
Email Support - Technical - support-eproc@nic.in

Note: For any Issues or Clarifications relating to the published tenders, bidders are requested to contact the respective Tender Inviting Authority

The process of utilizing e-procurement necessitates usage of **DSC (Digital Signature Certificate) (Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION)** and you are requested to procure the same immediately, if not presently available with you. Please note that only with DSC, you will be able to login the e-procurement secured site and take part in the tendering process.

The Vendors DSC Address List link as given below:
https://eprocurebhel.co.in/nicgep/app?component=%24DirectLink_0&page=DSCInfo&service=direct&session=T&sp=SDSCAddress.pdf

Vendors are also requested to go through seller manual available on ***https://eprocurebhel.co.in***.

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. 2 to 3 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. Contactors are also required to furnish details as per Annexure (HSE) to NIT along with their offer. Offers received without compliance & data about HSE requirements are liable to be rejected.
9. All documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder.
10. Clarifications, if any, can be obtained from the undersigned but such requests should be submitted well before the due date for submission of tenders. Due date for submission and opening of tenders will not be extended on such grounds.
11. Please note that wherever there is a contradiction between the 'ANNEXURE TO CONDITIONS OF CONTRACT FOR ETC 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 and/or under applicable legal provisions".

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

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

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

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

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

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

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

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

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

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

27. **Integrity Pact (IP)**

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

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

    (b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (part-I in case of Two/ Three Part Bid). Only **those bidders**

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

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

Note: -

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

Details of contact person (s): -

1) Name: - 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

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. **Special Conditions:**

i) Project License:

All electrical jobs shall be carried out only through contractors possessing valid project licenses from Odisha State.

ii) HT/EHT license:

HT/EHT license issued by the State Govt. Authority available with the Contractor is sufficient for the purpose of participation in the subject tender. In case the HT/EHT license is not from the ELBO Odisha, Contractor license for execution of works to be obtained from the office of the EIC-CUM-PCEI, Odisha. However, the contractor should furnish the documents as a proof to BHEL/OPTCL, that they have applied to the issuing authority for issuing of Contractor license within thirty (30) days from the issue of LOI. In case the Contractor License application is not furnished within 30 days from the issue of LOI, BHEL/OPTCL have the right to cancel the LOI.

35. **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/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

SUB: TENDER FOR "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha".

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

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

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

(Signature of Tenderer)

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

(TO BE FILLED BY TENDERER OVER THEIR LETTERHEAD)

ANNEXURE - Y

REF.: TBSM/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

SUB: TENDER FOR "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha".

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.

(Signature of Tenderer)

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

ANNEXURE – Z

REF.: TBSM/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

SUB: TENDER FOR "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha".

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/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

SUB: TENDER FOR "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha".

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

Sl. No.	Criteria	Description
A	Turn Over	Bidder should have a minimum average annual turnover of **Rs. 93,95,998/-** for last three financial years **(2020-21, 2021-22 & 2022-23 Or 2021-22, 2022-23 & 2023-24**) and should submit audited balance sheet and Profit & Loss Account Sheet of these years. The audited financial statements must be signed by the owner and the auditor. Auditors seal, Name, Membership No., Firm Registration No. & firm name (if applicable), UDIN and the capacity in which he is signing (Proprietor/Partner), must be mentioned on the Profit & Loss A/c and Balance Sheet. In case of proprietorship and partnership firms where Audited Profit & Loss A/c and Balance Sheet is not mandatory as per extant rules, CA certificate certifying turnover and profit for the required financial years must be submitted. CA certificate must be on his letter head mentioning his/her name, Membership No., Firm Registration No. & firm name (if applicable), UDIN, capacity in which he is signing (Proprietor/Partner), date and place of signing.
B	Profit & Net worth	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. Net worth of the Bidder based on the latest Audited Accounts as furnished for 'A" above should be positive. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
C	Similar Work	Bidder should have successfully executed Similar works "Successful erection testing and commissioning/ pre-commissioning of AIS/GIS of 220 kV or higher Voltage Class with other allied works" during last seven years ending on **31.05.2024** and should be either of the following: i. Three similar jobs executed costing (except service tax/GST) not less than **Rs. 1,25,27,998/-** each. OR ii. Two similar jobs executed costing (except service tax/GST) not less

		than **Rs. 1,56,59,997/-** each. OR iii. One similar job executed costing (except service tax/GST) not less than **Rs. 2,50,55,996/-**

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 ODISHA POWER TRANSMISSION CORPORATION LTD

2.0 PROJECT LOCATION AND DETAILS:

Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

3.0 CONTACT PERSON: FOR CONTRACTUAL ISSUES

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HSE CONDITIONS
at a GLANCE (for bidders)



Health Safety and Environment Management

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

Transmission Business Group, Noida

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BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP

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

1. BHEL HSE Policy



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

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

Atul Sobti
Chairman & Managing Director

June 5, 2018

Creating BHEL of tomorrow

2. Legal Compliances:

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

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

b. Indian Standard (IS) Codes related to HSE

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

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

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

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

c. The Sub-contractors need to

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

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

3. Labour Welfare and Medical Facilities

a. Labour Welfare

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

b. Medical facilities and Health centres

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

4. House Keeping & Storage

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

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

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

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

5. Site Safety

a. Induction and others safety trainings

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

b. Appointment of Safety Officer/Supervisor

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

c. Safety organisation, Safety committees and meetings

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

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

d. Personal Protective Equipment.

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

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

e. Material Handling

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

f. Vehicle/Machinery Documents and other safety requirements

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

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

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

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

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

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

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

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

Note:

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

h. Excavation

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

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

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

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

i. Bar bending and Binding

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

j. Concreting

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

k. Welding, Gas Cutting & other hot works

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

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

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

l. Erection & Height Work

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

m. Electrical Safety

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

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

n. Dust Gases and fumes

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

o. Vehicular Traffic

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

p. Barricading and floor openings

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

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

q. Scaffold & Ladder

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

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

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

r. Illumination

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

s. Safety banners/posters, caution boards

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

t. Waste management and disposal

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

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

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

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

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

v. Cable Laying

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

w. Fire Protection

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

x. Fencing of exposed rotating parts

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

y. Emergency preparedness response plan and periodic mock drills.

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

z. Safety reports & Reporting of accidents

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

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

6. General conditions and penalty clauses

Following are the general conditions:

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

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

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

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

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

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

Monitory penalty will be

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

Revision History

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

-:End of Document:-

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS GROUP,

NEW DELHI

CONDITIONS OF CONTRACT

FOR

ERECTION WORKS

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

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SECTION- A

GENERAL INSTRUCTIONS TO TENDERERS

SECTION - A

GENERAL INSTRUCTIONS AND INFORMATION FOR TENDERER

A.1.0 : PROCEDURE FOR SUBMISSION OF SEALED TENDERS

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

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

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

A.2.0 : PROCEDURE FOR EVALUATION OF PRICE BID

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

A.3.0

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

A.4.0

A.5.0

A.6.0

A.7.0

A.8.0

A.9.0

A.10.0

A.11.0

A.12.0

A.12.1

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

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

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

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

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

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

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

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

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

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

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

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

A.13.0 EARNEST MONEY DEPOSIT

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

A.13.2

A.13.3

A.13.4

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

A.13.6

A.13.7

A.13.8

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

A.14.0 **AUTHORISATION AND ATTESTATION:**

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

A.15.0 **VALIDITY OF OFFER:**

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

A.16.0 **EXECUTION OF CONTRACT :**

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

A.17.0 **SECURITY DEPOSIT:**

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

e)

f)

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

g)

h)

i)

j)

k)

l)

Note

A.17.2

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

A.17.3

A.17.4

A.17.5

A.17.6

A.17.7

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

.

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

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

A.19.2

A.19.3

A.19.4

A.19.5

A.19.6

A.19.7

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

A.19.8

A.19.9

A.19.10

A.19.11

A.19.12

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

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

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

ANNEXURE - A

DETAILS OF WORK EXECUTED / BEING EXECUTED

A) WORK EXECUTED

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

B) WORK BEING EXECUTED

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - B

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

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

(B) MONTH WISE MANPOWER DEPLOYMENT PLAN

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

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

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - C

(A) STATUS OF TOOLS, PLANTS & INSTRUMENTS

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

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

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - D

ANALYSIS OF UNIT RATE

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE -E

DECLARATION SHEET

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - F

CHECKLIST & SCHEDULE OF GENERAL PARTICULARS

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

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

Date .....

(SIGNATURE OF TENDERER)
WITH STAMP

WITNESS : (Signature with full particulars)

1.
2.

ANNEXURE - H

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

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

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

   AND

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

For and on Behalf of
(FIRST PARTY)

WITNESS (WITH ADDRESS)

For and on Behalf of
(SECOND PARTY)

1.
2.

ANNEXURE - I

MODEL FORM OF BANK GUARANTEE (FOR SECURITY DEPOSIT)

1.

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

2.

b)

c)

5.

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

6.

7.

NOTE

ANNEXURE - J

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

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

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

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

4. And whereas the SELLER / CONTRACTOR have approached ..... Bank Limited (hereinafter referred to as the GUARANTOR) and at their request and in consideration of the arrangement arrived at between the CONTRACTOR and the GUARANTOR, the GUARANTOR has agreed to give the Guarantee as hereinafter mentioned in favour of the COMPANY.

NOW THIS DEED WITNESSES AS FOLLOWS:

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

6. The COMPANY shall have the fullest liberty without effecting in any way the liability of the GUARANTOR under this guarantee, from time to time to vary any of the terms and conditions of the CONTRACT or extend time by the SELLER / CONTRACTOR or to postpone for any time and from time to time any of the powers exercisable by its against the SELLER / CONTRACTOR and either to enforce or forbear from enforcing any of terms and conditions governing the CONTRACT or securities available to the COMPANY and the GUARANTOR shall not be released from its liability under these presents by any exercise by the COMPANY of the liberty with reference to the matters aforesaid or by reason of time being given to the SELLER or any other forbearance, act or omission on the part of the COMPANY or any indulgence by the COMPANY to the SELLER / CONTRACTOR or of any other matter or thing whatsoever which under the law relating to sureties, would but for this provision have the effect of so releasing the GUARANTOR / CONTRACTOR from its liability under this Guarantee.

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

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

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

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

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

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

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

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

SIGNED FOR AND ON BEHALF OF THE BANK

WITNESS:

NAME AND ADDRESS **SIGNATURE**

1.

2.

ANNEXURE - K

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

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

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE -L

(On Bank's Letter Head)

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

Ref & Date

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

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

The signatures to the Bank Guarantee are duly authorised.

Thanking you,

For & On behalf of
Name of the Bank & Seal

(Please Sign here)

SECTION-B

GENERAL TERMS AND CONDITIONS

SECTION - B

GENERAL TERMS AND CONDITIONS

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

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

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

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

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

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

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

B.1.7 "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the agreement, the work order, the accepted appendices of rates, Schedules of Quantities, if any, General Terms and Conditions of Contract, Special Conditions of Contract, Instructions to Tenderer, the drawings, the Technical Specifications, the Special Specifications, if any, the tender documents and the Letter of Intent\Accepting Letter issued by BHEL. Any conditions or terms stipulated by the tenderer in the tender documents or subsequent letters shall not form part of the Contract unless specifically accepted in writing by BHEL in the Letter of Intent and incorporated in the Agreement.

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

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

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

B.1.11 "LETTER OF INTENT" shall mean the intimation by a letter/telegram/telex/ fax to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all the terms and conditions of contract are applicable from this date.

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

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

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

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

B.1.16 “TESTS" shall mean and include such test or tests to be carried out by the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contracted work or part thereof.

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

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

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

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

B.1.21 "MONTH" shall mean calendar month.

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

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

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

B.3.0 **ISSUE OF NOTICE**:

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

B.4.0 **USE OF LAND:**

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

B.5.0 **COMMENCEMENT OF WORK:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B.7.0 **RIGHTS OF BHEL:**

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

B.7.2

B.7.3

B.7.4

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

B.7.6

B.7.7

B.7.8

B.7.9

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

B.7.10

B.7.11

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

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

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

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

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

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

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

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

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

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

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

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

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

B.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it shall be the responsibility of the contractor to make good the losses or compensate them.

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

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

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

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

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

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

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

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

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

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

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

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

B.8.23 The contractor shall keep the area of work clean and shall remove debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of works, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.

B.8.24 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/or as per instructions of the Engineers.

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

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

B.9.1 All safety rules and codes applied by BHEL/its customer at site shall be observed by the contractor and his workmen without exception. The contractor shall be responsible for the safety of the equipment/materials and work to be performed by him and shall maintain all lights, fencing guards, signs etc. or other protections necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer, with a view to prevent pilferage, accidents, fire hazards etc. and suitable number of clerical staff, watch and ward, store keepers to take care of equipment, materials and construction tools and tackles shall be posted at site by the contractor till the completion of the work under this contract. The contractor shall arrange for such safety devices as are necessary for this type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per usual standards and practices.

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

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

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

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

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

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

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

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

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

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

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

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

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

B.9.8 In case of a fatal or disabling injury/accident to any person at construction sites pertaining to this work, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor & recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

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

B.9.10 In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay

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

B.9.11 If contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding

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

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

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

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

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

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

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

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

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

B.9.19 If safety record of the contractor in execution of the awarded job is to the satisfaction of Safety Department of BHEL, issue of an appropriate certificate to recognise the safety performance of the contractor may be considered by BHEL after completion of the job.

B.10.0 **CONSEQUENCES OF CANCELLATION:**

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

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

B.11.0 **INSURANCE:**

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

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

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

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

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

B.12.0 **STRIKES & LOCKOUTS:**

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

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

B.13.0 **FORCE MAJEURE:**

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

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

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

B.14.0 **GUARANTEE:**

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

B.15.0 **ARBITRATION:**

B.15.1

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

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

NOTE:

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

B.16.0 **VARIATIONS AND VALUATIONS:**

B.16.1 **QUANTITIES:**

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

B.16.2 **VARIATIONS:**

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

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

b) Omit any such work.

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

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

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

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

B.16.3 **VALUATION OF VARIATIONS:**

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

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

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

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

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ANNEXURE - M

PROGRAMME OF WORK

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

(SIGNATURE OF TENDERER)
WITH STAMP

ANNEXURE - N

LIST OF TEST EQUIPMENTS TO BE ARRANGED BY ETC CONTRACTOR

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

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

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

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

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

H. **Safety / protective means**

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

I. **For PLCC Equipment:**

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

c) 200Hz to 620KHz Selective level meter.

d) 200Hz to 620KHz Selective level generator.

Note:

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

ANNEXURE - P

ACTIVITIES FOR TESTING AND COMMISSIONING BY ETC CONTRACTOR

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

NOTES :-

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

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

ANNEXURE - Q

LIST OF TOOLS & TACKLES TO BE ARRANGED BY CONTRACTOR

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

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

IMPORTANT NOTE:

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

SECTION-C

SPECIAL CONDITIONS OF CONTRACT

SECTION - C

SPECIAL CONDITIONS OF THE CONTRACT

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

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

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

C.1.3 The Contractor will have following certificates.

a) Contractor electrical licence.

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

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

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

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

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

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

C.2.1

C.2.2

C.2.3

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

C.2.4

C.2.5

C.2.6

C.2.7

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

C.2.8

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

C.3.0 **SECURITY DEPOSIT:**

C.3.1

C.3.2

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

C.3.3

C.3.4

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

The contractor should refer the clause A.17.7.

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

C.4.0 **PERFORMANCE GUARANTEE:**

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

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

C.5.1

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

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

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

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

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

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

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

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

C.8.0 **TESTING AND COMMISSIONING:**

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

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

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

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

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

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

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

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

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

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

C.9.0 **COMPLETION OF CONTRACT:**

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

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

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

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

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

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

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

C.11.0 **ADDITIONAL EXPENDITURE:**

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

C.12.0 **SPLITTING THE WORK:**

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

C.13.0 **SUPPLY OF MATERIAL:**

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

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

C.14.0 **ELECTRICITY AND WATER:**

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

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

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

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

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

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

C.15.0 **INSURANCE :**

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

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

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

C.17.0 **OVERRUN CHARGES:**

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

C.18.0 **CONSTRUCTION SCHEDULE:**

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

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

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

C.20.0 **CALIBRATED TEST INSTRUMENTS:**

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

C.21.0 Contractor should maintain moisture free store.

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

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

C.22.0 **PROTECTION OF WORK :**

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

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

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

C.23.0 **SAFETY MEASURES :**

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

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

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

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

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

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

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

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

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

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

C.28.0 **WORKING HOURS:**

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

C.29.0 **DIVISION OF WORK:**

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

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

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

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

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

C.31.0 DISCREPANCIES AND ADJUSTMENT OF ERRORS

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

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

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

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

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

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

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

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

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

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

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

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SECTION-D

ERECTION CONDITIONS OF CONTRACT

SECTION - D

ERECTION CONDITIONS OF CONTRACT

D.1.0 **GENERAL:**

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

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

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

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

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

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

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

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

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

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

D.5.0 ACCESS TO SITE AND WORKS ON SITE :

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

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

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

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

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

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

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

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

D.8.0 **DISCIPLINE OF WORKMEN:**

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

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

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

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

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

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

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

D.11.0 **MANPOWER REPORT:**

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

D.12.0 **PROTECTION OF WORK:**

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

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

D.13.0 **EMPLOYMENT OF LABOUR:**

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

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

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

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

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

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

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

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

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

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

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

D.15.2 **COMMUNICATION:**

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

D.15.3 **FIRST AID:**

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

D.15.4 **CLEANLINESS:**

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

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

D.16.0 **LINES AND GRADES:**

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

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

D.17.0 **FIRE PROTECTION:**

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

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

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

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

D.18.0 **SECURITY:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D.23.0 **CONSTRUCTION AND ARRANGEMENTS:**

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

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

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

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

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

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

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

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

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

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

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

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

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

D.27.0 **PAINTING:**

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

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

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

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

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

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

D.29.3 Where it is necessary to provide and/or store petroleum products or petroleum mixtures & explosive, the contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act,1934. Explosively Act,1948 and petroleum and carbide of calcium manual published by the Chief Inspector Of Explosive of India. All such storage shall have prior approval of BHEL in case any approval are necessary from the Chief Inspector of Explosive of any statutory authorities, the contractor shall be responsible for obtaining the same.

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

D.30.0 **ELECTRICAL SAFETY REGULATIONS:**

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

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

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

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

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

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

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

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

D.31.0 **CONSUMABLES:**

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

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

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

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

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

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

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

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SECTION – E

SCOPE OF WORK AND COMPLETION SCHEDULE

SECTION - E

SCOPE OF WORK AND COMPLETION SCHEDULE

E.1.0 **SCOPE OF WORK :**

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

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

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

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

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

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

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

Temporary lighting in stores & construction area wherever required.

Safety / Security of equipments / materials.

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

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

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

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

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

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

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

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

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

All Equipment fixing hardware shall be arranged by BHEL.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

E.6.0 **PREPARATION FOR COMMISSIONING:**

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

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

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

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

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

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

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

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

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

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

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

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

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

E.7.0 **MINOR CIVIL WORK:**

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

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

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

E.8.0 **PRICE SCHEDULE**

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

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

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

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

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

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

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

E.10.0 **SCHEDULE OF EQUIPMENT:**

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

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 Cl no. 2 to Cl no. 4 of the Notice inviting tender.

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

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

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

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

A.2.6 Tenderer must fill up all the schedules and furnish all the required information as per the instructions given in various sections of the tender specification. Each and every page of the Tender Specification must be SIGNED AND SUBMITTED ALONG WITH THE OFFER by the Tenderer in token of complete acceptance thereof the information furnished shall be complete by itself.

A.2.7 The tenderer shall quote the rates in English Language and international numerals. Total price offered should be entered in figures as well as in words. For the purpose of the tender, the metric system of units shall be used.

A.2.8 T**he tenderer shall quote a percentage above/ below/At Par the rates shown in the "Bill of Quantities Cum Price Schedule (Annexure-I)" of subject tender.**

A.2.9 **The quoted percentage will apply to the individual items of "Annexure-I i.e Bill of Quantity Cum Price Schedule" uniformly.**

A.2.10 All entries in the tender shall either be typed or be written legibly in ink. Erasing and overwriting are not permitted and may render such tender liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

A.2.11 The tenderer must provide the registered e-mail of their registered office along with the addresses and authorised phone/mobile nos.

A.3.0 <u>ADJUSTMENT PRICE DISCREPANCY (IES): - Not Applicable being e procurement.</u>

A.4.0 <u>EVALUATION OF TECHNICAL BIDS</u>

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

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

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

6.6 Offer forwarding letter over the letterhead

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

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

6.9 GST Registration certificate

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

A.7.0 VALIDITY OF OFFER

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

A.8.0 REJECTION OF TENDER & OTHER CONDITIONS:

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

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

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

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

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

8.2 Conditional tenders, unsolicited tenders, containing abnormally low/ unworkable rates & amounts, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc. are liable to be rejected.

8.3. Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold / banning / delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry / Commissions of Govt. of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule in line with 'NIT'. The decision of BHEL will be final in this regard.

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

8.5 Offers with inadequate Tools & Plants, Manpower Deployment Plan, and Method Statement are liable for rejection.

8.6 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at its discretion, cancel such tender. If a partner of a firm expires after the submission of the tender or after the acceptance of the tender, BHEL may cancel such tender at its discretion unless the firm retains its character.

8.7 BHEL will not be bound by any Power of Attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. BHEL may, however, recognise such Power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

8.8 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract, if awarded, and forfeit the Earnest Money/Security Deposit/any other moneys due.

8.9 Canvassing in any form in connection with the tender is strictly prohibited and the tenders submitted by the tenderer who resorts to canvassing are liable to be rejected.

8.10 In case the Proprietor, Partner or Director of the Company / Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting tender shall be informed to the fact as per specified format along with the offer, failing this, BHEL may, at its sole discretion reject the tender or cancel the contract and forfeit the Earnest Money/ Security Deposit.

8.11 The successful tenderer should not sub-contract the part or complete work detailed in the tender specifications without written permission of BHEL's Site In charge/ Sector Head. For this the contractor shall submit request application to site in charge supported by credentials (financial and technical) and resource mobilisation schedule of such sub-contractor. Such request is to be considered in consultation with end user/ultimate customer (if applicable) and subject to satisfactory credentials, fund flow arrangement between them, HSE and other contractual and statutory obligations. The tenderer is solely responsible to BHEL for the work awarded to him.

8.12 The Tender submitted by a tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and

late tenders shall be returned to the bidders.

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

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

A.9.0 NO DEVIATIONS ARE ACCEPTABLE: -

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

A.10.0 Consortium**/** JV bidding is not allowed under this NIT. Please refer the Pre-Qualifying requirement for details terms & conditions in case of Consortium/JV bidding

B. EARNEST MONEY DEPOSIT

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

a. 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

In addition to above, the EMD amount in excess of Rs Two lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.

For example: In case the EMD amount is Rs. 20,00,000/- and bidder want to submit EMD in form of BG then amount of Rs. 2,00,000/- atleast to be submitted in the form of modes mentioned in sl. No. i) to v) above and BG for balance Rs. 18,00,000/- can be submitted.

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

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

b. **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.

c. 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.

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

e. EMD shall not carry any interest.

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

g. 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.

h. **No MSE benefits shall be given to MSEs bidder for WORKS CONTRACT. Please refer clause no. P (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.

a. 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.**

b. Mode of Security deposit:
The security Deposit should be furnished **before start of the work** by the contractor.

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

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

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

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

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

iii) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats enclosed with general conditions of contract.

iv) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL and duly discharged on the back.

v) Securities available from Indian Post Offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed/hypothecated/pledged, as applicable, in favour of BHEL and duly discharged on the back).

vi) Insurance Surety Bonds

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

c. 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.

d. 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).

e. 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.

f. 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.

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

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

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

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

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

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

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

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

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

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

h. **RETURN OF SECURITY DEPOSIT:**

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

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

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

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

E. <u>Payment terms:</u> Clause No. C.2.0 stands deleted. Now this clause shall be read as below. (BOQ items are categorized for payment purpose only.)

1. **For BOQ items - Complete scope of work (Category-A): Item:**

<u>Category-A BOQ items</u> Nos: 1-31, 34-41, 44-109, 111-113, 115-155, 176-194, 208-214 & 230-232.

1.1. 10% of the contract item price on the monthly progressive bills on pro rata basis for receipt, material including, 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.

1.2. 60% of the contract item price on the monthly progressive bills on pro rata basis after arranging necessary calibrated tools/tackles required for erection, submitting calibration reports, qualification/experience certificates of welder/Electrician/other staff, levelling, alignment, tightening and completion of erection including maintaining proper records of installation in FQPs and as certified by BHEL, Engineer.

1.3. 10% of the contract item price on the monthly progressive bills on pro rata basis on arranging calibrated testing equipment, submission of calibration reports, testing of equipment including maintaining proper records of testing in FQPs and as certified by BHEL, Engineer. BOQ items, which are not required to be tested as per FQP, shall be qualified for release of payment on prorate basis after completion of testing of all equipment's of corresponding bay (As per SLD/ layout)

1.4. 10% of the contract item price after completion of satisfactory commissioning and submission of complete records of erection/testing/commissioning /charging protocol as per FQPs for the corresponding bay.

1.5. 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.

2. For BOQ items: - (Supply in contractor's scope) (Category-B)

Category-B BOQ items are: - 32-33, 42-43, 110, 114, 156-175, 195-207, 215-229, 233-234, 240 & 243-245.

2.1. 80% of the contract item price on the monthly progressive bills on prorate basis after supply, receipt of the material at site, unloading, proper storage and as certified by site in charge.

2.2. 10% of the contract item price on the monthly progressive bills on prorate basis after material erection as certified by BHEL site In-charge on prorate basis after erection.

2.3. Last 10% payment shall be released as per E.1.5 above.

3. For BOQ items: - (Only For unloading & storage) (Category-C) – Applicable for Spares

Category-C BOQ items are: - 237-239 & 241-242

3.1. 30% of the contract item price on the monthly progressive bills on prorate basis after receipt of the material at site, unloading, proper storage and as certified by site in charge.

3.2. 60% of the contract item price on the monthly progressive bills on prorate basis after handing over to Customer and as certified by BHEL site In-charge.

3.3. Last 10% payment shall be released as per E.1.5 above.

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

Category-D BOQ items are: - 235 & 236

4.1. 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 in-charge of BHEL.

F. Overall Quantity variation-

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

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

G. OVER RUN COMPENSATION: -- 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:

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.

(vi) 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.

PVC/ ORC shall be governed by respective clauses in the NIT.

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. 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."

Guidelines for settlement of claims for compensation on accidents

The amount of compensation paid by BHEL under its guidelines on Settlement of claims for compensation on accidents as applicable for BHEL, **i.e. Rs.10,00,000/- (Rs Ten Lakh) in the event of death or permanent disability resulting from Loss of both limbs and ` 7,00,000/-(Rs Seven Lakh) in the event of permanent disability:** shall be recoverable in full from the contractor, agency or firm, if the accident is attributable to negligence of contractor, agency or firm or any of its employees, except in case of work/ service contract etc. being of less than Rs. 5,00,000/- value, in which case the entire amount of compensation shall be borne by BHEL.

M. 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

M.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 LD clause no. C-25.0 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

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

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

ii) Let the value of executed work till the time of termination of contract= X

iii) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y

iv) Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1

v) LD shall be calculated in line with LD clause (clause 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 'Breach of Contract' is established, amount equivalent to 10% of contract value shall be recovered by BHEL due to breach of contract by the subcontractor. This is without prejudice to BHEL's right to levy of liquidated damages, debarment etc. which shall be applied as per the 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.

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 months

In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedies under Clause 2.2. 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.

N. <u>FORCE MAJEURE:</u>

The following shall amount to force majeure conditions:

P.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.

P.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.

O. The Clause No. B.15.0 "Arbitration" of Conditions of contract for ETC works stands deleted. Now the modified clause shall be read as below:

Except as provide elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the contract; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL Unit/Region/Division issuing the Contract.

The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be New Delhi.

The cost of arbitration shall be borne as per the award of the Arbitrator.

Subject to the arbitration in terms of clause L above, the court at New Delhi shall have exclusive jurisdiction over nay matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this contract with due diligence and expedition in a professional manner except where the contract has been terminated by either Party in terms of this contract.

In the event of dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE OM No.4(1)/2013-DPE9GM)/FTS-1835 dated 22.05.2018.

P. 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.**

Q. <u>Conflict of Interest among bidders/Agents</u>: -

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

a) they have controlling partner (s) in common; **or**
b) they receive or have received any direct or indirect subsidy/ financial stake from any of them; **or**
c) they have the same legal representative/agent for purposes of this bid; **or**
d) they have relationship with each other, directly or through common third parties, <u>that puts them in a position to have access to information about or influence on the bid of another Bidder</u>; **or**
e) Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. <u>However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid</u>; **or**

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

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. "

R. SPECIAL TERMS:

i. **Project License:**

All electrical jobs shall be carried out only through contractors possessing valid project licenses from Odisha State.

ii. **HT/EHT license**:

HT/EHT license issued by the State Govt. Authority available with the Contractor is sufficient for the purpose of participation in the subject tender. In case the HT/EHT license is not from the ELBO Odisha, Contractor license for execution of works to be obtained from the office of the EIC-CUM-PCEI, Odisha. However, the contractor should furnish the documents as a proof to BHEL/OPTCL, that they have applied to the issuing authority for issuing of Contractor license within thirty (30) days from the issue of LOI. In case the Contractor License application is not furnished within 30 days from the issue of LOI, BHEL/OPTCL have the right to cancel the LOI.

S. <u>PERFORMANCE MONITORING</u>:

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.

T. <u>MEASUREMENT OF WORK AND MODE OF PAYMENT:</u>

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.

U. <u>NO INTEREST PAYABLE TO CONTRACTOR:</u>

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.

V. PROGRESSIVE PAYMENT/ FINAL PAYMENT:

1. Running Account Bills (RA Bills)

a) 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).

b) 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.

c) Recoveries on account of electricity, water, statutory deductions etc. are made as per terms of contract.

d) 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.

e) 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.

f) Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract

g) Release of payment in each running bill including ORC Bills where ever applicable will be as per stages of progressive pro rata payments.

h) 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.

i) All documents like HR Clearance, Quality and Safety Compliances etc. required for processing the RA Bills should be submitted along with RA Bills.

j) 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.

k) For MSMEs, at the time of submission of first RA bill, the subcontractor has to declare whether it is registered on RXIL portal and wishes to receive the proceeds through RXIL portal throughout the contract duration.

Note: BHEL may also choose to release payment by other alternative modes as applicable.

2. Documents required for RA Bill:

a. GST Complied Invoice of the work done as per approved BOQ.

b. Jointly signed Measurement sheet, Abstract (for civil works), WAM -6 for RA Bill.

c. Valid Bank Guarantees as applicable under the contract.

d. Labour Payment Certificate

e. copy of valid Workmen Compensation Insurance policy

f. Material Reconciliation statement

g. Test Report of the material as per FQP

h. Royalty challan for material used (for civil works)

i. Power of Attorney for representative signing MBs etc, if not submitted earlier.

j. HR compliance documents (like PF, ESI, Wage sheets etc.)

k. Any other documents as per customer/statutory requirement.

3. 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.

3.1 Documents required for Final Bill:

a. GST Complied Invoice of the work done as per approved BOQ.

b. Jointly signed Measurement sheet, Abstract (for civil works), WAM -7, WAM-10 (if applicable)

c. Valid Bank Guarantees as applicable under the contract.

d. Labour Payment Certificate

e. 'No claim' certificate from the contractor.

f. Deviation statement showing the Executed quantities and quantities as per the contract.

g. copy of valid Workmen Compensation Insurance policy

h. Material Reconciliation statement

i. Submission of As Built Drawings

j. Submission of balance royalty challan/Clearance from Mining dept. (for civil works)

k. Material Reconciliation statement duly approved by BHEL

l. Power of Attorney for representative signing MBs etc, if not submitted earlier.

m. HR compliance documents (like PF, ESI, Wage sheets etc.)

n. Compliance report from BHEL/Customer for completion of punch points

o. Final Delay Analysis.

p. Any other documents as per customer requirement/statutory requirement.

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, New Delhi-110049 through its Unit at BHEL, Transmission Business Group, Noida (name of the Unit) having agreed to exempt _____(Name of the Vendor / Contractor / Supplier) with its registered office at_____[1] (hereinafter called the said "Contractor" which term includes supplier), from demand under the terms and conditions of the Contract reference No._____ dated _____ [2] valued at Rs……[3](Rupees ……) (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs……[4] (Rupees…….....only),

We _____(indicate the name and address of the Bank) having its Head Office at _____(address of the head Office) (hereinafter referred to as the Bank), at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, an amount not exceeding Rs._____without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force up to and including_____[5] and shall be extended from time to time for such period as may be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[6], (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all the liability under this guarantee thereafter.

We, _____ (indicate the name of the Bank) further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner

our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [4]
b) This Guarantee shall be valid up to ……[5]
c) Unless the Bank is served a written claim or demand on or before _____[6] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____

for___(indicate the name of the Bank)__

(Signature of Authorised signatory)

[1] ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .

[2] DETAILS ABOUTTHE NOTICE OF AWARD/CONTRACTREFERENCE

[3] CONTRACT VALUE

[4] BG AMOUNTIN FIGURES AND WORDS

[5] VALIDITY DATE (At least 3 months more than completion period)

[6] DATE OF EXPIRY OF CLAIM PERIOD (At least 3 months more than the present date of validity of BG)

Notes:

1 The expiry of claim period shall be at least 3 months more than the validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.

2 The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

3 In Case of Bank Guarantees submitted by Foreign Vendors:

a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)

b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 will required to be followed.

Form WAM 6

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

Departmental Bill No.

Name of the Contractor — Date:

Name of the Work: — Division: — Sub-Division:

Sanctioned Estimate: — Date of written order to commence the Work: — Period of work covered in this bill:

Code No.: — Date of commencement of work:

Contract Agreement No.: — Dated: — Due date of completion as per agreement

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

I. ACCOUNT OF WORK EXECUTED

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

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

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

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

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

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

Rupees (in words) ..... Only

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

II. MEMORANDUM OF PAYMENTS

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

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

III. CERTIFICATE OF THE ENGINEER IN CHARGE

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

Signature of Contractor

Date:

Signature of Engineer in Charge

Designation:

Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

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

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

*** Here specify the net amount payable.**

Date: **Signature of Senior Engineer**

V. ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Code No.:

Accounts Bill No. ---------- dated ----------

Entered in Journal Book vide entry No. ---------- dated ----------

Passed for ---------- Rs.----------

Less Deductions ---------- Rs.----------

Net amount payable ---------- Rs.----------

(Rupees ---------- only)

Payable to Shri / M/s ---------- by cheque / cash

Entered in Contractors ledger No. ---------- Page ----------

	ALLOCATION	
Estimate No :	Debit	Credit
	(Gross amount)	(Deductions)
Name of Work :		
Account code head		
Total		

Assistant
Date:

Accountant
Date:

Finance Executive
Date:

Form WAM 6 (Contd.)

ANNEXURE A

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

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

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

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE B

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

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

Signature of Contractor
Date :

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date:

Form WAM 6 (Contd.)

ANNEXURE C

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

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

Signature of Contractor
Date :

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date:

ANNEXURE D
DEVIATION STATEMENT

Name of the Contractor:

Contract Agreement No

Name of Work:

Date:

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

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date :

Form WAM 7

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

Departmental Bill No:
Date:
Name of the Contractor: Division: Sub-Division:
Name of the Work: Date of Written order to commence the work:

Sanctioned Estimate: Date of commencement of the Work:
Contract Agreement/ Work Order No: Dated: Due date of completion as per Agreement:
Date of actual completion of the work:

I. ACCOUNT OF WORK EXECUTED

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

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

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

Rupees (in words) ..... Only

Form WAM 7 (Contd.)

II. MEMORANDUM OF PAYMENTS

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

Net value Rupees (in words) ..... Only

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

Signature of the Contractor

Date:

III CERTIFICATE OF THE ENGINEER IN CHARGE

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

Date:

Signature of Engineer incharge

Designation:

Form WAM 7 (Contd.)

IV CERTIFICATE OF THE SENIOR ENGINEER

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

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

***Here specify the net amount payable**

Signature of Senior Engineer

Date

IV ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

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

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

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

Form WAM 7 (Contd.)

ANNEXURE A
Part I

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

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from t he Contractor				
							Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
						Total					

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE A
Part II

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

Sl.No	Stores Issue Voucher No.and Date	Issue Voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11

TOTAL
Add Departmental Charges
Add GST (Wherever applicable)
GRAND TOTAL

Signature of Contractor
Date:

Signature of Engineer-in-Charge
Date:

Signature of Senior Engineer
Date:

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

Form WAM 7 (Contd.)

ANNEXURE B

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

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

Signature of Contractor
Date

Signature of Engineer-in-Charge
Date

Signature of Senior Engineer
Date

ANNEXURE C

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

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

Signature of Contractor
Date

Signature of Engineer in Charge
Date

Signature of Senior Engineer
Date

Form WAM 7 (Contd.)

ANNEXURE D

DEVIATION STATEMENT

Name of the Contractor: Contract Agreement/Work Order No.

Name of the Work: Date:

SL. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Difference		Reason for the deviation with authority, if any
									Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Engineer in Charge Signature of Senior Engineer

Date: Date:

ANNEXURE E

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

Name of the Work:

ON RECOVERY BASIS

SL. No.	Description of material	Unit	Quantity actually issued	Quantity actually incorporated in the work	Balance	Particulars of disposal of balance	Quantity to be issued as per approved data for work actually done	Variation in consumption (difference between colum 5 & 8)		Rate chargeable for excess/short consumption, if any	Amount Recoverable for excess/short consumption, including materials not returned, if any	Remarks
								More	Less			
1	Cement											
2	Bricks											
3	Wood											
4	Asbestos Sheet											
5	Iron Material											
6												
7												

Signature of Contractor Signature of Engineer in Charge Signature of Senior Engineer

Date: Date: Date:

Note

1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 & 6 respectively of Annexure A (Part I and II)
2. Data statement of theoretical consumption should be attached in support of quantity specified in column 8.

Form WAM 7 (Contd.)

ANNEXURE F

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

Name of the Work:

FREE OF COST

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

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE G

QUESTIONNAIRE TO BE ANSWERED BY THE ENGINEER IN CHARGE AND SENIOR ENGINEER

(Correct particulars and answers to be recorded)

1. Name of the Work:
2. Name of the Contractor:
3. Date of commencement of the Work:
4. Contract agreement /Work Order No. and date:
5. Reference to the supplementary Agreement No. if any:
6. Whether administrative approval and technical sanction has been accorded by the competent authority? If so, cite reference?
7. Whether sanction of the competent authority and financial concurrence of the Finance Department for award of the work has been accorded? If so, cite reference.
8. Whether the work has been completed in time? If not whether penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Finance Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter No. and date granting the extension of time should be given).
9. (a) Whether the rates allowed in the bill have been checked with the contract agreement?

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

    (b) If not whether security deposit has been proposed to be recovered from the final bill?
31. Whether all the previous audit objections raised on running account bills have been settled? If so, cite references.

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

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

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:

2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings.

3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.

4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL.

5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.

6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.

7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within

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

8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.

9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.

10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.

11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.

12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.

13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.

14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.

15. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.

16. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.

17. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.

18. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.

19. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.

20. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall

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

21. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.

22. The proceedings of Conciliation under this Scheme may be terminated as follows:
    a. On the date of signing of the Settlement agreement by the Parties; or,
    b. By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,
    c. By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
    d. By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration.
    e. On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

23. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	**Particulars**	**Amount**
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator)

Sl No	Particulars	Amount
		In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator) In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation and stay at outstation i) Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)	As per entitlement of the equivalent officer (pay scale wise) in BHEL.
	Others	As per the extant entitlement of whole time Functional Directors in BHEL.

Sl No	Particulars	Amount
		Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class.
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region / Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

24. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s)on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.

25. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.

26. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.

27. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.

28. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 3 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.

29. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.

30. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
    a. Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
    b. admissions made by the other party in the course of the Conciliator proceedings;
    c. proposals made by the Conciliator;
    d. The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.

31. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

32. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

33. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue

notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.

34. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

Format 2 to BHEL Conciliation Scheme, 2018

FORMAT FOR SEEKING CONSENT FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Sub: Resolution of the Disputes through conciliation by Independent Expert Committee (IEC).

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Sir,

With reference to above referred Contract/MoU/Agreement/LOI/LOA, you have raised certain Disputes/claims. Vide your letter dated____ you have requested BHEL to refer the Disputes/claims to IEC for Conciliation.

We are enclosing herewith Format (3) for giving consent and the terms and conditions of BHEL Conciliation Scheme, 2018 governing conciliation through IEC. You are requested to give your unconditional consent to the said terms and conditions of the Scheme by returning the same duly sealed and signed on each page. On receipt of your consent, matter will be put to the Competent Authority for consideration and decision.

Please note that BHEL has also certain claims against you (if applicable). BHEL reserves its right to agree or not to agree conciliation of the said disputes through BHEL and this letter is being issued without prejudice to BHEL's rights and contentions available under the contract and law.

Yours faithfully,

Representative of BHEL

Format 3 to BHEL Conciliation Scheme, 2018

FORMAT FOR GIVING CONSENT BY CONTRACTOR/VENDOR/CUSTOMER/COLLABORATOR/CONSORTIUM PARTNERSFOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

BHEL

.....

Sub: Resolution of Disputes through Conciliation by Independent Expert Committee (IEC).

Ref: Contract/MoU/Agreement/LOI/LOA No & date____

With reference to above referred contract, our following bills/invoices/claims submitted to BHEL are still unpaid giving rise to Disputes:

SL. no.	Claim Description	Bill submitted to BHEL (no. and date)	Amount of the bill/claim	Amount received from BHEL	Outstanding Amount

Accordingly we request you to kindly refer the Disputes in respect of above claims to IEC for Conciliation.

We hereby agree and give our unconditional consent to the terms and conditions of BHEL Conciliation Scheme, 2018 governing conciliation through IEC. We have signed the same on each page and enclosed it for your consideration.

Yours faithfully,

(Signature with stamp)

Authorized Representative of Contractor
Name, with designation
Date

Format 5 to BHEL Conciliation Scheme, 2018

STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE IEC BY BOTH THE PARTIES

1. Chronology of the Disputes

2. Brief of the Contract/MoU/Agreement/LOI/LOA

3. Brief history of the Disputes:

4. Issues:

5. Details of Clam(s)/Counter Claim(s):

Sl. No.	**Description of claim(s)/Counter Claim**	**Amount (in INR)Or currency applicable in the contract**	**Relevant contract clause**

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– *The Statement of Claims/Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/Counter Claims. The statement of Claims/Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.*

BILL OF QUANTITY CUM PRICE SCHEDULE

Name of Work: Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

Tender REF No.: TBSM/ERSAMA/ETC/TENDER/24-25 DATE: 27.06.2024

SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
1	ETC of 400kV GIS: Busbar modules - three single phase (isolated), SF6 gas-insulated metal enclosed bus bars complete in all respect, but excluding structure work, earthing work and gas work. Installation of Bus Disconnector and Earth Swith for future extension is also included in the busbar module.	2	Set	150708.73	301417.47
2	ETC of 400kV GIS: SF6 gas insulated Bus VT bay module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	98302.82	196605.63
3	ETC of 400kV GIS: Fully equipped SF6 GIS Bus Reactor bay Module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	202947.76	405895.51
4	ETC of 400kV GIS: Fully equipped SF6 GIS Line Bay Module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	234658.33	469316.67
5	ETC of 400kV GIS: Fully equipped SF6 GIS ICT bay Module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	202947.76	405895.51
6	ETC of 400kV GIS: Fully equipped SF6 GIS Tie bay Module complete in all respect, but excluding structure work, earthing work and gas work.	3	Set	234658.33	703975.00
7	ETC of 400kV GIS: Gas Insulated Bus Duct (GIB) - single phase GIS duct from GIS ICT/ Reactor/ Outgoing Line bays to outdoor type SF6 to Air bushing. Work includes complete installation of GIB complete in all respect, but excluding structure, earthing work & gas work.	1400	Meter	1153.11	1614354.39
8	ETC of 400kV GIS: SF6 to Air Bushing (Polymer type) complete in all respect & terminal connector, but excluding earthing work & structure work.	15	Nos.	12684.23	190263.39
9	ETC of 400kV GIS: Local Control Panel (LCC) complete in all respect & associated cabling work between LCC & GIS, but excluding earthing work.	10	Nos.	36899.59	368995.93
10	ETC of 400kV GIS: Structure Work for Installation of GIS including Support Structure for GIS, GIB (bus duct), SF6 to Air Bushings, Supports on floor/ wall, Platforms, Ladders, Foundation Bolts, Embedded Parts in floors etc. complete in all respect, which are required for installation of GIS system as per the specification	45	MT	17267.93	777056.85
11	ETC of 400kV GIS: SF6 Gas Filling/ Recovery/ Re-filling Cycle. The cycle of the gas filling/ recovery/ re-filling will be followed multiple times till the Completion of the HV test. Gas processing and filling unit (SF6 Gas cart) shall be in the scope of BHEL/ GIS manufaturer. Necessary support, such as unloading, shifting, minor assembling, service support, loading, etc., will be provided by the bidder.	18000	Kg	10.60	190864.49
12	ETC of 400kV GIS: HV Test for GIS - HV test kit shall be arranged by GIS Supplier. Test shall also be conducted by GIS supplier. All necessary support i.e. unloading, shifting, minor assembling of HV test kit, support for complete HV Test, dismantling & loading on carrier. Complete in all respect.	1	Lot	197500.50	197500.50
13	ETC of 400kV GIS: Grounding/ Earthing for GIS complete including Gas Insulated Bus duct, LCC, SF6 to air bushing, using braided Cu wire (insulated/ non-insulated)/ earth strip (Cu/Al/GI flat). Work includes cutting, lug crimping , bolting , fixing etc. and connecting with riser/earth strip (GI/AL /Cu flat) complete in all respect. Grounding Material will be supplied by GIS Supplier /BHEL.	300	Meter	35.38	10612.51
14	ETC of Online Continuous Partial Discharge Monitoring System (OPDM) with all necessary accessories & auxiliaries complete in all respect for 400kV & 220kV GIS. Unloading, storage, ETC work of all necessary accessories & auxiliaries, installation of PD sensors/PD Monitoring Junction Boxes/OCU/ RDC panels/ RCC panels/Workstation PC including OFC/LAN cabling work including tray/ties & handing over of equipment to Customer is included in scope.	1	Lot	236000.00	236000.00
15	ETC of 220kV GIS: Busbar modules - three single phase (isolated), SF6 gas-insulated metal enclosed bus bars complete in all respect, but excluding structure work, earthing work and gas work. Installation of Bus Disconnector and Earth Swith for future extension is also included in the busbar module.	2	Set	93895.09	187790.18
16	ETC of 220kV GIS: SF6 gas insulated Bus VT bay module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	46947.54	93895.09
17	ETC of 220kV GIS: Fully equipped SF6 GIS Bus Coupler bay Module complete in all respect, but excluding structure work, earthing work and gas work.	1	Set	124596.71	124596.71
18	ETC of 220kV GIS: Fully equipped SF6 GIS Line bay Module complete in all respect, , but excluding structure work, earthing work and gas work.	4	Set	121145.63	484582.52
19	ETC of 220kV GIS: Fully equipped SF6 GIS ICT bay Module complete in all respect, but excluding structure work, earthing work and gas work.	2	Set	103890.26	207780.53
20	ETC of 220kV GIS: Gas Insulated Bus Duct (GIB) - single phase GIS duct from GIS ICT/Outgoing Lines bays to outdoor type SF6 to Air bushing. Work includes complete installation of GIB complete in all respect, but excluding structure earthing work and gas work.	1200	Meter	627.48	752970.38
21	ETC of 220kV GIS: SF6 to Air Bushing (Polymer type) complete in all respect & terminal connector, but excluding structure & earthing work.	18	Nos.	6902.16	124238.92
22	ETC of 220kV GIS: Local Control Panel (LCC) complete in all respect & associated cabling work between LCC & GIS, but excluding earthing work.	7	Nos.	16544.11	115808.75
23	ETC of 220kV GIS: Structure Work for Installation of GIS including Support Structure for GIS, GIB (bus duct), SF6 to Air Bushings, Supports, Platforms, Ladders, Foundation Bolts, Embedded Parts in floors etc. complete in all respect, which are required for installation of GIS system as per the specification	30	MT	17267.93	518037.90
24	ETC of 220kV GIS: SF6 Gas Filling/ Recovery/ Re-filling Cycle. The cycle of the gas filling/ recovery/ re-filling will be followed multiple times till the Completion of the HV test. Gas processing and filling unit (SF6 Gas cart) shall be in the scope of BHEL/ GIS manufaturer. Necessary support, such as unloading, shifting, minor assembling, service support, loading, etc., will be provided by the bidder.	5000	Kg	10.60	53017.91
25	ETC of 220kV GIS: HV Test for GIS - HV test kit shall be arranged by GIS Supplier. Test shall also be conducted by GIS supplier. All necessary support i.e. unloading, shifting, minor assembling of HV test kit, support for complete HV Test, dismantling & loading on carrier. Complete in all respect.	1	Lot	141184.68	141184.68
26	ETC of 220kV GIS: Grounding/ Earthing for GIS complete including Gas Insulated Bus duct, LCC, SF6 to air bushing, using braided Cu wire (insulated/ non-insulated)/ earth strip (Cu/Al/GI flat). Work includes cutting, lug crimping , bolting , fixing etc. and connecting with riser/earth strip (GI/AL /Cu flat) complete in all respect. Grounding Material will be supplied by GIS Supplier /BHEL.	200	Meter	35.38	7075.01
27	ETC of 400/220/33kV, 500MVA, 3-Ph ICT (Inter Connecting Transformer) complete in all respect alongwith its Radiator Bank and its cooling arrangement with A frame, conservator, cooler control cabinet/ marshalling box, other accessories and insulating oil etc. Work includes erection of all auxiliaries such as turrets, bushings, terminal connectors, associated earthing works including neutral connection (excluding riser connections to main earthmat), laying of cable from Transformer auxiliaries to MK, Oil filtration, filling of oil, hot oil circulation, oil testing etc as required to complete the installation of ICT as per OEM recommendations. Supervision of unloading, erection, testing and commissioning shall be done by OEM/ manufacturer. Work shall include arrangement of all required T&P for E&C works including storage Tank and its placement for filtration (of required capacity of Reactor), Dry air Generator / Cylinder of Dew oint -60 or better , Filter Machine of required capcity with 0.3 µ filters and arrangement of Pre-erection testing of Turrets and Bushing carrying out erection of all auxiliaries viz turrets, Bushings, terminal connectors, associated earthing works (excluding riser connections to main earthmat), laying of cable from ICT auxiliaries to IMB , Oil filtration, filling of oil, hot oil circulation, Oil testing including fine filtration and particle count etc as required to complete the erection & commissioning of ICT. All required electrical and oil testing during different stage of E&C works of ICT along with post charging vibration masurement are deemed to be covered in this line item. (1 Set= Complete work for 1 ICT) Note:- 1. Charges for dry out cycle, oil filtration, filling of oil, hot oil circulation etc for first time readiness for commissioning of ICT are deemed to included in item, however, unloading of ICT tank main body and testing of drum oil is excluded in this scope. 2. All the actvities are to be done in full compliance with OEM/ manufacturer recommendations/ procedure.	2	Set	1744642.68	3489285.37
28	Unloading of ICT Tank (main body)	2	Nos.	174464.27	348928.54
29	Dragging/ shifting charges of above mentioned ICT (1 set) on ground, upto rail cum road / jacking pad (Applicable, if ICT is not unloaded on Jacking pad area)	150	Meter	3657.32	548598.72
30	Dragging / shifting charges of above mentioned ICT (1 set) on rail cum road	60	Meter	3657.32	219439.49
31	Dryout cycle for ICT by N2/Dry air filling/ vaccuming/ purging and heating, if required as per OEM standard recommendation/ procedure complete in all respect excluding supply N2 gas/ hot air. (1 Lot= 1 complete dryout cycle for single 3 phase ICT)	2	Lot	193849.19	387698.37
32	Supply of N2 gas in 50kg cylinder on returnable basis as per site requirement	20	Nos.	3603.53	72070.52
33	Supply of dry air in 50kg cylinder on returnable basis as per site requirement	20	Nos.	3603.53	72070.52
34	Insulating oil testing including (BDV, ppm, Resistivity, IFT & Tan delta etc for oil supplied in drums (1set means all test required as per OEM/ FQP/ requirements)	10	set	3192.90	31929.03
35	ETC of Online insulating oil drying system (1set= Complete system for 1 ICT)	2	Set	30000.00	60000.00
36	ETC of Online dissolved gas (multi gas) & moisture analyser (1set= Complete system for 1 ICT)	2	Set	20000.00	40000.00

BILL OF QUANTITY CUM PRICE SCHEDULE

Name of Work: Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

Tender REF No.: TBSM/ERSAMA/ETC/TENDER/24-25 DATE: 27.06.2024

SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
37	ETC of 400kV, 125MVAr Bus Reactor with complete in all respect alongwith its MB Box, Radiator Bank and its cooling arrangement with A frame, conservator, cooler control cabinet/ marshalling kiosk, other accessories and insulating oil etc. Work includes erection of all auxiliaries such as turrets, bushings, terminal connectors, associated earthing works including neutral connection (excluding riser connections to main earthmat), laying of cable from Transformer auxiliaries to MK, Oil filtration, filling of oil, hot oil circulation, oil testing etc as required to complete the installation of Reactor as per OEM recommendations. Supervision of unloading, erection, testing and commissioning shall be done by OEM/ manufacturer. work shall include arrangement of all required T&P for E&C works including storage Tank and its placement for filtration (of required capacity of Reactor), Dry air Generator / Cylinder of Dew oint -60 or better , Filter Machine of required capcity with 0.3 µ filters and arrangement of Pre-erection testing of Turrets and Bushing carrying out erection of all auxiliaries viz turrets, Bushings, terminal connectors, associated earthing works (excluding riser connections to main earthmat), laying of cable from Reactor auxiliaries to IMB , Oil filtration, filling of oil, hot oil circulation, Oil testing including fine filtration and particle count etc as required to complete the erection & commissioning of line reactor. All required electrical and oil testing during different stage of E&C works of Reactor along with post charging vibration masurement are deemed to be covered in this line item. (1 Set= Complete work for 1 Reactor) Note:- 1. Charges for dry out cycle, oil filtration, filling of oil, hot oil circulation etc for first time readiness for commissioning of Reactor are deemed to included in item, however, unloading of Reactor tank main body and testing of drum oil is excluded in this scope. 2. All the actvities are to be done in full compliance with OEM/ manufacturer recommendations/ procedure.	1	Set	758476.16	758476.16
38	ETC of 400kV, 125MVAr Bus Reactor: Unloading of Reactor Tank (main body)	1	Nos.	84275.13	84275.13
39	ETC of 400kV, 125MVAr Bus Reactor: Dragging/ shifting charges of above mentioned Reactor (1 set) on ground, upto rail cum road / jacking pad (Applicable, if Reactor is not unloaded on Jacking pad area)	150	Meter	2022.01	303300.97
40	Dragging / shifting charges of above mentioned Reactor (1 set) on rail cum road	60	Meter	2022.01	121320.39
41	Dryout cycle for Reactor by N2 (dry air) filling/ vaccuming/ purging and heating, if required as per OEM standard recommendation/ procedure complete in all respect excluding supply N2 gas/ hot air. (1 Lot= 1 complete dryout cycle for single 3 phase Reactor)	1	Lot		0.00
42	Supply of N2 gas in 50kg cylinder on returnable basis as per site requirement	10	Nos.	3603.53	36035.26
43	Supply of dry air in 50kg cylinder on returnable basis as per site requirement	10	Nos.	3603.53	36035.26
44	Insulating oil testing including (BDV, ppm, Resistivity & Tan delta etc for oil supplied in drums (1set means all test required as per OEM/ FQP/ requirements)	10	set	3192.90	31929.03
45	ETC of Online insulating oil drying system (1set= Complete system for 1 Reactor)	2	Set	30000.00	60000.00
46	ETC of Online dissolved gas (multi gas) & moisture analyser (1set= Complete system for 1 Reactor)	2	Set	20000.00	40000.00
47	ETC of 390kV, 1 phase Surge Arrester: 390kV, 1 Phase, gapless type metal oxide polymer housed surge arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connector, but excluding support structure.	15	Nos.	4474.22	67113.26
48	ETC of 216kV, 1 phase Surge Arrester: 216kV, 1 Phase, gapless type metal oxide polymer housed surge arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connector, but excluding support structure.	18	Nos.	3065.91	55186.42
49	ETC of 30kV, Phase Surge Arrester: 30kV, 1 Phase, gapless type metal oxide polymer housed surge arrester complete with surge counter, leakage current meter, insulating base, connecting cable and terminal connector, but excluding support structure.	12	Nos.	1046.23	12554.79
50	ETC of 400kV, 1 phase solid core Bus Post Insulator complete with corona ring & terminal connectors but excluding support structure	21	Nos.	2299.43	48288.12
51	ETC of 220kV, 1 phase solid core Bus Post Insulator complete with corona ring & terminal connectors but excluding support structure	18	Nos.	1839.55	33111.85
52	ETC of 66kV, 1 phase solid core Bus Post Insulator complete with corona ring & terminal connectors but excluding support structure	24	Nos.	1395.86	33500.70
53	ETC of 400kV, 3 phase horizontal double break (HDB) type isolator, three pole electrically ganged individual pole motor operated with one earth switch, along with operating mechanism and other accessories complete in all respect including support insulators and terminal connectors but excluding structure work. Supervision of erection, testing and/ or commissioning from OEM/ manufacturer, if required shall be arranged by BHEL.	5	Set	36761.44	183807.19
54	ETC of 220kV, 3 phase horizontal double break (HDB) type isolator, three pole mechanically ganged, motor operated with one earth switch and other accessories complete in all respect including support insulators and terminal connectors but excluding structure work. Supervision of erection, testing and/ or commissioning from OEM/ manufacturer, if required shall be arranged by BHEL.	6	Set	26891.69	161350.12
55	ETC of 66kV, 3 phase horizontal double break (HDB) type isolator, three pole mechanically ganged, motor operated with one earth switch, along with operating mechanism and other accessories complete in all respect in all respect including support insulators and terminal connectors but excluding structure work. Supervision of erection, testing and/ or commissioning from OEM/ manufacturer, if required shall be arranged by BHEL.	2	Set	5867.94	11735.88
56	ETC of 66kV 3 Phase Circuit Breaker alongwith lattice type GS supporting structure, terminal connectors, mechanism boxes, breaker common control cabinet, ladder, platform and interpole cabling complete in all respects. Supervision of erection, testing and/ or commissioning from OEM/ manufacturer, if required shall be arranged by BHEL. Supplier will bring Timing kit and Gas leak detector only. Necessary manpower support, tools, tackles and testing kit to be in scope of ETC contractor).	2	Set	7041.79	14083.59
57	ETC of 66kV, 1 Phase, Current Transformer with other accessories complete in all respect including terminal connectors but excluding structure work.	12	Nos.	3578.73	42944.71
58	ETC of CT Junction Box outdoor, Pedestal/Trench/ structure mounted	4	Nos.	2000.00	8000.00
59	ETC of 66kV, 1 Phase, Potential Transformer with other accessories complete in all respect including terminal connectors but excluding structure work.	6	Nos.	3226.44	19358.62
60	ETC of VT Junction Box outdoor, Pedestal/ Trench/ structure mounted	2	Nos.	2000.00	4000.00
61	ETC of 1000kVA, 33kV/ 433V Oil filled Station Transformer: Work includes dragging upto/ putting on main foundation , testing & Commissioning etc. Work includes erection of all auxiliaries including bushings, terminal connectors, associated earthing works including neutral connection (excluding riser connections to main earthmat), oil filtration, filling of oil, hot oil circulation, oil testing etc as required to complete the work as per OEM recommendations.	2	Set	21726.71	43453.43
62	ETC of 400kV PLR Insulator with stringing hardware: The work shall include fixing of PLR insulator with its stringing hardware complete in all respect, as per following details, 400kV Double tension porcelain long rod insulator string hardware asembly with insulators complete with all stringing hardware accessories including corona ring and tension clamp suitable for twin ACSR Moose conductor with 450mm sub conductor spacing with/without turn buckle.	18	Set	4060.59	73090.56
63	ETC of 400kV PLR Insulator with stringing hardware: The work shall include fixing of PLR insulator with its stringing hardware complete in all respect, as per following details, 400kV Double suspension porcelain long rod insulator string hardware asembly with insulators complete with all stringing hardware accessories including corona ring and drop/ straight clamp suitable for twin ACSR Moose conductor with 450mm sub conductor spacing.	15	Set	4060.59	60908.80
64	ETC of 220kV PLR Insulator with stringing hardware: The work shall include fixing of PLR insulator with its stringing hardware complete in all respect, as per following details, 220kV Single suspension porcelain long rod insulator string hardware asembly with insulators complete with all stringing hardware accessories including corona ring and drop/ straight clamp suitable for single ACSR Moose conductor.	12	Set	3451.50	41417.98
65	ETC of 220kV PLR Insulator with stringing hardware: The work shall include fixing of PLR insulator with its stringing hardware complete in all respect, as per following details, 220kV Single suspension porcelain long rod insulator string hardware asembly with insulators complete with all stringing hardware accessories including corona ring and drop/ straight clamp suitable for single ACSR Moose conductor with 250mm sub conductor spacing.	1	Set	3451.50	3451.50
66	ETC of Shield wire including tension clamp, PG clamp and clamping on structure for down conductor, fixing/bolting with earth strip etc to complete .	500	Meter	64.22	32111.60
67	ETC of ACSR Moose Conductor complete with Tee connectors for droppers to equipment connections, PG clamps for busbar jumpering, twin/ quad bundle spacers etc to complete in all respect.	3600	Meter	82.55	297192.02
68	ETC of 4.5" Alumnium tube including aluminium welding and bending work, however, welding sleeve and aluminium tube shall be supplied by BHEL.	600	Meter	510.42	306249.39
69	ETC of 415V Main AC Distribution Board	1	Set	77260.99	77260.99

BILL OF QUANTITY CUM PRICE SCHEDULE

Name of Work: Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

Tender REF No.: TBSM/ERSAMA/ETC/TENDER/24-25 DATE: 27.06.2024

SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
70	ETC of 415V AC Distribution Board	1	Set	77260.99	77260.99
71	ETC of 415V Main Lighting Distribution Board (including 2 nos. Lighting transformer)	1	Set	57945.74	57945.74
72	ETC of 415V Emergency Lighting Distribution Board (including 1 no. Lighting transformer)	1	Set	46356.59	46356.59
73	ETC of 220V DC Distribution Board	1	Set	57945.74	57945.74
74	ETC of 48V DC Distribution Board	1	Set	36698.97	36698.97
75	ETC of 415V Outdoor type Kiosk/ Fuse panel (padestal/ trench mounted) for Station / LT Transformer	2	Set	20000.00	40000.00
76	ETC of 48V, 800AH VRLA Type Battery Bank with rack assembly and all accessories complete in all respect including interconnecting cables, connectors etc. Supervision for installation, testing and commissioning shall be provided by OEM/ manufacturer.	2	Set	36698.97	73397.94
77	ETC of 220V DC, 645 AH, Lead Acid Plante Type Battery Bank along with fittings & accessories complete in all respect including interconnecting cables, connectors etc. Supervision for installation, testing and commissioning shall be provided by OEM/ manufacturer.	2	Set	77260.99	154521.97
78	ETC of 220V, 70A Float Charger and 100A Float cum Boost Charger complete in all respects. Supervision for installation, testing and commissioning shall be provided by OEM/ manufacturer.	2	Set	11927.16	23854.33
79	ETC of 48V, 125A SMPS based battery charger complete in all respects. Supervision for installation, testing and commissioning shall be provided by OEM/ manufacturer.	2	Set	7339.79	14679.59
80	ETC of Automatic Battery discharge Load/ Tester (Resistive/ reactive type)	1	Set	5000.00	5000.00
81	ETC of De-mineralised plant of 30 litre/hr for making distilled water for battery bank.	1	Set	5000.00	5000.00
82	ETC of SAS & CRP: 400kV Line (Feeder) Protection Panel with Auto Reclose (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	4	Set	7664.78	30659.12
83	ETC of SAS & CRP: 400/220/33kV, 500MVA Transformer Protection Panel (for HV, IV & Tertiary side) (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	4	Set	7664.78	30659.12
84	ETC of SAS & CRP: 400kV Tie Breaker Protection Panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	3	Set	7664.78	22994.34
85	ETC of SAS & CRP: 400kV, 125MVAR Bus Reactor Protection Panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	4	Set	7664.78	30659.12
86	ETC of SAS & CRP: 400kV Bus Bar Protection Panel including provision for future bays (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	2	Set	7664.78	15329.56
87	ETC of SAS & CRP: 220kV Line (Feeder) Protection Panel with Auto Reclose (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (Including Mounting & Internal wiring of loose-supplied 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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	8	Set	7664.78	61318.24
88	ETC of SAS & CRP: 220kV Bus Coupler Protection Panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (Including Mounting & Internal wiring of loose-supplied 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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	1	Set	7664.78	7664.78
89	ETC of SAS & CRP: 220kV side of 500MVA Transformer bay Circuit Breaker Relay Panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (Including Mounting & Internal wiring of loose-supplied 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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	2	Set	7664.78	15329.56
90	ETC of SAS & CRP: 220kV Bus Bar Protection Panel including provision for future bays (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (Including Mounting & Internal wiring of loose-supplied 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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	1	Set	7664.78	7664.78
91	ETC of SAS & CRP: 33kV Breaker Protection Panel (with BCPU) (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (Including Mounting & Internal wiring of loose-supplied 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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	2	Set	7664.78	15329.56

BILL OF QUANTITY CUM PRICE SCHEDULE

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92	ETC of SAS & CRP: SAS/ Networking panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor) (1 Set = 1 No. of Panel)	2	Set	7664.78	15329.56
93	ETC of SAS & CRP: Station Aux BCU Panel (Approx 800mm Wide) Control and Relay Panels along with Substation Automation System - (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's including 3-ph numerical relay test kit is in scope of ETC contractor)	1	Nos.	7664.78	7664.78
94	ETC of SAS & CRP: Substation Automation System: Time Synchronizing equipment (GPS receiver with 100mm TDU complete in all respects including antenna, all cables, processing equipment etc.)	1	Set	7292.77	7292.77
95	ETC of SAS & CRP: 67 inch or more Large Video Display System with all auxiliaries	1	Set	5000.00	5000.00
96	ETC of SAS & CRP: : Operator Work Station/ Engineering Work Station PC at Control room	3	Nos.	1000.00	3000.00
97	ETC of SAS & CRP: Energy Metering Master Station	1	Nos.	1000.00	1000.00
98	ETC of SAS & CRP: A3/A4 Colour Printer	2	Nos.	1000.00	2000.00
99	ETC of SAS & CRP: Dot Matrix printer	1	Nos.	1000.00	1000.00
100	ETC of SAS & CRP: UPS/ Inverter with Battery Backup	2	Nos.	2000.00	4000.00
101	ETC of SAS & CRP: Large Video Screen	1	Nos.	5000.00	5000.00
102	ETC of SAS & CRP: Laptop with relay parameterisation software (Only Handling and storage)	2	Nos.	1000.00	2000.00
103	ETC of SAS & CRP: Common equipments: Relay Test Kit (Only Handling and storage)	1	Nos.	1000.00	1000.00
104	ETC of SAS & CRP: Handling & installation of furniture required in switchyard control room & Power house control room for OWS, printer, servers etc.	1	Lot	6000.00	6000.00
105	ETC of SAS & CRP: Armoured/ Unarmoured FO cable/ Network Cable along with connectors for SAS/ Busbar Protection/ PLCC/ OLTE Communication. The laying of all network/optical cables shall be in the contractor scope. However, Optical cable will be laid under SAS supplier's supervision. Splicing and Termination shall be in SAS supplier's scope.). FO cable shall be laid in HDPE pipe/ GI Pipe and the same is covered in seperate BOQ item.	2500	Meter	22.65	56628.05
106	ETC of SAS & CRP: Splicing of Armoured FO Cable (1 No. = Splicing of 1 No. Fibre)	20	Nos.	952.22	19044.41
107	ETC of SAS & CRP: Inverter/ UPS of suitable capacity (min 3kVA) for station HMI/ displays and peripheral devices (printer etc.) . The scope of work includes erection, testing & commissioning of Inverter/ UPS	2	Set	3000.00	6000.00
108	ETC of FOTE Equipment panel - Equipment Cabinet For SDH/ Digital Protection Coupler: (Including Mounting & Internal wiring of loose-supplied interface cards and Tributary cards, Common Cards, Cross Connect/Control Cards, Optical Base Cards, Power Supply Cards, Sub-Rack, DDF, MDF(as applicable), patch cord, Termination Equipment Drop Insert Mux fully equipped, Subscriber line interface cards, Joint Boxes, PVC/Hume ducts, telephone receiver, Other Hardware and accessories required for installation of equipment. FOTE Equipment - (Testing and commissioning of FOTE equipment in scope of FOTE supplier; Necessary manpower support for FOTE testing, arranging tools and tackles is in scope of ETC contractor) (1 Set = 1 No. of Panel)	1	Set	8544.17	8544.17
109	ETC of EOW Telephone FOTE Equipment - (Testing and commissioning of FOTE equipment in scope of FOTE supplier; Necessary manpower support for FOTE testing, arranging tools and tackles is in scope of ETC contractor)	2	Nos.	738.94	1477.88
110	Approach Cable (24 fibre) - Laying of Armoured Fibre Optic cable (supply, splicing and termination shall be in scope of OEM, however the Optical cable shall be be laid by ETC contractor) FO cable shall be laid in HDPE pipe/ GI Pipe and the same is covered in seperate BOQ item.	1000	Meter	19.28	19282.86
111	ETC of FODP, Indoor Type, rack mounted with FCPC coupling and pig tails (DWSM Fibre)	2	Nos.	4727.98	9455.96
112	ETC of Digital Protection Coupler Panel (Approx 800mm Wide) (1 Set = 1 No. Panel) FOTE Equipment - (Testing and commissioning of FOTE equipment in scope of FOTE supplier; Necessary manpower support for FOTE testing, arranging tools and tackles is in scope of ETC contractor)	1	Set	7359.60	7359.60
113	ETC of Joint Box, mounted on tower	1	Set	1000.00	1000.00
114	Supply, handling & installation of furniture required in switchyard control room building as per Annexure-Furniture (Godrej make)	1	Lot	1361000.00	1361000.00
115	Cabling of 2CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	3000	Meter	13.67	40995.48
116	Cabling of 4CX4 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	4000	Meter	15.07	60278.29
117	Cabling of 4CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	3500	Meter	13.67	47828.06
118	Cabling of 5CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	2000	Meter	13.67	27330.32
119	Cabling of 7CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	1000	Meter	14.63	14634.87

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SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
120	Cabling including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.10CX2.5 sqmm armoured control cable	8000	Meter	14.63	117078.98
121	Cabling of 12CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	2500	Meter	17.56	43904.62
122	Cabling of 16CX2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	4500	Meter	22.58	101595.99
123	Cabling including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.19CX2.5 sqmm armoured control cable	5500	Meter	27.60	151802.48
124	Cabling of 27C X2.5 sqmm armoured control cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	3500	Meter	41.40	144902.36
125	Cabling of 1CX630 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	2000	Meter	172.47	344944.99
126	Cabling of 1CX300 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	1000	Meter	86.24	86236.25
127	Cabling of 1CX150 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	300	Meter	48.93	14678.23
128	Cabling of 3.5CX120 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	500	Meter	67.07	33535.53
129	Cabling of 3.5CX185 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	500	Meter	87.19	43596.19
130	Cabling of 3.5CX70 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	250	Meter	28.30	7075.01
131	Cabling of 3.5CX35 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	500	Meter	19.52	9758.44
132	Cabling of 4CX16 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	1000	Meter	15.07	15069.57
133	Cabling of 4CX6 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	1000	Meter	15.07	15069.57
134	Cabling of 2CX6 sqmm armoured aux. power cable including laying, tagging, dressing, except installation of cable gland/lugs/ ferrules, termination and drilling/ cutting holes in cable gland plates- laying can be either on trays, supports, underground, buried in ground or through GI/ PVC pipe over/ under ground, through wall etc. All erection materials viz. ferrules, copper lugs, cable tie / straps, aluminium tags, markers, GI/ PVC wall sleeves with rubber/ nylon bushes and flexible steel conduits shall be supplied by bidder. However, for supply & installation of cable glands, prices shall be quoted seprately.	2000	Meter	15.07	30139.14
135	Directly burried cable - Aux. power cables upto 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.	600	Meter	251.52	150913.43
136	Cable Termination and installation of cable glands for 2CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	250	Nos.	87.12	21778.85
137	Cable Termination and installation of cable glands for 4CX4 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	210	Nos.	96.07	20174.39
138	Cable Termination and installation of cable glands for 4CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	140	Nos.	87.12	12196.15
139	Cable Termination and installation of cable glands for 5CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	20	Nos.	87.12	1742.31
140	Cable Termination and installation of cable glands for 7CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	20	Nos.	93.30	1865.95

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141	Cable Termination and installation of cable glands for 10CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	290	Nos.	93.30	27056.22
142	Cable Termination and installation of cable glands for 7CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately . 12CX2.5 sqmm armoured control cable	130	Nos.	111.96	14554.38
143	Cable Termination and installation of cable glands for 16CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	240	Nos.	143.93	34542.64
144	Cable Termination and installation of cable glands for 19CX2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately .	60	Nos.	175.95	10557.17
145	Cable Termination and installation of cable glands for 27C X2.5 sqmm armoured control cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	130	Nos.	263.93	34310.81
146	Cable Termination and installation of cable glands for 1CX630 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	1099.51	43980.49
147	Cable Termination and installation of cable glands for 1CX300 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	549.76	21990.24
148	Cable Termination and installation of cable glands for 1CX150 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	20	Nos.	311.91	6238.25
149	Cable Termination and installation of cable glands for 3.5CX120 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	427.58	17103.12
150	Cable Termination and installation of cable glands for 3.5CX185 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	555.85	22234.06
151	Cable Termination and installation of cable glands for 3.5CX70 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	180.41	7216.51
152	Cable Termination and installation of cable glands for 3.5CX35 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	40	Nos.	124.42	4976.80
153	Cable Termination and installation of cable glands for 4CX16 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	180	Nos.	96.07	17292.33
154	Cable Termination and installation of cable glands for 4CX6 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	80	Nos.	96.07	7685.48
155	Cable Termination and installation of cable glands for 2CX6 sqmm armoured aux. power cable including cable termination, lugging, ferruling, soldering, tapping, jointing, crimping, installation of cable glands, drilling/ cutting holes in cable gland plates. Any extra hole making for closing of glands plates with GI sheet shall also be in scope of ETC contractor. Supply of lugs, ferruls etc. is in bidder's scope. Individual quantity may vary up to any extend. Supply rates of Glands shall be quoted separately.	150	Nos.	96.07	14410.28
156	Supply of Cable Glands (Double compression type) for 12CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	250	Nos.	202.00	50500.00
157	Supply of Cable Glands (Double compression type) for 4CX4 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	210	Nos.	310.00	65100.00
158	Supply of Cable Glands (Double compression type) for 4CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	140	Nos.	254.00	35560.00
159	Supply of Cable Glands (Double compression type) for 5CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	20	Nos.	254.00	5080.00
160	Supply of Cable Glands (Double compression type) for 7CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	20	Nos.	310.00	6200.00
161	Supply of Cable Glands (Double compression type) for 12CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.10CX2.5 sqmm armoured control cable	290	Nos.	321.00	93090.00

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162	Supply of Cable Glands (Double compression type) for 12CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	130	Nos.	321.00	41730.00
163	Supply of Cable Glands (Double compression type) for 16CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	240	Nos.	416.00	99840.00
164	Supply of Cable Glands (Double compression type) for 12CX2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.19CX2.5 sqmm armoured control cable	60	Nos.	416.00	24960.00
165	Supply of Cable Glands (Double compression type) for 27C X2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	130	Nos.	529.00	68770.00
166	Supply of Cable Glands (Double compression type) for 1CX630 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	40	Nos.	1423.00	56920.00
167	Supply of Cable Glands (Double compression type) for 1CX300 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	40	Nos.	770.00	30800.00
168	Supply of Cable Glands (Double compression type) for 27C X2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.1CX150 sqmm armoured aux. power cable	20	Nos.	467.00	9340.00
169	Supply of Cable Glands (Double compression type) for 3.5CX120 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	40	Nos.	321.00	12840.00
170	Supply of Cable Glands (Double compression type) for 3.5CX185 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	40	Nos.	504.00	20160.00
171	Supply of Cable Glands (Double compression type) for 27C X2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.3.5CX70 sqmm armoured aux. power cable	40	Nos.	897.00	35880.00
172	Supply of Cable Glands (Double compression type) for 3.5CX35 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	40	Nos.	416.00	16640.00
173	Supply of Cable Glands (Double compression type) for 4CX16 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	180	Nos.	321.00	57780.00
174	Supply of Cable Glands (Double compression type) for 27C X2.5 sqmm armoured control cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.4CX6 sqmm armoured aux. power cable	80	Nos.	310.00	24800.00
175	Supply of Cable Glands (Double compression type) for 2CX6 sqmm armoured aux. power cable of Tin/ Nickel, Nichel/ chromium - Plated (coating thickness not less than 10 microns) BHEL approved make brass cable glands as per BS:6121, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene and of tested quality.Cable glands shall match with the sizes of different HT/LT/Control cables. The quantity shown herewith is indicative only and shall change to any extend as per Site requirement.	150	Nos.	202.00	30300.00
176	38/ 66kV XLPE,1Cx240sqmm, Cu conductor cable	1500	Meter	336.80	505194.94
177	ETC of 66kV Indoor cable termination (heat shrinkable/ cold shrinkable type) kit compatible of 1Cx240sqmm copper cable suitable for tertiary weatherproof cable box/ outdoor bushing of ICT/ transfomer	6	Set	9569.41	57416.46
178	ETC of 66kV outdoor cable termination (heat shrinkable/ cold shrinkable type) kit compatible of 1Cx240sqmm copper cable suitable for connecting to single ACSR moose conductor	6	Set	9569.41	57416.46
179	ETC of 1nox3 phase link box without SVL (sheath voltage limiter) at ICT/ transformer end	2	Set	3987.36	7974.73
180	ETC of 1nox3 phase link box with SVL (sheath voltage limiter) at Station transformer end	2	Set	3987.36	7974.73
181	ETC of Metallic screen bonding/ earth continuity cable along with accessories	500	Meter	60.00	30000.00
182	ETC of Single clamps, non-magnetic suitable/ compatible for 1Cx240sqmm, 66kV XLPE, copper cable for fixing on GI cable racks in trench. Installation includes any hole making in the rack and supply of hardware for fixing.	1000	Nos.	40.00	40000.00

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SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
183	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)	14	MT	36698.97	495436.08
184	Laying of 450 mm wide, 2.5 M long , 2 mm thick GI Ladder type Cable trays: including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Minor modification work by cutting welding wherever required shall also be part of work.	4875	Meter	54.40	265222.48
185	Laying of 300 mm wide, 2.5 M long , 2 mm thick GI Ladder type Cable trays: including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Minor modification work by cutting welding wherever required shall also be part of work.	1750	Meter	41.85	73236.98
186	Laying of 150 mm wide, 2.5 M long , 2 mm thick GI Ladder/ perforated type Cable trays: including bends, tees, elbow, reducers, stiffeners coupler plates, bolting to racks, structure etc. to complete. Minor modification work by cutting welding wherever required shall also be part of work.	250	Meter	32.19	8048.02
187	Laying of 25/32/40mm (Nominal Dia) HDPE pipes Payment shall be made for the as erected length including elbow length)	1000	Meter	33.99	33994.79
188	Laying of 50 mm (Nominal Dia) HDPE pipes Payment shall be made for the as erected length including elbow length)	1000	Meter	51.53	51529.72
189	Laying of 50 NB GI pipe/conduits at minimum depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends , tees, elbows, bends, check nuts, bushings, educers, enlargers, coupling caps, nipples where required etc. complete. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	300	Meter	110.07	33019.53
190	Laying of 100 NB GI Pipe/conduits at minimum depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends , tees, elbows, bends, check nuts, bushings, educers, enlargers, coupling caps, nipples where required etc. complete. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	500	Meter	251.99	125994.05
191	Fixing of 50 mm dia GI Pipes on lattice/ pipe stucture/ vertical wall/ structure including clamping, fixing of sockets/ bends as required etc. complete in all respect. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	100	Meter	73.38	7337.67
192	Fixing of 100 mm dia GI Pipes on lattice/ pipe stucture/ vertical wall/ structure including clamping, fixing of sockets/ bends as required etc. complete in all respect. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	100	Meter	167.99	16799.21
193	Laying of 63mm DIA PVC pipe/conduits at minimum depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends , tees, elbows, bends, check nuts, bushings, educers, enlargers, coupling caps, nipples where required etc. complete. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	100	Meter	41.05	4105.13
194	Laying of 110mm DIA PVC pipe/conduits at minimum depth of 300mm including excavation, backfilling, making and repairing of walls in trenches, cutting, threading, fixing of sockets/ bends , tees, elbows, bends, check nuts, bushings, educers, enlargers, coupling caps, nipples where required etc. complete. Both ends of GI Pipes shall be closed by plastering/ any other method. Payment shall be made for the as erected length including elbow length)	100	Meter	86.00	8600.19
195	Supply of 25 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 Pipe only. Tee & Bend as per requirements are deemed included.	50	Meter	146.00	7300.04
196	Supply of 32 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 Pipe only. Tee & Bend as per requirements are deemed included.	20	Meter	204.40	4088.02
197	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 Pipe only. Tee & Bend as per requirements are deemed included.	50	Meter	292.00	14600.09
198	Supply of 50 NB, medium duty GI Pipe/ long radius elbow/ tee as per site requirement. The materials shall be as per IS 1239 and shall carry BIS certification marking.	300	Meter	614.47	184341.30
199	Supply of 100 NB, medium duty GI Pipe/ long radius elbow/ tee as per site requirement. The materials shall be as per IS 1239 and shall carry BIS certification marking.	500	Meter	1378.30	689150.00
200	Supply of 63mm Dia PVC pipe (class 4 as per IS 4985, Customer accepted) alongwith accessories like sockets, bends, tees etc.	20	Meter	66.19	1323.74
201	Supply of 110mm Dia PVC pipe (class 4 as per IS 4985, Customer accepted) alongwith accessories like sockets, bends, tees etc.	100	Meter	290.85	29085.10
202	Supply of 200mm Dia PVC pipe (class 4 as per IS 4985, Customer accepted) alongwith accessories like sockets, bends, tees etc.	100	Meter	581.70	58170.20
203	Supply of 50x50x6 mm MS Angle - Customer approved make	1	MT	44742.71	44742.71
204	Supply of 50x6 mm MS Flat - Customer approved make	1	MT	61209.54	30604.77
205	Supply of MS C-Channel - ISMC 75 / ISMC 100 - Customer approved make	1	MT	44742.71	44742.71
206	Supply of SWG Shield wire (customer approved make) - refer TS_Shield Wire	500	Meter	53.96	26978.29
207	Supply and Installation of fire & water proof sealing/ fire stop system/ fire protection coating system required to prevent spreading of fire from one placed to other place (or one zone to other zone) through the openings in wal / floor, cables laid in trays/ racks and openings below LT Switchgear/ Distribution boards / Cabinets/ Panels/ trench opening/ cutout, etc. using suitable block system using individual blocks with suitable framework or by silicon RTV foaming system.	200	Sq. meter	3061.73	612346.28
208	Erection of Galvanised steel Lattice Structures including hardwares for Towers, beams & equipment support	180	MT	5752.56	1035460.58
209	Erection of Galvanised steel Pipe Structures including hardwares for equipment support	45	MT	4473.94	201327.20
210	Installation/ fixing of Panel Supporting Angles / Channel & Structural Steel Work etc. on cable trench in Building, Vertical support for cables etc. 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	36698.97	91747.42
211	Earthing work with 75X10 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/ floor and embendment in building floor 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. Hardware, Lugs, Bimetallic sleeves required for GI flat on pads of structure & equipment included in the scope of ETC Contractor/ Bidder. The Earthing of equipments, Auxiliary Earthmats under Iso/ ES MOM boxes shall be carried out as project earthing layout and equipment earthing requiremenet including GIS.	39	MT	13603.71	530544.64
212	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/ floor and embendment in building floor 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. Hardware, Lugs, Bimetallic sleeves required for GI flat on pads of structure & equipment included in the scope of ETC Contractor/ Bidder. The Earthing of equipments, Auxiliary Earthmats under Iso/ ES MOM boxes shall be carried out as project earthing layout and equipment earthing requiremenet including GIS.	17	MT	13603.71	231263.05
213	40 mm Dia MS Rod Earthing material- The earthing includes earthing (as per approved earthing drgs and customer specification) of all switchyard equipment, towers, pipe structure, cable trenches, fence, pipe electrode , Control room equipments using necessary connectors for earthing flats. Earthing clamping shall be carried out by ETC contractor. GS strip including cutting, bending, welding with 40 mm dia MS rod riser/earth strip, applying zinc rich paint, clamping to structure/building wall etc. to complete. Hardware required for connecting flat on pads of structure & equipment included in scope. Earthing to be done as per equipment earthing drg	50	Meter	129.79	6489.32
214	Installing of 40/100 mm dia GS pipe Electrode (length - 3.0 Mtr) with test links and treated earth pit as per Equipment Earthing drawing with CI frame and hinged cover alongwith all associated civil works i.e - excavation - installing the pipe electrode with alternate layers of Coke & charcoal, salt - backfilling and compaction - Casting the Test Pit with Cast Iron covers - any other work necessary to complete the work (Only GI Pipe, Nuts, Bolts & Washers,test links will be supplied by BHEL. Other items like CI frame, CI cover, charcoal, salt etc shall be supplied by contractor)	2	Nos.	10235.00	20470.00

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Tender REF No.: TBSM/ERSAMA/ETC/TENDER/24-25 DATE: 27.06.2024

SR_NO	Description_of_Item	Quantity	UOM	Unit_Rate	AMOUNT
215	Supply & installation of braided 240 sqmm Cu. Conductor for gate/ fence/ panel earthing or at any other location as required at site. Earthing clamping & bolting shall be carried out by ETC contractor. Supply of any hardware, Lugs required for fixing on structure & equipment, brazing included in the scope of ETC Contractor/ Bidder. Earthing details shall be as per project earthing layout and equipment earthing drawings & customer specification.	5	Kg	1100.00	5500.00
216	Supply & installation of braided 35 sqmm Cu. Conductor for gate/ fence/ panel earthing or at any other location as required at site. Earthing clamping & bolting shall be carried out by ETC contractor. Supply of any hardware, Lugs required for fixing on structure & equipment, brazing included in the scope of ETC Contractor/ Bidder. Earthing details shall be as per project earthing layout and equipment earthing drawings & customer specification.	7	Kg	1100.00	7700.00
217	Supply & installation of braided 16 sqmm Cu. Conductor for gate/ fence/ panel earthing or at any other location as required at site. Earthing clamping & bolting shall be carried out by ETC contractor. Supply of any hardware, Lugs required for fixing on structure & equipment, brazing included in the scope of ETC Contractor/ Bidder. Earthing details shall be as per project earthing layout and equipment earthing drawings & customer specification.	10	Kg	1100.00	11000.00
218	Supply & installation of 50x6 sqmm Cu.flat for gate/ fence/ panel earthing or at any other location as required at site. Earthing clamping & bolting shall be carried out by ETC contractor. Supply of any hardware, Lugs required for fixing on structure & equipment included in the scope of ETC Contractor/ Bidder. Earthing details shall be as per project earthing layout and equipment earthing drawings & customer specification.	20	Kg	1100.00	22000.00
219	Supply & installation of 18MM DIA. 3 M LONG COPPER CLAD STEEL RODS for gate/ fence/ panel earthing or at any other location as required at site. Earthing clamping & bolting shall be carried out by ETC contractor. Supply of any hardware, Lugs required for fixing on structure & equipment included in the scope of ETC Contractor/ Bidder. Earthing details shall be as per project earthing layout and equipment earthing drawings & customer specification.	120	Kg	1100.00	132000.00
220	Supply & ETC of BHEL/ customer approved make 5.0 HP Automatic Start/ Stop type Centrifugal pump and accessories for sump pit for cable trench/ reactor/ ICT/ Oil Collection Pit etc. Scope including supply and fixing of DOL/ star delta starter, fixing of accessories, piping, shed for pumping arrangement including civil works for foundation works, if required.	1	Set	46200.00	46200.00
221	Supply & ETC of BHEL/ customer approved make 2.0 HP Automatic Start/ Stop type Centrifugal pump and accessories for sump pit for cable trench/ reactor/ ICT/ Oil Collection Pit etc. Scope including supply and fixing of DOL/ star delta starter, fixing of accessories, piping, shed for pumping arrangement including civil works for foundation works, if required.	1	Set	22994.34	22994.34
222	Supply & ETC of BHEL/ customer approved make 1.0 HP Automatic Start/ Stop type Centrifugal pump and accessories for sump pit for cable trench/ reactor/ ICT/ Oil Collection Pit etc. Scope including supply and fixing of DOL/ star delta starter, fixing of accessories, piping, shed for pumping arrangement including civil works for foundation works, if required.	3	Set	18395.47	55186.42
223	Supply & ETC of BHEL/ customer approved make 0.5 HP Automatic Start/ Stop type Centrifugal pump and accessories for sump pit for cable trench/ reactor/ ICT/ Oil Collection Pit etc. Scope including supply and fixing of DOL/ star delta starter, fixing of accessories, piping, shed for pumping arrangement including civil works for foundation works, if required.	3	Set	13796.60	41389.81
224	Supply & installation of Water cooler with water purifier system (with RO & ultra violet purification system with ISI mark)	1	Set	70593.00	70593.00
225	Supply and fixing/ mounting of Phase color discs, danger & identification plates: The scope covers the supply and fixing/ mounting of Phase Color Discs, Danger Labels and Identification Plate for bays & equipments as per latest standards (IS:2551 & IS:5) and technical specification etc.	1	Lot	165826.06	165826.06
226	PHASE IDENTIFICATION : Painting the structures in Red, Yellow and Blue by reflecting Colour is to be provided around the top of the structure with Colour band of 100 mm width. Supply of paint is in bidders scope.	1	Lot	16448.29	16448.29
227	Equipment Fixing Hardware: Supply of Equipment fixing hardware (hot dip galvanized) full threaded, 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 equipment /box/JB, and same shall be decided at site. Hardware for fixing of tray with lattice / pipe structure shall also be covered as required.	80	Kg	129.17	10333.39
228	Insulating Rubber Mat: The scope covers supply and laying of insulating mats (Class-A suitable for 1.1 kV conforming to IS: 15652-2006). These insulating mats shall be laid in front of all floor mounted LT AC/ DC boards, control, relay, telecommunicaiton, panels & LCC located in various buildings.	120	Sq. meter	1995.94	239512.56
229	Structural Plates: Carrying out the modification/ correction work for modification in Structure materials including supply of additional materials. 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 works also included in the scope. Minor civil works, welding and application of protective / zinc rich paint on welded surface is also included in the scope.	25	Kg	23.81	595.14
230	Increase in hole Sizes in Structures materials: Carrying out the drilling work for enlargement of hole in Structure materials including any modification works. 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 works also included in the scope. Minor welding and application of protective / zinc rich paint on welded surface is also included in the scope.	30	Nos.	119.03	3570.83
231	Drilling of Additional Holes in Structures materials: Carrying out the drilling work for additional hole in Structure materials including any modification works. 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 works also included in the scope. Minor welding and application of protective / zinc rich paint on welded surface is also included in the scope.	10	Nos.	119.03	1190.28
232	Making cut outs: Making cut out in concrete floor of control room/ CR Panel Room/ GIS building/ any other building. Work includes cutting/ breaking of RCC/ PCC by any suitable method (core cutting etc.), minor civil works and making it good to satisfaction of BHEL/ Customer.	10	Sq. meter	6903.00	69030.01
233	Supply of anchor fastner/ bolts: Supply of anchor fastner/ bolts of required size (M12/M16/M20 upto 150mm long) and fixing in Concrete floor/ wall/ ceiling, as per requirement.	25	Kg	131.05	3276.22
234	SUPPLY & INSTALLATION OF GROUTING: i) Non-shrink flowable grout shall be used for under pinning work below base plate of Structure. 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 structure. Actual qty as per site condition	20	Cum	8903.00	178060.00
235	Security personnel with armed security guard arrangement: 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.	12	One post per month	65954.71	791456.50
236	Security personnel with unarmed security guard arrangement: 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.	24	One pos	50734.39	1217625.38
237	Unloading and handing over to customer of Mandatory Maintenance & Testing Equipment as per Annexure-ME	1	Lot	37800.00	37800.00
238	Unloading and handing over to customer of 400kV GIS Mandatory Spares as per Annexure-400kV GIS spares	1	Lot	31100.00	31100.00
239	Unloading and handing over to customer of 220kV GIS Mandatory Spares as per Annexure-220kV GIS spares	1	Lot	27600.00	27600.00
240	Supply, unloading and handing over to customer of TOOLS AND PLANTS (T&P'S) for 400kV/220kV substation as per Annexure-T&P	1	Lot	97440.00	97440.00
241	Unloading, storage DG set & its accessories and shifting from storage space to its foundation at site (Dim. 4600x1650x2400, weight 2850 Kg)	1	Set	4828.81	4828.81
242	Unloading and storage of Air conditioning units of 2TR split AC with accessories, stabilisers and controllers etc. for CRB/ Relay panel room	37	Nos.	200.00	7400.00
243	Supply & installation of Chain Pulley block with Winch machine to lift and lower material of capacity 5MT	1	Set	16500.00	16500.00
244	Supply & installation of Chain Pulley block to lift and lower material of capacity 1.5MT	1	Set	8800.00	8800.00
245	Supply & ETC of Temperature transducer in building: Temperature transducer shall have the following specification: Sensor : Air temperature sensor (indoor use) Output : 4 to 20 mA Temperature range : -5° C to 60° C Resolution : 0.1°C Accuracy : 0.5° C or better.	3	Nos.	7250.00	21750.00
			Total Amount (in Rs.) excluding GST		**31319994.64**

Validate Print Help

Percentage BoQ

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

Name of Work: Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha.

Contract No: TBSM/ERSAMA/ETC/TENDER/24-25 DATE 27.06.2024

Name of the Bidder/ Bidding Firm / Company :						

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	Estimated Rate in Rs. P	TOTAL AMOUNT Without Taxes in Rs. P	TOTAL AMOUNT In Words
1	2	4	5	6	53	55
1	Total amount as per rates in BOQ (as per Annexure-I) for "Erection, Testing & Commissioning (ETC) work Includes Unloading, Storage, Material handling, safe keeping, Preassembly, erection, testing, pre-commissioning and commissioning including trial run, reconciliation & handing over surplus material to BHEL of 400/220 kV GIS switchyard at OPTCL, Ersama Project in Odisha." - Excluding GST	1.000	Nos	31319995.00	**31319995.00**	INR Three Crore Thirteen Lakh Nineteen Thousand Nine Hundred & Ninety Five Only
Total in Figures					**31319995.00**	INR Three Crore Thirteen Lakh Nineteen Thousand Nine Hundred & Ninety Five Only
Quoted Rate in Figures			**Select**		**0.000**	INR Zero Only
Quoted Rate in Words				**INR Zero Only**		

ANNEXURE-ME

SN	Mandatory Maintenace and Testing Equipment for Ersama Substation	Unit	Quantity
1	Universal Relay Testing Kit (Omicron/Megger make)	Set	1
2	Capacitance Tan-Delta Testing Kit (Omicron/Dovel/Megger make)	Set	1
3	Contact Resistance Measurement Kit- (Milli volt drop measurement (Contact resistance measurement -200Amp DC) (Omicron/Dovel/Megger make)	Set	1
4	10KV IR Test Kit (Omicron/Dovel/Megger make)	Set	1
5	TTR Testing Kit (Omicron/Dovel/Megger make)	Set	1
6	Winding Resistance Testing Kit (Omicron/Dovel/Megger make)	Set	1
7	Third Harmonic Resistive Current Measurement Kit for SA (Omicron/Dovel/Megger/Becon Energy Solutn. make)	Set	1
8	Infra red camera (suitable for SF6 Gas leakage monitoring) (Fluke/Flir make)	Set	1
9	SF6 gas analyzer: Portable type	SET	1
10	SF6 gas leak detector: The detector shall be portable, battery operated with built in battery charger, hand held type and having a minimum SF6 gas leakage sensitivity of 5gm/year.	SET	1
11	SF6 Gas Filling, Evacuating, Filtering, Drying, Pumping & Storage Plant with spares for 5 years Operation.(DILO make)	SET	1
12	SPECIAL TOOLS: i) Box Spanner: 1 Set (suitable for GIS equipment erection) ii) Adjustable Spanner: 1 Set (suitable for GIS equipment erection) iii) Adjustable torque rench with socket of different sizes required for GIS equipment erection	LOT	1
13	100kV Automatic Transformer Oil Breakdown voltage test set	Nos.	1
14	Oil sampling bottle	Nos.	4
15	LCD, Digital Multimeter (Make: Fluke/Megger/Motwane)	Nos.	2
16	LCD, Clamp on meter (Make: Fluke/Megger/Motwane)	Nos.	2
17	Digital earth tester (Make: Megger/Sonel/Fluke)	Nos.	1
18	Discharge rod as per standard for carrying out the switch yard maintenance work	Nos.	6
19	Rubber gloves of operation of isolators and earth switch	Pairs	2
20	Relay Tools Kit	SET	1
21	Portable emergency light	Nos.	4
22	Oil Syringe (50ml) for DGA test of CT	Nos.	4
23	Thermo Vision Scanning Camera	Nos.	1
24	Oil Filterarion Plant of 10KLPH	Nos.	1
25	Circuit Breaker Operational Analyser with DCRM measurement (Make: Omicron/Megger/ DV Power)	Nos.	1
26	Puncture Insulator Detector for LAs for 400/220kV Substations (Make: Positron, Canada)	Nos.	1
27	Primary Injection kit 2kA for CT & PT testing	Nos.	1
28	Automatic Battery Load/ Discharge Tester	Nos.	1
29	Transformer Sweep Frequency Response Analyser (SFRA) kit	Nos.	1
30	Vibration meter for Transformer/ Reactor	Nos.	1
31	Dry Air Plant	Nos.	1

NOTE: The above list is not exhaustive and any other instrument/ equipment to be handed over to OPTCL shall be deemed included in the above list.

Annexure- Project Scope for ETC Works

REV00

Sl. No.	Particulars	Remarks
1	**ETC of 400 & 220kV GIS** as per enclosed single line diagram. Work shall include Erection/ installation, testing and commissioning of 400 & 220kV GIS including LCC Panels. The supervision shall be provided by respective GIS manufacturers/ OEMs. Arrangement of general tools & tackles shall be done by contractor as per Annexure-1A (For 400kV) & Annexure-2A (For 220kV) but not limited to, However, arrangement of special tools & testing instruments shall be in the scope of BHEL/ GIS OEM as per Annexure-1B (For 400kV) & Annexure-2B (For 220kV). The scope of works includes complete installation of GIS, GIB and SF6 to air bushing including all the work/ services required for ETC of complete GIS, support structure, earthing/ grounding, Internal cabling between GIS to LCC, SF6 Gas treatment, handling/ filling/ top-up etc. complete in all respect. Erection of rails/any ebeddments on the floor of GIS hall shall be covered separately in GIS structure work line item. LCC to GIS equipment cabling work includes any cable tray installation work on GIS equipment/platform/GIS structure, chipping/ cutting of floor for levelling to ensure GIS installation.	
2	**ETC of LT Switchgear, Battery Bank, Battery Charger System f**or auxiliary supply arrangement includes installation/ fixing, inter panel connection, bus wiring and earthing work etc. however, supervision for installation, testing and commissioning shall be provided by OEM/ manufacturer, as the case may be.	
3	**ETC of SAS & CRP: 400kV & 220kV Control & Relay Panels, Station Automation system** includes installation/ fixing, inter panel connection, bus wiring and earthing work etc. Testing and commissioning of Relays from OEM/ manufacturer shall be arranged. however, necessary manpower support, wiring, bus wiring, tools, tackles and testing shall be in scope of ETC contractor.	
4	**66kV EHV Cabling Works:** 38/66kV, 1Cx240sqmm stranded Cu conductor XLPE insulated cable shall be laid in trench on rack assembly. The activity shall further include cable jointing, if required, termination at ends, fixing of trefoil/ single clamps, earthing link box with/ without SVL and laying of bonding/ earthing cable. The supervision of installation of EHV cable & earthing/ bonding cable, fixing of earthing link box with/ without SVL, fixing of trefoil/ single clamps and fixing of support structure materials shall be done by cable OEM/ manufacturer. In addition to this, testing & commissioning of cabing system along with installation, testing & commissioning of jointing & termination kit shall be done by OEM with assistance of ETC contractor. However, supply of small consumables, minor modifications in civil works, fabrication and welding etc. for completion of activities shall be in contractor's scope.	
5	**Cable Trench Material:** Work includes welded type GI rack arrangement and Tray arrangement for cable trenches in Switchyard, GIS building, Control Room Building, Fire Fighting Building & DG house. The work shall include cutting, drilling, fabrication, punching, welding and painting work with protective zinc rich paint and minor civil works, compelete in all respect Cable rack assembly shall be 1/2/3/4 tier as per site requirement. Cutting, drilling, punching, minor civil works also included in the scope.	
6	**Cable fire sealing Works:** Cable/cable tray openings in walls and floors or through pipe sleeves from one area to another or from one elevation to another within the unit shall be seated by a fire proof sealing system (FPSS). The FPSS shall effectively prevent the spread of fire from the flaming to non-flaming side of a fire. Wherever the cables/cable trays pass through walls/floors, fire proof cable penetration seals rated for one hour shall be provided. This shall be by suitable block system using individual blocks with suitable framework or by silicon RTV foaming system. In case foaming system is offered, damming board, if used, shall not be considered for fire rating criteria. Any of the system offered shall be of proven type as per BS: 476 (Part-20) or equivalent standard. In order to prevent fire propagation through cable penetrations, after laying, dressing & clamping of cables, all the openings shall be properly sealed by using Fire Stop Mortar Seal and Fire Retardant Cable coating compound. Also the cable runs both before and after the fire scale shall be suitably sprayed with anti-fire propagation liquid.	
7	**Supply of Insulating mats:** The scope covers supply and laying of insulating mats conforming to Internation standards. 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 / GIS LCC Panel e.t.c. 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. 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 International standards. Width of insulating mats shall generally be of 1.5 meters or as per site requirements. Length shall be supplied as per site requirements.	
8	**Supply of Cable Tags & Markers** Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule. 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 International standards. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables. Location of cables laid directly underground shall be clearly indicated with cable route marker made of galvanised iron plate. Location of underground cable joints shall be indicated with cable route marker with an additional inscription "Cable joints". 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. 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.	
9	All ETC works shall be done as per BHEL/Customer Specification. Miscellaneous works pertaining to switchyard area is deemed to included.	

10	Equipment bolted connection after being checked and tested shall be painted with anticorrosive paint/ compound be welded. For rust protection, the welds shall be treated with zinc chromate primer and coated with zinc rich paint.	
11	All the drawing/ documents including Single Line Diagram, Layout drawing, Erection Key Diagram etc.are tentative and subject for revision during detailed engineering / contract stage. Bidder to quote accordingly.	
12	Rating & type of Battery & Battery Charger are tentative and subject for revision during detailed engineering / contract stage. Bidder to quote accordingly.	
13	Quantity for individual item are indicative and may change as per final engineering and site requirement.	
14	Prices quoted for items are deemed to be inclusive of miscellaneous works including erection of clamps & connectors, earthing work etc.	

Annexure- Standard Scope for ETC Works		
		REV00
Sl. No.	Particulars	Remarks
1	Individual item may vary up-to any extend and even may get deleted, however overall contract value may vary +/- 30%. The validity for variations shall be valid up-to contract stage.	
2	Loading/ unloading, handling, preservation & upkeeping, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and commissioning tests (as per BHEL / Customer FQP/ OEM recommendations) are included in the scope. Shifting of the material from store to site shall be done with truck/ trailor.The scope of work includes loading of material with hydra on truck/ trailor at store, unloading of the material from truck/ trailor at site with Hydra/ crane etc. complete in all respect. Standard/ General tools & tackles mentioned in tender document is included in the scope of contractor.	
3	Bidder Supplied Material - Bidder (ETC contractor) to supply material of proven design and make, which have already been extensively used and type tested (as applicable). Bidder to obtain approval from BHEL Engineer incharge / Customer prior to supply.	
6	HV test kit is in scope of GIS OEM/ maufactuere, however, ETC contrcator shall extend all possible help and support is unloading, shfting to location, unpacking and installation of HV test for HV testing. After successful HV testing, contrcator shall support in packing, shifting and loading of HV test kit in trailor.	
7	The ETC works shall be carried out in line with engineering drawing/ other technical details mentioned elsewhere, however, instruction of engineer in charge shall be final and binding for execution of work.	
8	Minor Civil works including modification of civil foundations, making holes in the trenches/ control room building, GIS building, grouting, fixing of trench material, sealing of GI/ PVC/HDPE Pipe/ conduits shall be in the scope of ETC contractor.	
9	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, ETC contractor shall be make it good to bring it in original shape.	
12	All painting materials & other consumable as per contractual requirements shall be part of ETC works. All the supply materilals under scope of ETC contractor shall subject to customer approval.	
13	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.	
15	Equipment erection (per say Surge Arrestor) means complete erection, metallics, connectors (expansion/rigid tubular for aluminium Tube/ single/ double/ quadraple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/ Tee connectors etc in line with electrical layout drawings.	
16	Equipment and tower erection would include supply and erection of miscellanneous 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 3864.	
17	Welding of Aluminium tubes (supply of welding sleeve excluded) is in ETC contractor's scope and joints shall be tested by radiography & dye penetration test. Welding and Bending machines and any other equipment shall be in ETC Contractor scope.	
18	Completete ETC package is under the scope of bidder. All T&P including oil filterating machine, cranes etc. required to complete the job shall be provided by bidder only.	
19	Quantities identified for supply items are provisional and shall be confirmed during detailed engineering stage/ execution of work at site.	
20	MS Welding - The M.S. flat/ angle/ channel shall be finally painted with two coats of Red oxide primer and two coats of Zinc riched enamel paint.	
21	In cable tray/ ladder if minor fabrication is required the same shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint. Supporting steel shall be painted before laying of cables. The painting shall be done with one coat of red lead paint and two coats of approved bituminous aluminium paint	
22	All erection T&P's, tools & tackels, testing instruments (duly calibrated) as per Annexure-A & B shall be arranged by ETC Contractor at it's own cost on returnable basis. Please note that this is only indicative list and hence, any other instrument not mentioned below but required for sucessful completion of ETC work shall be in ETC contractor's scope.	
23	In addition to above few other general Tools and Tackles to be arranged by ETC Contractor on returnable basis specifically for GIS erection & testing as informed by respective OEMs of GIS are also enclosed as Annexure-1A & 2A. Contractor to arrange the same.	

Annexure-1A

Equipment to be arranged by customer.

1) Farhana/Crane for Loading/Unloading & shifting of test kit & tools at site with safe & sufficient storage space for same shall be provided by purchaser on free of cost.

2) Farhana/Crane (min. capacity 30 Ton) for packing, unloading, and reloading of High Voltage test kit at site outside GIS building.

3) Farhana/Crane with appropriate capacity for erection/dismantling/shifting of GIS.

4) To operate the HV test kit, a control power source of 3Ph, 415V AC with □ 63A is necessary. The power supply must be without leakage current protection. The end of the supply cable (4 wires, 3 phases and earth; minimum 16 mm2) should be without any terminals. If the test power is supplied by a stand-alone generator, it has to be designed for a power of minimum 65 kVA.

5) Resonance frequency of voltage transformer shall match HV test kit requirements. If it fails to do so, purchaser shall dismantle voltage transformers from GIS.

6) All the necessary normal tools, special tool, consumable material shall be arrange by customer/end-customer.

a. Electrical angle grinder

b. Welding transformer

c. Work Bench

d. Bench Vice

e. Power press for cable lugs

f. Electrical hand lamp

g. Welding goggles

h. First Aid Box.

i. Ladder with 8 & 12 steps. Transport and lifting devices such as forklift, hydra cranes (hook with lockable slings), mobile platform etc. available

j. Necessary electrical power supply.

HIGH VOLTAGE TEST CONTAINER

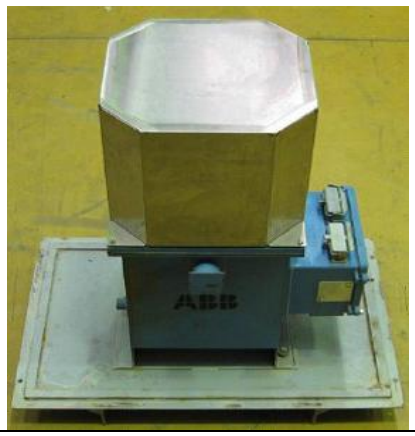
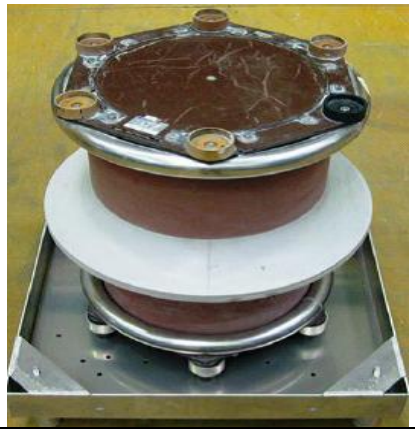
IN3510



Dimensions

Length / Breadth / Height	**6300x 2500x 2500 mm**
Weight	**8000 Kg**
Packing	**High Voltage test Container**
Country of origin	**INDIA**

Qty.	Description	Article
1	Transport Container Indentification No.: **IN3510**	
1	Air conditioner Indentification No.: **IN3510**	
1	Indentification No.: **IN3516** Description : Frequency converter Length : 900 mm Width : 1000 mm Height : 1600 mm Weight : 572 kg	
1	Indentification No.: **IN3521** Description : Input Transformer Length : 750 mm Width : 500 mm Height : 710 mm	

1	Indentification No.: **IN3522** Description : Step-up Transformer Length : 1150 mm Width : 760 mm Height : 1300 mm Weight : 540 kg	
4	Indentification No.: **IN3517/18/19/20** Description : High Voltage Reactor 6A Length : 950 mm Width : 950 mm Height : 1050 mm Weight : 512 kg	
1	Indentification No.: **IN3530** Description : High Voltage Divider Length : 1750 mm Width : 1000 mm Height : 900 mm Weight : 400 kg	
1	Indentification No.: **IN3540** Description : Toroids for HV Reactor Length : 1260 mm Width : 1300 mm Height : 990 mm	

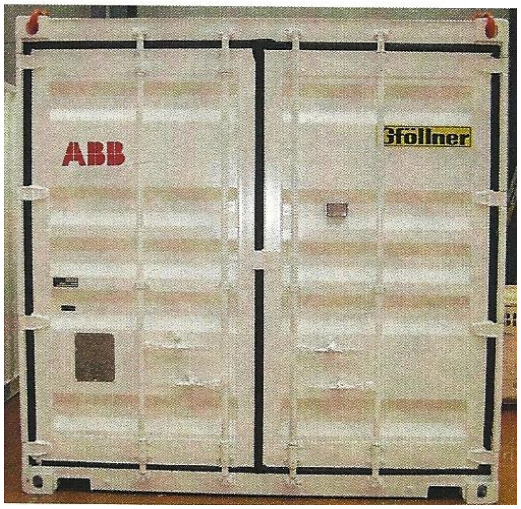
1	Indentification No.: **IN3549** Description : Toroids Voltage Divider Length : 1260 mm Width : 1260 mm Height : 990 mm	
1	Indentification No.: **IN3548** Description : Shielding Ball Length : 1260 mm Width : 1300 mm Height : 770 mm	
1	Indentification No.: **IN3545** Description : High Voltage Connection tube Length : 1750 mm Width : 630 mm Height : 450 mm Weight : 100 kg	
1	Indentification No.: **IN3551** Description : P.D. equipment Length : 1750 mm Width : 630 mm Height : 450 mm Weight : 100 kg	
1	Indentification No.: **IN3610** Description : P.D.Accessories Length : 1750 mm Width : 630 mm Height : 450 mm Weight : 100 kg	

TOOL CONTAINER "GIS-01"

IN6110 01



Equipped with tools and devices for the assembly of GIS.



Dimensions

Length / Width / Height	**6085 / 2438 / 2591 mm**
Weight	**7000.00 Kg**
Country of Origin	**India**

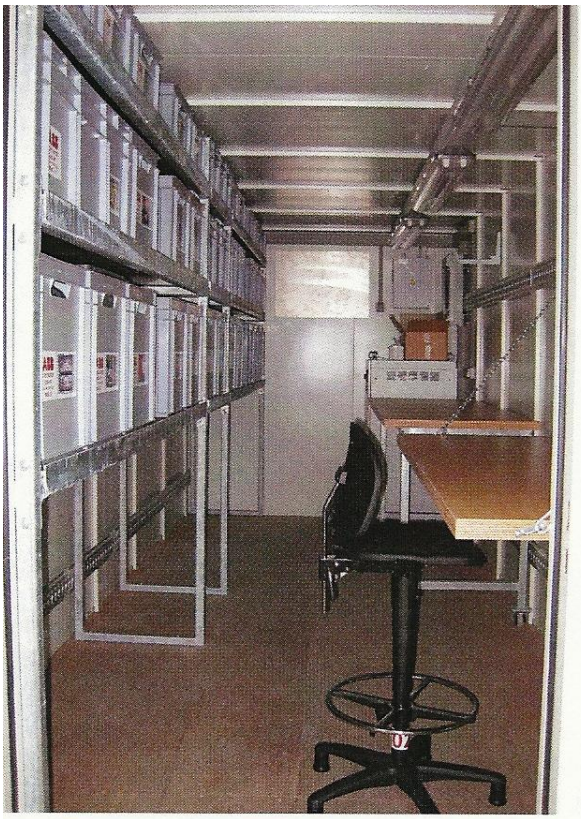












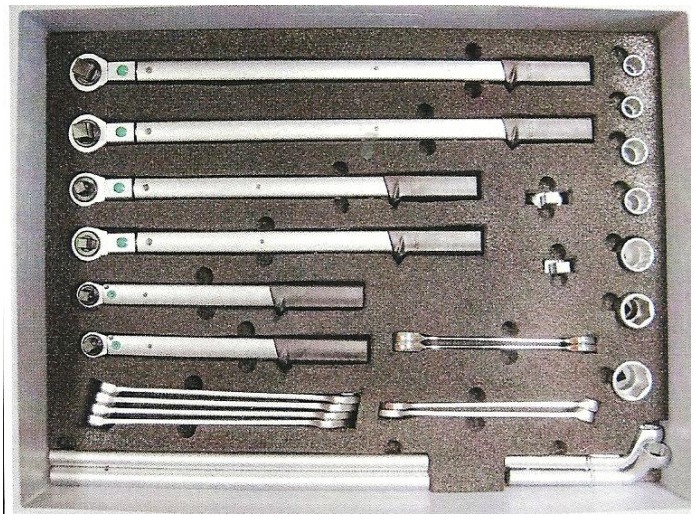

ABB
CONTAINER
GIS-09
BOX 20

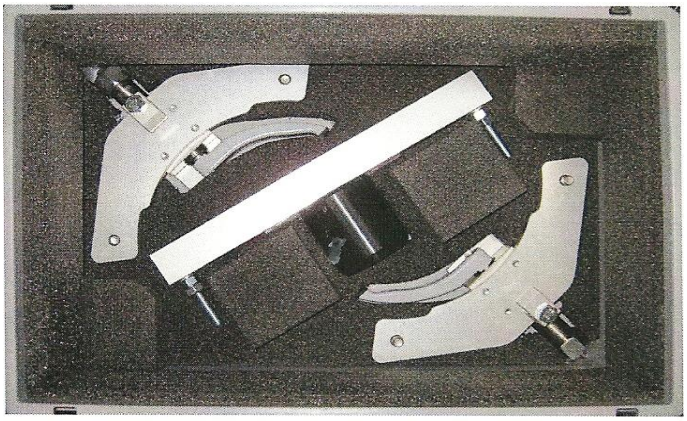
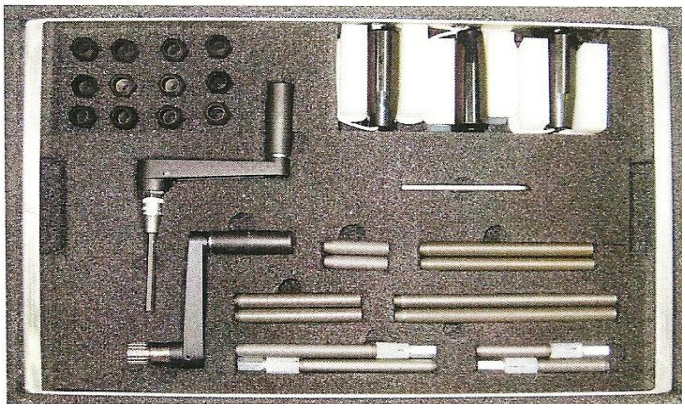
Quantity	Description	Article No
1	Container "ABB"	IN6120
	1 Key for Container and 1 key for padlock (inside tool car)	IN7425
1	Padlock 85-40mm	IN7421
1	Folder (stored in box number 24)	
1	Index Container E	IN9999
1	Certification of Container	48026 WN/2
1	Wiring Diagram	203984
1	Instruction manual DIE "Air-condition"	R407C
1	Instruction manual DIE "S'K'H"	Y306AN12AT
	Key for Container	
	Countersunk head screw Inbus M10x20	DIN 7991
	For treads of ring-screws	
	(Transportation locking, swivel chair)	
	Aluminum ramp "ABB-C"	IN6313
	Movable workbench "ABB-C"	IN6315
	Workbench,- swivel chair	IN6317
	All machines and devices having an own	
	Index, are marked as following:	
	(SI) = Separate index	

Quantity	Description	Article No
1	Multipurpose ladder 6.98 M	IN5117
8	Transport trolly " Y Car "	IN6412
2	Pry bar 1800	IN6412
1	Toolbox "GIS-01"	IN2310 (SI)
1	GAS evacuating/refill. Device 63M3/H	IN4114 (SI)
	Only for the locking while transportation	
	(23) Polyester strap "AK30-m" 2.5M	IN5612
	(8) Polyester strap "AK30-m" 3.5M	IN5611
	(10) Polyester strap 25mm *14M*	IN5613
	(6) Transport Device "ABB-C"	IN6007
	2 pcs. Hexagonal nuts M10	IN5531
	(1) Foamed material 1100x150x20 mm	IN6006
	(1) Foamed material 1100x150x20 mm	IN6006
	(1) Foamed material 750x100x20 mm (between workbench and frame)	IN6004
	The boxes No.2 and No.3 are earmarked as storage place for the transportation locking material on site	

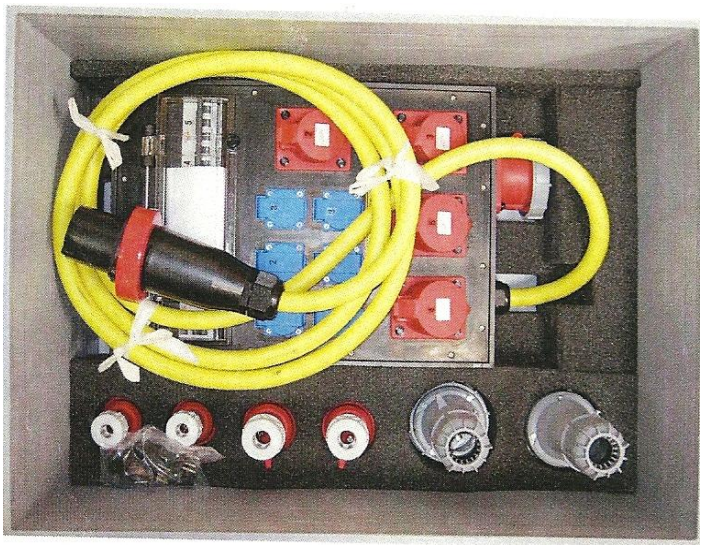
Quantity	Description	Article No
	Box 01	
		
1	**Stacking box 600x400x220mm**	IN6210
	(1) Foamed material 2 black	IN6002
1	Box Opener "BAHCO" crow bar 900x25	IN1621
1	Box opener "SUPERBAR"	IN1621
2	Pry bar "HAZET 400"	IN1612
2	Pull and pry bar	IN1619
	Box 02	
		
1	**Stacking box 600x400x220mm**	IN6210
	For polyester round sling and transportation material	

Quantity	Description	Article No
	Box 03 	
1	Stacking box 600x400x220mm For polyester roundsling and transportation material	IN6210
	Box 04 	
1	Stacking box 600x400x220mm Empty for spare material	IN6210

Quantity	Description	Article No
	Box 05	
		
1	Stacking box 600x400x220mm Empty for spare material	IN6210
	Box 06	
		
1	Stacking box 800x600x220mm	IN6222
	(1) Foamed material 3 black	IN6003
2	Torque wrench "730R/5" (8-60Nm 3/8")	IN1111
2	Torque wrench "730R/20" (40-200Nm 1/2")	IN1114
2	Torque wrench "730R/40" (80-400Nm 3/4")	IN1117
2	Combination wrench 19	IN1519
4	Combination wrench 24	IN1524

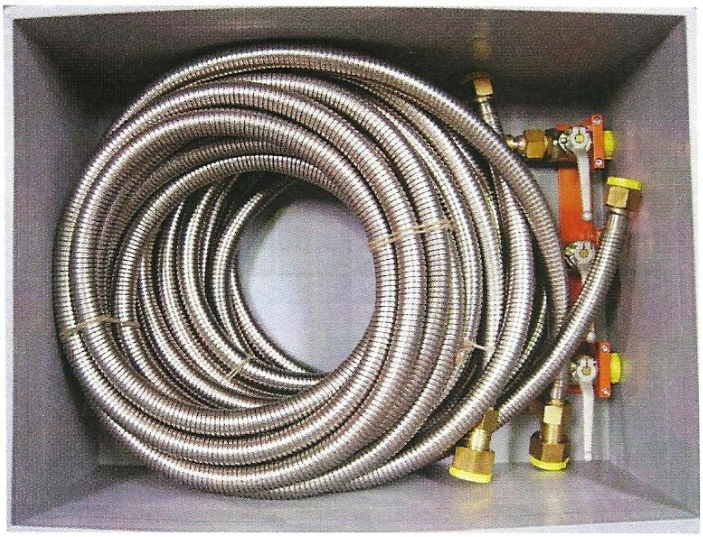
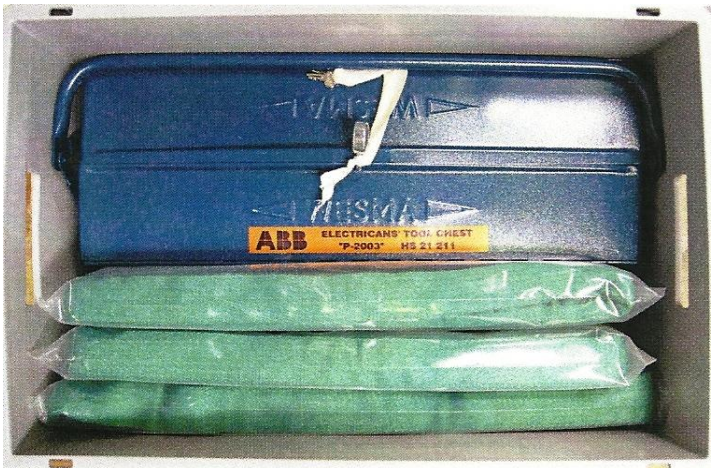
Quantity	Description	Article No
2	Box end wrench 24	IN1524
2	Extension tube 24-30	IN1133
2	Socket wrench long 1/2" 19 mm	IN1319
2	Socket wrench long 1/2" 24 mm	IN1324
1	Socket wrench long 1/2" 30 mm	IN1330
1	Socket wrench long 3/4" 30 mm	IN1330
1	Socket wrench long 3/4" 36 mm	IN1332
1	Open end wrench 18-19	IN1429
1	Open end wrench 18-24	IN1434
2	Ratchet spanner "RG" 19mm	IN1479
2	Ratchet spanner "RG" 17mm	IN1477
2	Ratchet spanner "RG" 24mm	IN1480
	Box 07	
		
		
1	**Tool set "ELK14-NM08"**	**IN2214 (SI)**

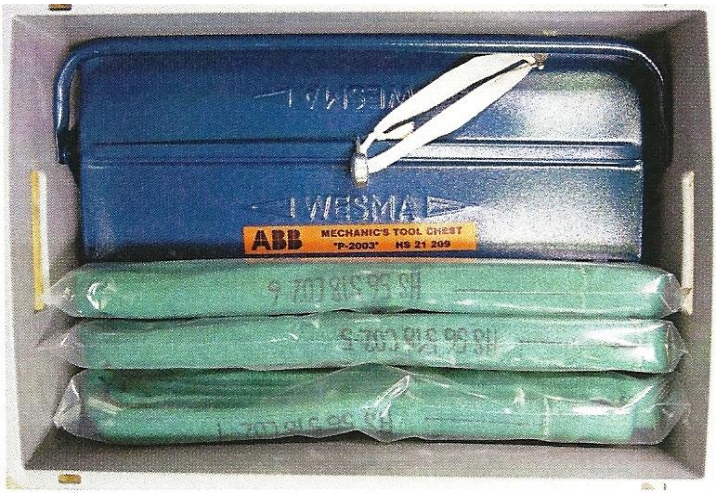
Quantity	Description	Article No
	Box 08	
		
1	**Stacking box 600x400x220mm**	**IN6210**
6	Polyester round sling "1M/V"	IN5411
6	Polyester round sling "2M/V"	IN5412
6	Polyester strap 50mm / 5M	IN5615
	Box 09	
		
1	**Stacking box 600x400x220mm**	IN6210
6	Polyester strap 50mm */8m*	IN5618

Quantity	Description	Article No
	Box 10	
		
1	**Stacking box SOOx600x220mm**	IN6222
6	Polyester round sling "6MN"	IN5417
	Box 11	
		
1	**Power board "7800"**	IN3113 (SI)

Quantity	Description	Article No
	Box 12 	
1	Set for evacuating/refill. Device 63M3/H	IN4114 (SI)
	Box 13 	
1	Stacking box 600x400x325mm Empty, for spare material	IN6211

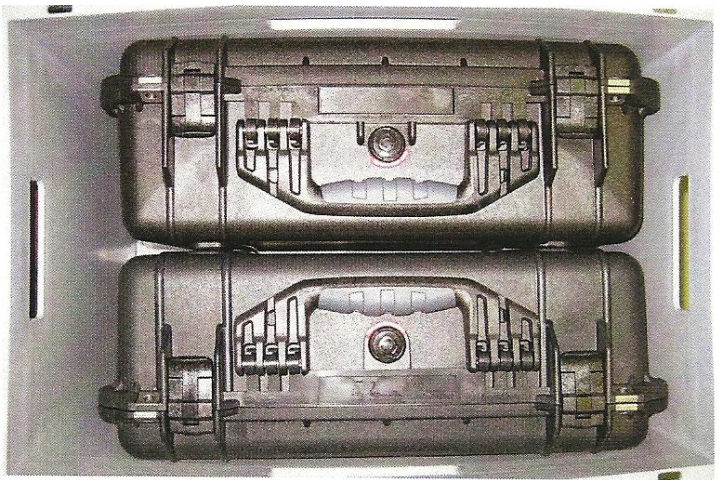
Quantity	Description	Article No
	Box 14	
		
1	Stacking box 600x400x325mm Empty, for spare material	IN6211
	Box 15	
		
1	Stacking box 800x600x325mm	IN6223
3	Metal hose "Bellow type"	IN4220

Quantity	Description	Article No
	Box 16	
		
1	**Stacking box 800x600x325mm**	IN6223
3	Metal hose "Bellow type"	IN4220
1	Adapter "Dilo 3-244"	IN4415
	Box 17	
		
1	**Stacking box 600x400x325mm**	IN6211
1	Electricians tool set "PICCOlO-2003"	IN2220 (SI)
3	Polyester round sling "6M/G"	IN5434

Quantity	Description	Article No
	Box 18	
		
1	**Stacking box 600x400x325mm**	IN6211
1	Mechanics tool set "PICCOLO-2003"	IN2222 (SI)
3	Polyester round sling "6M/G"	IN2222
	Box 19	
		
1	**Stacking box 600x400x325mm**	IN6211
6	Polyester round sling "4MIY"	IN5416

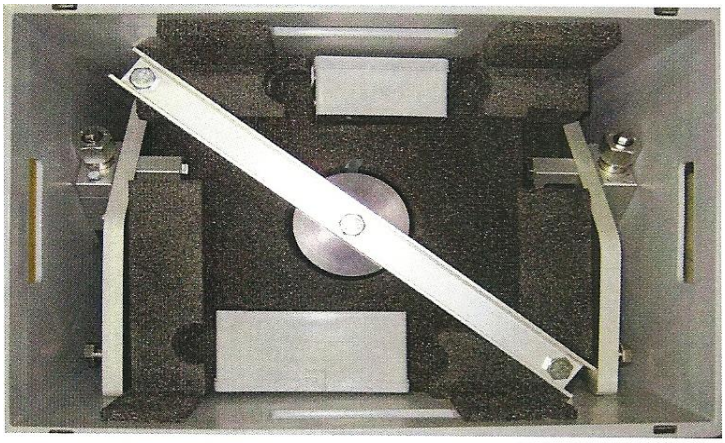
Quantity	Description	Article No

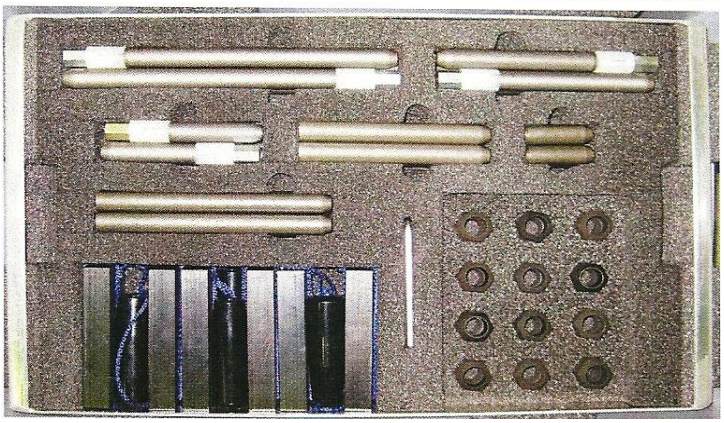
Box 20



1	**Stacking box 600x400x425mm**	IN5416
1	Mikroohmmeter "MOM600+" (2 pcs.)	IN3434 (SI)

Box 21

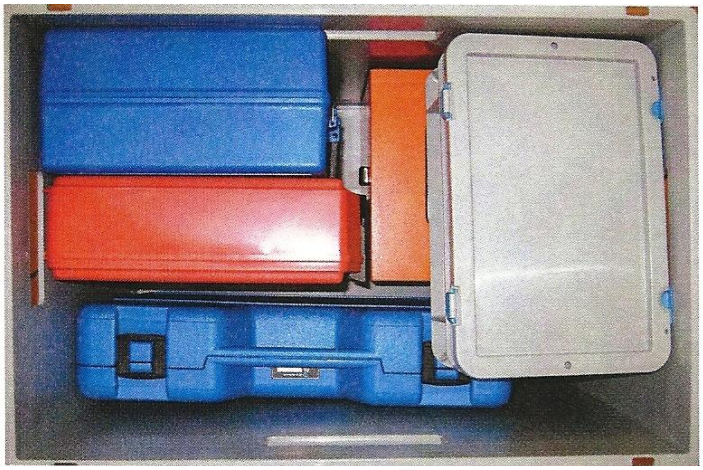


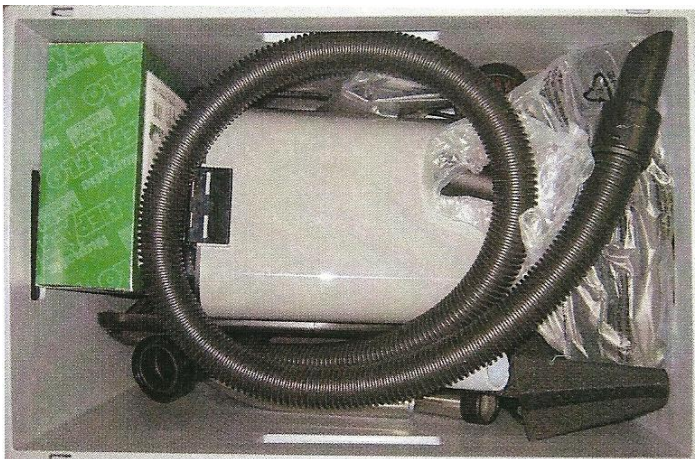


1	**Tool set "ELK3-420-NM08"**	**IN2216 (SI)**

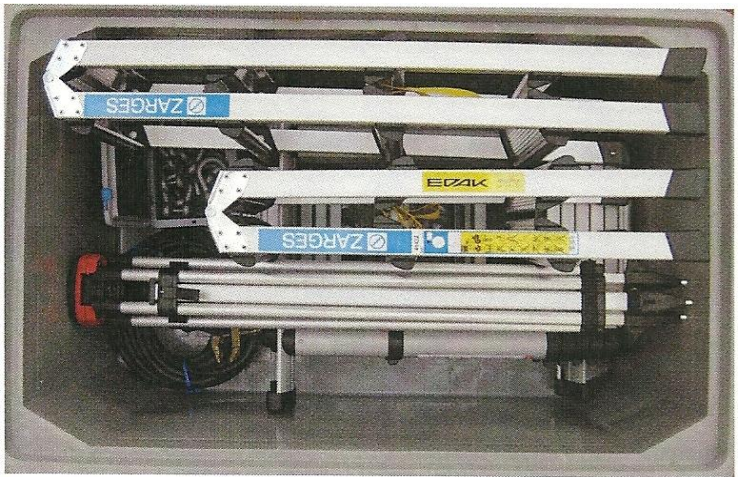
Quantity	Description	Article No
	Box 22	
		
1	Stacking box 600x400x425mm	IN6212
1	Safety belt - set	IN5203 (SI)
1	Density monitor test set ABB	IN4390 (SI)
1	Socket wrench set W' 8-34 / 4-14	IN1328 (SI)
1	Transit level "NA724	IN2042 (SI)
1	Analog/Digital Millimeter "METRAHIT ONE	IN3223 (SI)
	Box 23	
		
1	**Stacking box 600x400x425mm**	**IN6212**
1	Pressure gauge T 0-1000 KPA / "LE02/SF6"	IN6212 (SI)

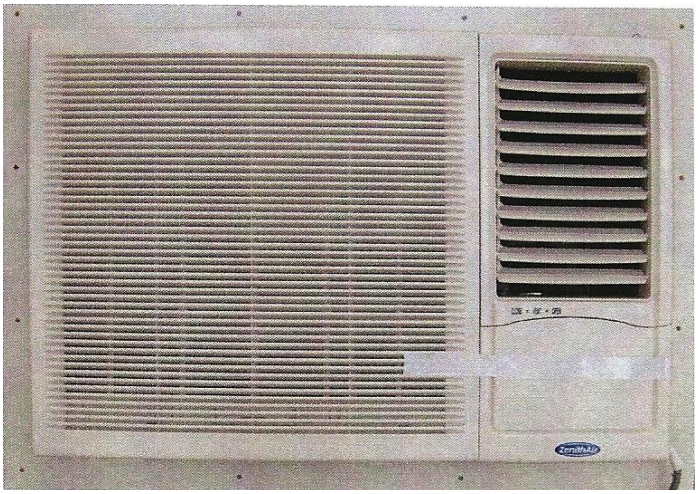
Quantity	Description	Article No
2	Pressure gauge 0-1000 KPA "LE02/SF6"	IN4325 (SI)
1	Pressure reducing valve "N2"	IN4335 (SI)
1	Service-Set "OILO/ONS-20"	IN4120 (SI)
	Box 24	
		
1	Stacking box 600x400x425mm	IN6212
	Empty, as spare storage place	
	Box 25	
		
1	Stacking box 600x400x425mm	IN6212
1	Pressure reducing valve "SF6"	IN4411 (SI)
1	Impact wrench "BOSCH GHS18E	IN4411 (SI)

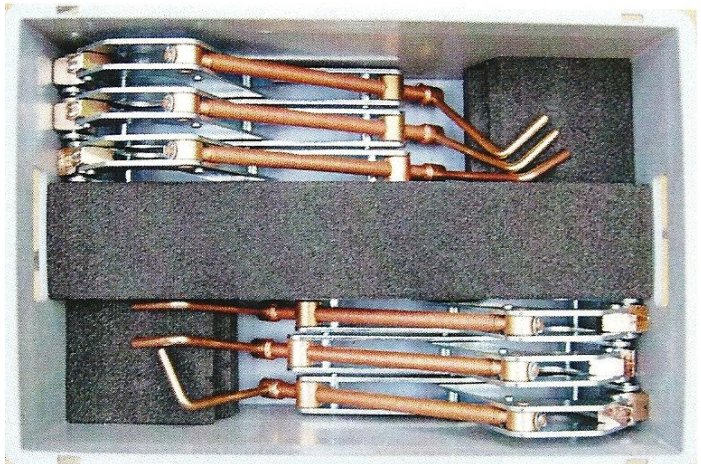
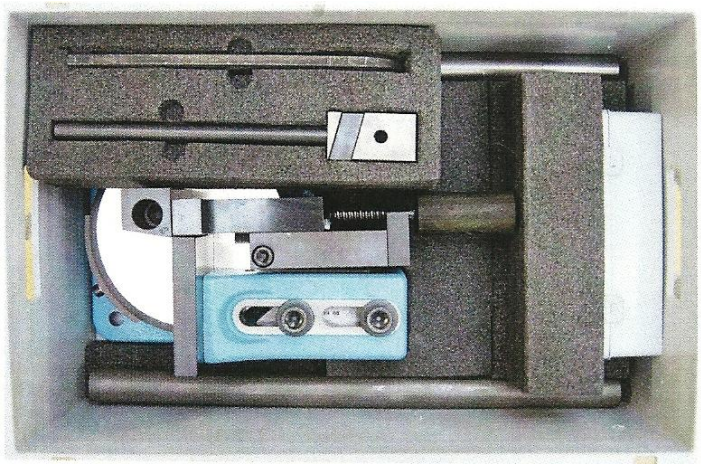
Quantity	Description	Article No
1	Sabre saw "BOSCH GST 120 E"	IN3226 (SI)
1	Laser leveling instrument "PML 32"	IN3356 (SI)
1	Laser measuring instrument "PO 42"	IN3353 (SI)
	Box 26	
		
1	**Stacking box 600x400x425mm**	IN6212
1	Protection cloth-set *"BG1/2"*	IN6212 (SI)
1	Protection cloth-set "BG3"	IN7322 (SI)
1	Vakuummeter "OIAVAC N	IN4332 (SI)
1	Leak seaker "L-790A"	IN4332 (SI)
1	Crimping tool hydraulic. "HT 51"	IN2618 (SI)
	Box 27	
		
1	**Vacuum cleaner "RSV 200"**	IN2618 (SI)

Quantity	Description	Article No
	Box 28	
		
1	**Vacuum cleaner "RSV 200"**	IN2618 (SI)
	Box 29	
		
	Stacking box 600x400x425mm	IN6212
1	Cable reel "220V/20M"	IN3122
6	Polyester roundsling "2M/G"	IN5431
6	Polyester roundsling *"3M/G"*	IN5431
1	Polyester strap 50 mm / 6M	IN5616
1	Polyester strap 50 mm / 8M	IN5618

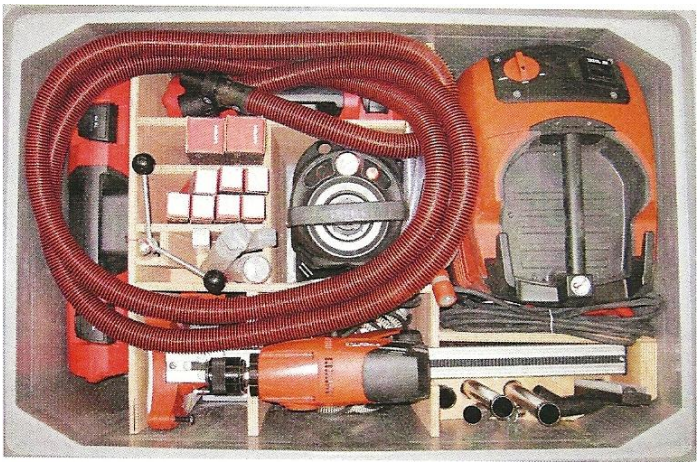
Quantity	Description	Article No
	Box 30	
		
1	Stacking box 600x400x425mm	IN6212
2	Cable reel "220V/20M"	IN3122
6	Polyester roundsling "4M/G"	IN3122
	Box 31	
		
1	Stacking box 600x400x425mm	IN3122
	(1) Foamed material 3 black	IN6003
1	Cable reel 50M/380V CEE 16A15x2.5	IN3125

Quantity	Description	Article No
	Box 32	
		
1	Dollie 1200x800mm	IN6233
1	Pallet box 1200x800x600mm	IN6233
1	Ladder 0.6M	IN6233
1	Ladder O.8M	IN5110
2	Ladder "TELESTEPS-KOMBI" 2.3M	IN5115
1	Shaft for transit level "NA724"	IN2042
1	Grounding-cable with locking plier 15M For earthing of the container	IN2042
1	Coupling "CEE 32-A" 380V 3L+N+PE For container connection!	IN2042
1	Plastic Box 300x200x11 0 mm	IN6241
4	Shakle 2.0 T	IN5513
4	Shakle 3.25 T	IN5514
4	Shakle 4.75 T	IN5515

Quantity	Description	Article No
	Box 33	
		
1	**Dollie 800x600mm**	IN6231
1	**Stacking box 800x600x425mm**	IN6224
	(1) Foamed material 3 black	IN6003
1	Air-Condition "ASS-C"	IN3006
	Box 34	
		
1	**Stacking box 800x600x220mm**	IN6224
	(1) Foamed material 3 black	IN6003
1 pair	Braces for air-condition "ABB-C"	IN3006

Quantity	Description	Article No
	Box 35	
		
1	**Dollie 800x600mm**	IN6231
1	**Stacking box 600x400x220mm**	IN6210
	(1) Foamed material 2 black	IN6002
6	Locking Pliers "KT 9"	IN1715
	Box 36	
		
1	**Bending device "HB20"**	IN2413

Quantity	Description	Article No
	Box 37	
		
1	**Stacking box 800x600x220mm**	**IN2413**
1	Extension Hose .Dilo", NW86M	IN4211
2	Extension Hose "Dilo" NW20	IN4215
	Box 38	
		
1	**Stacking box 800x600x220mm**	**IN6224**
	(1) Foamed material 3 black	IN6003
2	Puller 1.ST "CM-PULLER"	IN5314

Quantity	Description	Article No
	Box 39	
		
1	**Stacking box 800x600x220mm**	IN6224
	(1) Foamed material 3 black	IN6003
2	Puller O.5T "CM-PULLER"	N5311
2	Puller O.75T "CM-PULLER"	IN5312
	Box 40	
		
1	**Dollie 1200x800mm**	IN6233
1	**Pallet box 1200x800x600mm**	IN6232
	(1) Insert wood "22389"	

Quantity	Description	Article No
1	Diamond head drill "DD130/ VCU40"	IN3350 (si)
1	Rotary/Hammer Drill "HIL TI TE16-C"	IN3316 (si)
1	Rotary/Hammer Drill "HILTI TE70"	IN3370 (si)
1	Setting tool for bolts M16-24	IN2210 (si)



GIS Commissoning Test Kit

ELK 03 / 04 / 14



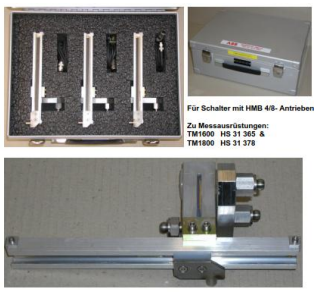
Equipped with tools and testing equipment's for commissioning of GIS ELK 03/ 04/ 14



Dimensions

Length / Width / Height	**2000 / 1100 / 1200 mm**
Weight	**850.00 Kg**
Country of Origin	**India**

Quantity	Description	Picture of Test Kit
1	Handtool for commissioning engineer	
1	973-SF6 Analyzer complete set	
1	SF6 Gas leak Detector Model : GIR-10 complete set	
1	Measuring Bridge "Metrahit 27M" with lead set	
1	10KV Insulation Resistance Tester complete set	
1	Fluke Digital Mulltimeter 179 1AC-II	

Quantity	Description	Picture of Test Kit
1	Omicron make CPC 100 with complete set of leads	
1	Omicron CT Analyzer with complete set of leads	
1	Breaker Analyser System TM1800 complete set	
1	SDRM 202 with complete set of cables	
1	Transducer set for HMB 4/8 complete	

Quantity	Description	Picture of Test Kit
1	CP CB 2 – Current Booster	
1	Motwane Make clamp on meter DCM 9930A	
1	AC/DC Leakage Current Clamp Meter	
1	Endoscope complete set	

ANNEXURE-220kV GIS Spares

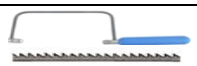
SN	Mandatory Spares for 220kV GIS	Unit	Quantity
1	220KV Gas Insulated Single phase voltage transformer with enclosure	No	1
2	220KV Gas Insulated Single phase Current transformer with enclosure	No	1
3	SF6 gas Pressure relief devices for 220kV GIS	Set	1
4	SF6 Pressure gauges cum switch or Density Monitors and pressure switches for 220KV GIS	Set	1
5	Trip coil assembly with resistor for 220KV GIS Circuit breaker	No	6
6	Closing coil assembly with resistor for 220KV GIS Circuit breaker	No	6
7	All types of control valves for SF6 gas of each type for 220KV GIS	Set	1
8	Locking device to keep the Disconnectors and Earthing switches in close or Open position in case of removal of driving mechanism for 220KV GIS.	Set	1
9	SF6 to Air bushing as applicable for 220KV GIS	No	1
10	Set of spares for local control cabinet including MCB, fuses, time relays, all type of auxiliary relay & contactors, lamps, semaphor, terminals, push buttons etc. for 220KV GIS	Set	1
11	Auxiliary contacts for 220KV GIS circuit breaker	Set	1
12	Limit switch & Auxiliary contacts for 220KV GIS DS and ES	Set	1
13	SF6 gas in steel bottle	Set	2
14	Spring charge motor for 220KV GIS circuit breakers	Set	1
15	Complete Drive single phase for 220KV GIS circuit breaker-	No	1
16	Complete drive mechanism for disconnect switches and grounding switches for 220KV GIS	No	1
17	Motor for disconnect switches and grounding switches for 220KV GIS	No	1
18	Complete drive mechanism for fast acting grounding switches for 220KV GIS	No	1
19	Motor for fast acting grounding switches for 220KV GIS	No	1
20	Rupture disc for circuit breakers for 220KV GIS	Set	1
21	Rupture disc for potential transformer for 220KV GIS	Set	1
22	Limit switch & Auxiliary switch for 220KV GIS	Set	1
23	Rupture disc for other compartments for 220KV GIS	Set	1
24	Bus supplort insulator for 220KV GIS	Set	1

Annexure-2A

General Tools under Purchaser Scope for 245 kV GIS				
Sr.No	**Tool/Equipment Name**	**Description（Photo and Specification）**	**QTY**	**Use For**
			245 kV	
A) General tools for Installation				
1	Transit Compass with Tripod	 Magnification x15 Min. Sight Dis. 0.8m	1	Floor Level Measurement
2	Surveyor with Total station	 Angle measurement, 5"/2" accuracy	1	Surveying,floor markings
3	Staff	 Length 2m Minimum Unit 1㎜	1	Floor Level Measurement
4	Water level	 Sensitivity 0.5㎜/m Scale Error ±0.1deg.	2	measurement of Unit level
5	Measuring tape	 Length 5m 10m	1 1	Measuring Length
6	Linen Measuring tape	 Length 50m	1	Measuring Length
7	Plumb Bob	 Strings : 5m Weight 100g	6	Locating Perpendicular
8	Pot for India Ink		1	Marking Centre Line on the Floor
9	India Ink	 Colour Black 100 ml	1	Marking Centre Line on the Floor
10	String	 Length 100 m	1	Marking Centre Line on the Floor
11	Safety Belt		5	Height Work
12	Scaffold	 W:1200-1800 D: 900-1200 H:1600-1700	4 Set	Around the GIS Foundation with 6m height & For GIB full length
13	Scaffold Floor	 W:1200-1800 D: 500-600	4 set	For platform on scaffold
14	Step Ladder	 H:1200 H:2000	2 2	High Location Work
15	Ladder	 H:3000	1	High Location Work
16	Leakage checker	soap water:350 g	3	for leak check

General Tools under Purchaser Scope for 245 kV GIS				
Sr.No	**Tool/Equipment Name**	**Description（Photo and Specification）**	**QTY** **245 kV**	**Use For**
17	Safety Rope (Nylon)	 Length 100m	1 set	Locating Safety
18	Chain Block	 Permissible weight 2000 kg 5000 kg 1000 Kg	4 4 4	Lifting
19	Lever block	 5 ton	2	Docking assembly
20	Wire Rope	 Φ16x10m Φ12x8m Φ８x6m	4 2 2	Lifting
21	Nylon Sling	 For 3000kgx８m For 5000 keg 5 m For 5000kgx８m	 2 2 2	Lifting
22	D Shackle	 Permissible weight 2000kg 5000kg	 4 4	Lifting
23	Truck crane	 Max capacity 50ton	1	For handling heavy equipment/GIS & GIB
24	Alternating Current Arc Welding machine with accessories	 Out Put 200A～300A	1	Arc Welding
25	Grinder	 For Grinder stone Φ180	1	Grinding Metal Surface
26	Sleeve Crimp	 for 100～250㎜㎡ wire Electrically Operated Hydraulic	1	Jointing Grounding Wire
27	Claw Bar & Nail Puller	 Length 400mm 800mm	2 2	Unpacking Transportation Wooden Box
28	Saw	 Length 400mm	2	Unpacking Transportation Wooden Box
29	Steel Hammer	Weight 1 pound 1/2 pound	2 2	Standard Tool
30	Adjustable Angle Wrench	 Length 200mm 300mm	2 2	Standard Tool
31	Open Ended Spanner	 L 30mm 36mm 46mm	2 2 2	Standard Tool
32	Double Ended Spanner	 L1 x L2 10x13mm 17x19mm 24x30mm	2 2 2	Standard Tool
33	Flash Light	 LED Type	2	Standard Tool

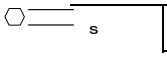
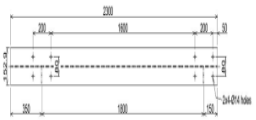
General Tools under Purchaser Scope for 245 kV GIS				
Sr.No	**Tool/Equipment Name**	**Description（Photo and Specification）**	**QTY** **245 kV**	**Use For**
34	Drill machine & Core cutting Machine with bits	 Diameter range 12-100mm	1	for drilling undisturbed holes and removing iron samples
35	Electrical Vacuum Cleaner	 For Wet & Dry 300W～400W	2	Cleaning of docking area
36	Thermo/Hydro meter	 Indication -10℃～50℃ 20%～98% Digital type	1	Measuring Temperature and Humidity
37	Dustproof Net/Tarpalin	 H5m x L10m	30	Dustproof Room for GIS & GIB
38	Vinyl Rope	 Φ6～Φ10㎜ X 50m	3	Dustproof Room
39	Blower (Exhaust type only)	 400W Φ280～Φ320	1	Ventilation
40	Cable drum	 length 30 m 220 V AC	2	for power supply

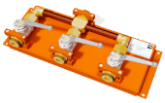
B) General Tools for Wiring				
1	Drill machine with bits	  20 to 50 Different Sizes	1set	For drilling holes on metal
2	Hacksaw	 200～250	2	For Cutting
3	Cable Stripper (with provision for adjusting length)	 0.9～5.0㎟ with stopper	2	Wiring
4	Crimp Tool	 0.5-6sqmm	2	Wiring
5	Crimp tool for Traffic	 0.25 to 6mm2 AWG -24-10 Crimp fox 6 phoenix	1	Wiring
6	Ferrule printing machine		1	for ferrule printing
7	Adjustable Wrench	 Length 16-88mm	2	For assembly
8	Cutter	 Length 100～150mm	3	Cutting
Note : the above items are standard general tools for GIS installation, if any project specific tools are required will be informed during or before the project executing stage				

Annexure-2B

ANNEXURE-A

Special Tools under TTDI Scope for 245 kV GIS

S.NO	DESCRIPTION	SPECIFICATION	QTY	PHOTO
1	Torque wrench (open spanner type)	M8 12N・m	1	
		M10 25N・m	1	
		M12 45N・m	1	
		M16 110N・m	2	
2	Torque wrench (box spanner type)	M10 25N・m	1	
		M12 45N・m	1	
		M16 110N・m	1	
		M20 220N-m	1	
3	Guide Bolt	M16	4	
4	Extension Bar	Length		
		M8 50mm	2	
		M10 75mm	2	
		M10 400mm	1	
		M12 100mm	2	
		M12 400mm	1	
5	Hexagon sockets			
		M8 6mm	2	
		M10 8mm	2	
		M12 10mm	2	
		M16 14mm	2	
6	Taper Nut	 Length		
		M16 30mm	6	
7	Conductor supports	Detachable Bus Bar	6	
8	Roller stack support beam		2	
9	Lifting Beams		2	
10	D-schakles	5-ton,10-ton capacity	12	
11	Screw Jack	5-Ton	2	
12	Screw Jack with claw	5- Ton	2	
13	Load Skates	Max Capacity-10 ton	1 set	

14	Tools Trolley	INHOUSE	1	
15	Gas Handling unit and adapters for connection to GIS	DILO	1	
16	Manifold		1	
17	Gas Leak Detector	DILO-3-033-R002, 11g/year	1	
18	SF6 Multi Analyser	3-038-R302-DILO 0 – 100 Vole-% sf6 gas concentration -60 - +10°C moisture So2 0 - 20 p.m. 0 - 100 p.m.0 - 500 ppmV	1	

B) General Tools Wiring

No	Discripton	Model/type		Photo
1	Crimp Tool	Type: 09 99 000 0888 Type:09 99 000 0379 1.5㎟~4㎟ **HARTING**	2	
2	Depressing Tool	Type: 09 99 000 0319 Pin Disassembly Tool	2	
3	High Voltage Test Kit	HIGH VOLT 550kV	1	As per project scope
4	PD Measurement monitor with cables	QUALITROL	1	As per project scope

1	Multi meter			1	Circuit measurement and voltage measurement
2	contact Resistance meter			1	Main circuit resistance measurement
3	Insulation Tester			1	Insulation resistance measurement
4	Operation Kit/Timing kit			1	For CB, Isolator & earth swith timing test
5	Power supply (optional)			1	For Operation test and functional test
6	break down volatge tester			1	for power frequency withstand voltage test on control circuit
7	CT analyzer			1	For CT testing

ANNEXURE-400kV GIS Spares

SN	Mandatory Spares for 400kV GIS	Unit	Quantity
1	400KV Gas Insulated Single phase voltage transformer with enclosure	No	1
2	400KV Gas Insulated Single phase Current transformer with enclosure	No	1
3	SF6 gas Pressure relief devices for 400kV GIS	Set	1
4	SF6 Pressure gauges cum switch or Density Monitors and pressure switches for 400KV GIS	Set	1
5	Trip coil assembly with resistor for 400KV GIS Circuit breaker	No	6
6	Closing coil assembly with resistor for 400KV GIS Circuit breaker	No	6
7	All types of control valves for SF6 gas of each type for 400KV GIS	Set	1
8	Coupling device for pressure gauge cum switch for connecting Gas Handling Plant	Set	1
9	Locking device to keep the Disconnectors and Earthing switches in close or Open position in case of removal of driving mechanism for 400KV GIS.	Set	1
10	SF6 to Air bushing as applicable for 400KV GIS	No	1
11	Set of spares for local control cabinet including MCB, fuses, time relays, all type of auxiliary relay & contactors, lamps, semaphor, terminals, push buttons etc. for 400KV GIS	Set	1
12	Auxiliary contacts for 400KV GIS circuit breaker	Set	1
13	Limit switch & Auxiliary contacts for 400KV GIS DS and ES	Set	1
14	SF6 gas in steel bottle	Set	2
15	Spring charge motor for 400KV GIS circuit breakers	Set	1
16	Complete Drive for single phase 400KV GIS circuit breaker	No	1
17	Complete drive mechanism for disconnect switches and grounding switches for 400KV GIS	No	1
18	Motor for disconnect switches and grounding switches for 400KV GIS	No	1
19	Complete drive mechanism for fast acting grounding switches for 400KV GIS	No	1
20	Motor for fast acting grounding switches for 400KV GIS	No	1
21	Rupture disc for circuit breakers for 400KV GIS	Set	1
22	Rupture disc for potential transformer for 400KV GIS	Set	1
23	Limit switch & Auxiliary switch for 400KV GIS	Set	1
24	Rupture disc for other compartments for 400KV GIS	Set	1
25	Bus support insulator for 400KV GIS	Set	1

LIST OF TEST EQUIPMENTS &
TOOLS & TACKLES
TO BE ARRANGED BY CONTRACTOR

ANNEXURE- A		
(LIST OF TOOLS & TACKLES TO BE ARRANGED BY CONTRACTOR)		
Sl. No.	**PARTICULARS**	
1	Electrical Drilling Machine & Hand drilling Machine.	
2	Hydraulic Bending Machine for Aluminium pipes suitable upto 5" IPS Al tube	
3	Gas Welding Set & Gas Cutting Set.	
4	Hand Operated Winches.	
5	Electric Welding machine.	
6	Jack with axle for lifting Cable Drum. (Power cables/Control cables/HV & EHV cables, as required)	
7	Jointers Tool Box.	
8	Blow Lamps.	
9	Compression Tools suitable for all type of Cables	
10	Pull Lifts	
11	Pulley Blocks	
12	Hooks/ Chains	
13	Cable Rollers.	- For HV/EHV cable laying.
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 Hg vacuum (In case 250 MVA/ 315/500 MVA transformer / Reactor, Oil filtration machine of 1500 GPH suitable for 760mm Hg Vacuum) equipped with fine filter of size 0.5 micron or less of oil to achieve the particle count of 10000 per liter of 4micron/as per OEM recommendation. and **50 kl or above capacity storage tank** for oil storage and processing of oil should be provided.	
20	Hydraulic cranes/Hydra crane/farana crane 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 / Cables	
22	Crimping tools for cable termination.	
23	Torque wrenches of different ranges in sufficient numbers.	
24	All general-purpose hand tools in sufficient quantities.	
25	Shearing Machine for cutting of Earthing Flat.	

26	Tool Kits for fitters.
27	Tool Kits 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 in sufficient quantity.
34	Tarpaulin in sufficient quantity.
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.
40	Scaffolding/staging material for platform for working on heights.
41	Man-Lifter machine (with suitable boom length for providing working platform for switchyard equipments including Circuit Breaker, Isolator, Surge Arrester, Transformer etc. as per project requirement)
IMPORTANT NOTES:	
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 indicative list only and any other tools & tackles as may be required by owner/BHEL at site during the execution of work shall have to be arranged by contractor.
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 equipment and tools & tackles mentioned in the annexures of section B as per requirement of project.
4.	For GIS projects, some other general tool & tackles may be required as per OEM requirement and the same have to be arranged by contractor.

ANNEXURE- B

(LIST OF TEST EQUIPMENT TO BE ARRANGED BY 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.5.0,E.6.0 & E.7.0 under** Section E of the tender specification for more details.

Sl. No.	TEST EQUIPMENT PARTICULARS	QTY
A	**GENERAL PURPOSE**	
1	Digital mustimeter - 4½ digits Accuracy ± 1% (Any reputed make - preferably Fluke - make)	4 Nos
2	Digital Insulation Resistance Meter 500V - 5kV, range 0.5 MΩ -10,000 MΩ (Any reputed make-preferably Megger make)	1 No.
~~3~~	~~Insulation Resistance Meter having voltage multiplier 0-500V-1000V, (Motorised / Electronic) Range 0.5 MΩ- 1000 MΩ (Any reputed make preferably Megger 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	1 No
7	Stop watch	1 No
8	Contact Resistance 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 or any other reputed make	2 sets
12	Variable D.C. power supply 0-250V DC, 10 A	2 Nos
13	4 pole Miniature moulded case breaker (range 16A/5A)	3 No
14	Capacitance meter having range 20 PF- 100mfd ± 1%	1 No
15	Isolation Transformer 1KVA, 240V AC, 1 phase, 50Hz	2 Nos
~~16~~	~~Digital Clamp meter of reputed make rating 200A AC/DC~~	~~2 Nos~~
17	Digital Clamp on Meter of reputed make rating 0-100A DC	1 No.
18	Digital Clamp on Meter 0-3000A, 50 Hz (Any reputed make).	1 No
~~19~~	~~Digital Tongue tester 0-20A, 600V AC, 50 Hz (Any reputed make).~~	~~1 No~~
20	Leakage Current Measurement Kit, 0-1A, 50Hz (Any reputed make).	2 Nos
21	Earth resistance tester	1 No
B	**FOR TESTING OF CURRENT TRANSFORMER**	
1	Primary injection test kit, range 0-3000A with a pair of leads	1 No

	& C clamps for testing of CT's	
~~2~~	~~Secondary injection test kit suitable for 5A& 1A with banana plug cable leads~~	~~1 No~~
3	CT analyser kit of Megger, Omicron or any reputed make	1 No.
C	**FOR TESTING OF OIL COOLED TRANSFORMER AND REACTOR**	
1	Transformer winding resistance test kit (WRM) of reputed make	1 No.
2	Capacitance and tan Delta kit suitable for 12KV (Omicron, Doble, Megger or any other reputed make)	1 Set
3	Transformer turns ratio meter	1 No
4	PPM tester for transformer oil	1 No
5	BDV tester for transformer oil	1 No
6	Sweep Frequency resonance analyser, any reputed make	1 No
7	CT analyser kit of Megger, Omicron or any reputed make	1 No
8	Particle Count Meter	1 No
9	Dew point meter Vaishala any other reputed	1 No
10	MCleoud Vaccume gauge	1 No
D	**FOR TESTING OF RELAYS INCL. DISTANCE PROTECTION**	
1	Automatic Microprocessor based Relay Test Kit with Two current (upto 12.5 A) and at least one voltage source (3x110 V AC) (Any reputed make- Preferably Megger or Omicron Make)	1set
2	~~CFB kit or equivalent - of any reputed make~~	~~1 Set~~
3	~~ZFB kit or equivalent - of any reputed make~~	~~1 Set~~
E	**FOR TIME MEASUREMENT OF CIRCUIT BREAKER**	
1	Three Phase Breaker Analyser kit (Timing kit) with graphical representation facility (Scope/Megger/other reputed make)	1 No.
2	DCRM kit with suitable transducer- Scope/megger/other reputed make)	1 No.
F	**FOR TESTING OF CVT & CIRCUIT BREAKER**	
1	Capacitance and tan Delta kit suitable for 12KV (Omicron, Doble, Megger or any other reputed make)	1 Set
G	**SAFETY / PROTECTIVE MEANS**	
1	Protective earth rod suitable for 11/33/66/132/220/400/765 AC yard or 800/1200kV DC yard, as applicable, having leakage current meter, 70MM² copper cables and C clamps (Any reputed make).	2 Nos
2	Helmets, hand globes and Any other personal protective equipment as required	
H.	**FOR PLCC EQUIPMENT (if not covered in OEM scope)**	

1	Digital time interval meter and frequency counter, 8 digits with frequency range 10 Hz to 10MHz.	1 Set
2	200Hz to 620 KHz Selective level meter.	1 Set
3	200Hz to 620 KHz Selective level generator.	1 Set
I	**FOR TESTING SURGE ARRESTER**	
1	Kit for third harmonic measurement	1 Set
2	Testing kit for surge counter	1 Set
3	Capacitance and tan Delta kit suitable for 12KV (Omicron, Doble, Megger or any other reputed make)	1 Set
J.	**FOR GIS (if not covered in OEM scope)**	
1	SF6 Leakage Detector	1 No.
2	Dew Point meter with gas pushback facility	1 No.
3	SF6 Gas analyser for purity measurement with pushback facility	1 No.
NOTES:		
1	Any other test equipment (s), apart from above list, as may be required by Owner / BHEL at site during the execution of work will be arranged by the contractor well in time.	
2	Quantities mentioned above are the minimum requirement. If further, any requirement during testing, the same shall be arranged by contractor without any further charges.	
3	The status of tools, plants and instruments mentioned by subcontractor in tender does not relieve the subcontractor of his responsibility to make available all the test equipment and tools & tackles mentioned in Annexure A&B as per requirement of project.	
4	The above list of Testing kit/ instrument are general list for projects, however, for GIS projects, special tools and plant along with testing kits/ instrument shall be arranged by BHEL/ GIS OEM, which shall be part of tender document for information purpose.	

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NEW DELHI

DOCUMENT No.	TB-XXX-316-040	Rev. No.	02		Prepared	Checked	App.
TYPE OF DOC.	STANDARD TECHNICAL SPECIFICATION			NAME	NK	DS	SN
TITLE	GI PIPE & BENDS			SIGN	Sd/-	Sd/-	Sd/-
				DATE			
				GROUP	TBEM	W.O. No	
CUSTOMER							
CONSULTANT							
PROJECT	RATE CONTRACT (ONE YEAR)						

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SCOPE AND SPECIFIC TECHNICAL REQUIREMENT

1.0 SCOPE

This technical specification covers design, manufacture, testing at works, packing and dispatch of 'GI 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 Galvanized Iron (GI) Pipe
The GI pipes shall be of nominal diameter 50 mm and/ or 100 mm, as per the indent. The pipe shall be of medium Grade as per IS 1239 and shall be of standard length of 6 meters. The pipe shall fully comply with specified standard and carry the BIS certification marking. The pipe shall have a socket at one end and threaded at both ends.

1.1.2 Sockets
The sockets shall fully comply with the requirements of IS 1239 (Part-2).

1.1.3 For Bends
The bends shall be of 90°, 112.5° and/ or Tee, as specified, for above mentioned pipes. The bends shall, in general, comply with the requirement of IS 1239 (part-2). The specific requirements and BIS certification marking of these bends shall be as per IS 1239 (Part-2). 90°, 112.5° and Tee bends shall have a socket at one end and threaded at all ends.

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS	
02	25.04.13				90° bends has been included.	
01	30.11.10	Sd/-	Sd/-	Sd/-	Document revised.	
Distribution				To	TBMM	OFFICE COPY
				Copies		

18. Office Furniture: (ANNEXURE-IV)

Office furniture shall be supplied & installed at each substation as per the list given below. All the furniture shall be of Godrej make. Before supply of the furniture to the sub-station, approval from OPTCL is required. Details of the scope of supply are as indicated below.

Sl No	Description of Items	unit	Quantity Required		
			At each 132/33 KV S/S	Applicable for Ersama 400/220kV	At each 220/33 KV S/S
1	5ftX3ft executive table with drawer both sides	Nos	5	6	5
2	3ftX2&1/2ft Table with one side drawer	Nos	7	8	7
3	Computer table suitable keeping monitor, CPU,UPS and printer with two nos revolving arm chair suitable for computer use.	Set	1	1	1
4	Executive revolving ,adjustable (height) chairs with arm	Nos	5	6	5
5	Cushion fixed "S" type steel chairs with arm	Nos	18	24	18
6	6ftX3ft conference table	Nos	1	1	1
7	Cushion arm steel chairs for conference table purpose.	Nos	6	8	6
8	6ft height steel almirah (only with selves) for keeping records and other valuable items.	Nos	4	6	4
9	6ft height steel almirah with glass doors for library purpose	Nos	2	2	2
10	6ft height (having minimum 6 lockers facility) steel cupboard with locking arrangement.	Nos	2	2	2
11	4ft steel rack (minimum three selves) for keeping the files and other items.	Nos	8	10	8

17. Other Tools and Plants (T&P's) Requirement:(ANNEXURE-III)

Following T&P's of reputed make shall be supplied & installed at each substation.

Sl No	Description of Items	unit	Quantity Required			
			At each 400/220 KV S/S	At each 220/132/33 KV S/S	At each 220/33 KV S/S	At each 132/33 KV S/S
1	Set of "D" spanner(6mm – 42mm)	Set	1	1	1	1
2	Set of "Ring" spanner(6mm – 42mm)	Set	1	1	1	1
3	Socket wrench with sockets, handles, and other attachment(6mm-42mm)	Set	1	1	1	1
4	Insulated cutting plier	Nos	2	2	2	2
5	Insulated nose plier	Nos	2	2	2	2
6	Monkey plier	Nos	1	1	1	1
7	Circlip plier	Nos	1	1	1	1
8	Pipe wrench a)12 inch – 1 no b)18 inch – 1 no	Set	1	1	1	1
9	Sly wrench a)12inch – 2 nos b)18inch – 1 no	Set	1	1	1	1
10	Insulated handle screw drivers of different sizes as per required a)12inch plain head – 2 nos b)8inch plain head – 2 nos c) 12inch star head – 1 no d) small size6inch plain and star head – 2 each e)Complete set of different head in one box/set -1set	Set	1	1	1	1
11	"L"-N keys set of different sizes in one box/set	Set	1	1	1	1
12	M.S Files(12inch and 6inch sizes) Round files and flat files-one each of different sizes)	set	1	1	1	1
13	Hammar with handle a)1 lb – 2 nos b)1/2 lb-2 nos c)2 lb-1 no	Set	1	1	1	1
14	Crow bar a)5 ft – 2nos b)3ft-2 nos	set	1	1	1	1
15	Steel scale(12inch)	Nos	2	2	2	2
16	Steel tape a)5 mtrs-2 nos b)30mtrs-1 no	Set	1	1	1	1
17	Oil cane	Nos	2	2	2	2
18	Spirit level (8inch)	No	2	2	2	2
19	Plumb head with string and attachment	No	1	1	1	1
20	Maintenance safety belt with all attachment and helmets(complete one set)	Set	3	4	3	3
21	Hand drill machine with different bits and key.(Wolf make)	No	1	1	1	1

BHEL, Transformers Business Group
Industry Sector
Noida-05

Sl No	Description of Items	unit	Quantity Required			
			At each 400/220 KV S/S	At each 220/132/33 KV S/S	At each 220/33 KV S/S	At each 132/33 KV S/S
22	Vacuum cleaner having hot blower provision with all attachments (Eureka Forbes make)	No	1	1	1	1
23	230-250VAC,80W,450mm sweep,1400 rpm stand(rugged) FAN Make: Almonard/,CGL/ USHA/HAVELS	No	4	4	2	2
24	Full Body Harness (Make:-Delta Plus/ DBI-Sala/ Karam)	No	5	5	5	5
25	PP Rope of different sizes(20 mm size) (Make:-Utkal/ Uttam/King Rope)	No	5	5	5	5

** T&P's shall be of Taparia/Geodre make. The hand drill and vacuum cleaner shall be wolf and Eureka Forbes make.

Procedure for transformer / Reactor Installation , Testing and Commissioning

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP- NORTHERN SECTOR

Rev.0

Procedure for transformer / Reactor Installation , Testing and Commissioning

Sl no.	Description	Remarks
A.	**On Arrival of Transformer Tank**	
A.1	Checking of Pressure, Dew point , IR of CC- CL - Tank	Record the values If tank pressure is zero then reports to Bhopal
A.2	Removal of Impact Recorder after placement on Plinth	Sent to Bhopal for review
A3	Before signing LR on receipt of material - Transformer shall be physically checked for any damage /physical abrasion during transportation	Remarks to be mentioned on the LR .
B.	**Installation work**	
B.1	Drum oil test - BDV, PPM, Tan Delta, Resistivity and IFT	Number of sample to be tested as per customer standard procedure.
B.2	Ensure the availability of drawing (OGA, Assembly drawing like cooler bank, aux system and other piping work, Part List etc.)	
B.3	Material Verification	Shortages to be reported to BHEL prior installation of work.
B.4	Turret CT and Bushing to be tested, Dry Air Generator Dew point level to be examined before raise the call for internal inspection	Bushing to be tested on variable frequency upto 391Hz. Reports to be submitted for clearance. PS class CT's ratio error@ 100%rating to be <0.25%
B.5	Internal inspection and Bushing erection a. Ensure crane availability b. Ensure Dry air generator to achieve dew point -60 c. Dew point measurement kit (Vaisala Make kit) d. Ensure CT ratio measurement kit for internal CT test	23T capacity crane or last boom capacity 2T and minimum 60 feet boom length)
B6	Transformer GT/ICT /ST /UAT / Reactor to be examined for any loose earthing / core locking arrangement /Wall shunts / clearance between the Tanks and Bushing leads . Transformer should be flushed with Hot oil and thoroughly cleaned before Boxing up of Transformer.	Any abnormality may please be reported to the Manufacturing BHEL Unit
B.6	**TESTING AFTER ERECTION - BEFORE DRYOUT** Testing of WRM and Turn Ratio (HV/IV, HV/LV, IV/LV at all taps - applicable for transformer)and SFRA	Reactor- WRM and SFRA ICT - WRM & Turn ratio and SFRA for Transformer Acceptance Limit - error should be less than 0.5% for turn ratio and WRM <2.5%
C	**PREPARATION BEFORE START OF ERECTION**	
1	**PIPEWORKS** -All pipe works shall be checked as per checklist before start of the work . Pipe work be thoroughly cleaned before Erection and if required flushed with oil	Cleaning and Flushing of the pipe work to be ensured before Erection
2	**CONSERVATOR** - Air cell of the conservator to be tested for leak test at 1 PSI / 0.07kg/cm2 for 1 hrs . Conservator without Air cell may be checked for 2 PSI for a period of 1 hr .After successful testing of Air cell and Conservator and MOG and changing the inspection cover "O Ring " - Erection of Conservator to be carried out .	In case of the any leakage noticed , concerned OEM Unit to be informed .
3	**RADIATORS/ COOLER BANKS** - All Radiator to be mounted are to be leakage tested as per BHEL standard protocol through Air pressure of 2 psi for 15 min (time span for soap solution test). This is followed by Flushing of each radiator for 15min with the Transformer oil as provided by BHEL Engineer in charge at site	Details to be filled as per standard protocol
C.	**Dry out of Transformer- (once WRM & turn ratio in Limit)**	
C.1	Cooling bank & Conservator must be isolated from main tank	
C.2	Leakage test at pressure upto 5 PSI for Main Tank after complete Box up of Transformer .	If test is cleared go for the next cycle of vacuum test .

Sl no.	Description	Remarks
C.3	Vacuum Test to be performed after successful leakage Test at vacuum (500-700mmHG)	Check for any leakage after 1 hrs and subsequent 0.5 hrs in 2 intervals .
C.4	Leakage test at vacuum (L1 & L2 method) between 1 to 2 torr in McLeod gauge	for PGCIL project . Calculate leakage rate (L2-L1)volume/Time) L1 is reading at start and L2 is reading at time duration. Leakage should be less than <100
C.5	1st Vacuum cycle for 72 hour after reaching 0.5 torr vacuum in McLeod Gauge	Continuous running of vacuum pump for 72 Hour
C.6	After 72 hour vacuum - fill the **N2/dry air cylinder** (prefably Nitrogen from cylinders) **of Dew point better than -60** at 0.25 to 0.35 kg / sq cm (3.5 to 5 PSI)	
C.7	Check the Dew point after 24 hour of N2 filling	Record the values, If dew point is -20 or below. Process of Heating +vacuum of main tank to be done.
C.8	2nd cycle of Vacuum for 48 hour after reaching 0.5 torr vacuum in McLeod Gauge	
C.9	After 48 hour vacuum - fill the **N2/dry air cylinder** (prefably Nitrogen from cylinders) **of Dew point better than -60** at 0.25 to 0.35 kg / sq cm (3.5 to 5 PSI)	
C.10	Check the Dew point after 24 hour of N2 filling	Acceptable value of dew point is -36 **(0.5 RH)** or better. If desired dew point not obtained then go for 3rd cycle of 48 hrs (depend on the 2nd cycle test results). Dry out cycle to be repeated till achieving Main Tank - active part dew point -36 **(0.5 RH)** or better.
D.	**Oil Filling and Filtration**	
D.1	Provision for Storage capcity of complete required oil to be filled in Transformer Tank in one go to be maintained. Oil of each storage Tank to be tested at Power grid Lab. Complete oil to be made ready before oil filling .	BDV, PPM, Tan Delta @90, Interfacial tension & Resistivity. BDV value -75 (Min) and PPM<5
D.2	Oil filling in the ICT / Reactor Tank to be done under vacuum to be maintained for 24-48 hrs prior to oil filling . Oil to be inside the Tank shall be at temp 40-50 degree . Complete oil fillingto be done in one go after achieving the required parameters	Before filling, oil to be tested for each storage tank in PGCIL approved Lab. BDV - 75 (min) and PPM <5
D.3	OLTC to be filled through Main tank and after filling equalizing link atatched during entire process may be removed.	After OLTC filling upto tank level. Equalising pipe to be remove and connect all pipe of OLTC
D.4	Remove the Dummy plate between cooling bank and main tank under B/F in closed condition	
D.5	Oil filling in cooling to be filled through bottom pipe line through main tank or cooling to be filled separately .	Oil to be filled under open condition of air plug in header pipe and all B/F of cooling bank.
D.6	Fill the Oil in conservator to be done as per standard comissioning process after completion of HOC process .	Follow OEM instruction for Conservator commissioning .
E	**Filtration and HOT Oil Circulation**	
E.1	Closed the B/F valve of Top/Bottom pipe of cooling bank if opened	
E.2	HOC to be done for min period of 72 Hour or more till achieving the PI value . Time of HOC shall be considered after reaching outlet oil temperature from ICT Tank /OTI/WTI Temp (60 degree) or as per recommendation of OEM. HOC period will be extended if PI value does not reach.	Ensure filter M/C outlet pipe (heated oil pipe) must be connected at bottom valve of main tank. PI to be taken in last 24 Hour. Inlet and outlet temperature to be recorded. Following PI to be measured at Regular interval of 4 hour. a. HV+IV+N /E+LV : PI >1.75 b. HV+IV+N/LV : PI>1.75 c. LV/E+ HV+IV+N: PI> 1.75

Sl no.	Description	Remarks
E.3	After clearance of HOC . Each Cooling bank to be filtered separately with minor opening of B/F of top pipe line to ensure breathing of oil through conservator. Minimum 8 Hour	Local BDV (>75) & PPM (<5) to be checked. Minimum 4 rotation of oil (calculation based on with 50% capacity of Filter M/C)
E.4	After completion of filtration of cooling bank, oil to be mixed with main tank. Filtration to be done for minimum 24 hours	All B/F of Top and Bottom to be opened.
E.5	Particle count test to be done when the Transformer oil is completely mixed and under motion .Fine filtration carried out with Filter Machine of 0.3-0.5 micron filters . While carrying out particle count Filter machine to be kept under throughout during the process of Particle count .	Under running condition of cooling bank pump. Particle count must be **maximum 4 micron, 10,000 particle count per liter** (i.e. ISO 10) Minimum three sample to be tested. For measurement (Oil qty 100mL in each measurement) to be taken under each sample with test duration of 4.5- 5min.
E.6	Complete Electrical test to be done. A. WRM & Turn Ratio as per factory test b. Bushing at variable freq & Winding Tan Delta Test c. Magnetic Balance /Vector group d. Magnetizing current e. SFRA test f. IR test of winding g. Short circuit impedance calculation . h. Floating point voltage calculation . i. Meaurement of Vibration in case of Reactor after charging g. Other Balance test as per PGCIL.	Testing kit with Calibration certificate is required. Test to be performed under electrical operation of OLTC tab.
E.7	Following oil Test to be done : sample to be taken from Tank Bottom & Tank Top 1. BDV , PPM, Tan Delta@90, DGA, IFT & resistivity 2. Any other test as per Power Grid contract	

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SECTION 2
INSTALLATION

2. INSTALLATION

2.1 RECEPTION AND ASSEMBLING OF TRANSFORMER / REACTOR DESPATCHED PARTLY DISMANTLED AND FILLED WITH NITROGEN.

To ensure that a Transformer will function satisfactorily it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

This section gives instructions how handling, lifting, storing and assembling should be carried out. For large Transformers it is recommended that the work is done by BHEL or is under supervision by experts from BHEL.

2.1.1 INSPECTION

In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damages etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loadings, and a careful investigation is therefore justified.

After the arrival of the material at receiving points, the customer should, in case of possible damage/loss of any component, make the necessary claims with the contractors representatives under intimation to BHEL so that such claims can be registered with the transport agents. Before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks verified (condenser bushings). If necessary, appropriate statements and claims should be made.

Drums containing oil which have been dispatched separately should be examined carefully for leaks or any sign of tampering. All drums are dispatched filled up to their capacity and any shortage should be reported.

In order to protect the active part against moisture, the transformer tank is filled with nitrogen during transport at an over pressure of 0.17 kg/ sq.cm (2.5 psi) approximately at room temperature.

Check immediately the gas pressure at the arrival. A positive pressure indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry.

If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/cm^2 (2.5 psi) without loss of time as per instructions given para 1.2.3

Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during the transport. Instructions for checking of the core isolation are given in clause 2.10

2.1.2 UNLOADING

Typical unloading arrangement of the transformer is shown in fig 2.1.

Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers/trolleys. For mounting of rollers refer roller mounting drawing included in Vol.I.

Alternatively for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc. can also be resorted to.

2.1.3 STORING

Dismantled equipment and components are packed to be protected against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages. Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar material. Oil drums should be stored in horizontal (lying) position with both the bungs also in horizontal position.

2.1.4 LIFTING

Lifting devices on the transformer tank are dimensioned for lifting of the complete transformer filled with oil. The positioning of the lifting devices, permissible lifting angles, minimum height to crane hook and transformer weight, appear from the OGA drawings. Check at lifting of complete transformer that the lifting wires/ropes are not in contact with bushing or other components on the cover. For lifting with hydraulic jacks, the transformer is provided with jacking pads dimensioned for lifting of complete transformer filled with oil. The positions of the pads appear on the OGA drawings. If active part is to be lifted refer instructions given in clause 2.7.

2.1.5 LOCATION AND SITE PREPARATION

a) Reactor shall always be placed on concrete plinth without rollers as per foundation plan drawing whereas transformer may be even placed with rollers. Therefore it is very important to refer foundation drawing before placing the transformer/reactor on final location.

b) Transformer/reactor should be placed on the foundation so that easy access is available all around and diagram plates, thermometers, valves, oil gauges, etc. can be easily reached or read. Adequate electrical clearances are also to be provided from various live points of the transformer to earthed parts.

c) ONAN type transformers/reactors depend entirely upon the surrounding air for carrying away the heat generated due to losses. For indoor installation, therefore, the room must be well ventilated so that the heated air can escape readily and be replaced by cool air . Air inlets and outlets should be of sufficient size and number to pass adequate air to cool the transformer. The inlets should be as near the floor as possible and outlets as high as the building will allow. Where necessary, exhaust fans can be installed for the purpose.

d) The transformers should always be separated from one another and from all walls and partitions to permit free circulation of air. In this connection reference is also drawn to IS: 10028 (Part II).

e) Where rollers are not fitted, level concrete plinth with bearing plates of sufficient size and strength can be adopted for outdoor transformers. To prevent the formation of rust, it is essential to avoid presence of air and water in the space between the plinth and the base of the transformer by use of cretex or similar bituminous compound.

f) Where rollers are fitted, suitable rails or tracks should be used and the wheels locked to prevent accidental movement of the transformer. Where walls are provided, it should be ensured that the transformer gets a good ventilation as mentioned above for indoor transformers. Provision should be made for the emergency drainage of the oil from the transformers (e.g. in case of fire in neighboring apparatus or bushing or the transformer tank), by surrounding the transformer plinth with sump filled with small pebbles.

2.1.6 INTERNAL INSPECTION AND CHECK POINTS FOR ASSEMBLING THE TRANSFORMER/REACTOR

(a) Check-points before starting assembly:

1. Conditions of leads.
2. Bracing, clamping of leads.
3. Connections.
4. Tap changer checks.
5. General conditions of insulation.
6. Core check that it has not moved in transit.
7. Core-ground; this is checked with the megger after removing earth connection.
8. CTs, including the secondary leads and their passage through metal parts.
9. Check that shipping frame for bushings have been removed.
10. Check that coil position has not moved in transit.
11. Check for dirt, metal swarf, moisture.
12. Check that the bushing leads set without being too close to ground or other points of different potential.

(b) Check-points during Assembly

By means of the Part list and the transformer/reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions. The following precautions are to be taken:

1. Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.
2. Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fire-protection personnel.
3. Smoking on or near the transformer shall not be allowed.
4. Transformer tank, control cabinet etc. as well as assembling and oil treatment equipment shall be connected with the permanent earthing system of the station.
5. Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.
6. All loose objects, tools, screws, nuts etc., shall be removed from the transformer cover before opening the connection and blanking lids.
7. All loose objects (tools, pencils, spectacles etc.,) shall be removed from the boiler-suit pockets etc. before starting the work through man holes.
8. Tools to be used inside the transformer/reactor -e.g. for tightening of screw-joints- shall be fastened to the wrist or another fixed point by means of cotton tape or string.
9. Tools with loose sleeves and tools with catches must not be used at work inside the transformer.
10. Greatest possible cleanliness shall be observed at work inside the transformer/reactor, and at handling of parts to be mounted inside the transformer.
11. Fibrous cleaning material should not be used as it can deteriorate oil when mixed with it.
12. All components dispatched separately should be cleaned inside and outside before being fitted.
13. A transformer/reactor is best protected from damp hazard by circulating warm, dry, de-aerated oil through it until it temperature is 5 °C to 100 °C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time transformer is open to atmosphere,
14. Oil pump & all joints in the oil pipe work should be airtight to avoid entrance of air through leakage joints.

15. The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushings, valves etc.
16. Objects which-despite all precaution are dropped inside transformer/reactor, must absolutely be brought up from the equipment.
17. Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank.

2.1.7 ASSEMBLY OF WHEELS

Mounting of wheels under reactor/transformer is to be done as per roller arrangement drawing. The reactor however in service, is to be placed on plinth with anti-earthquake fastening without rollers. Transformer placement can be with or without rollers as per applicable OGA/foundation drawing.

2.1.8 ASSEMBLY OF BUSHINGS

In case the bushings are mounted on turrets on the transformer/reactor cover, they are either delivered mounted on their turret or -in case of large bushings dismantled from the turrets. The turrets are often individually adapted; check therefore that they are re-mounted in correct places, which appear from the OGA drawing and ,part list.

Assembling of bushings is carried out according to bushings installation manual available. In case of draw rod / lead connection of bushing with transformer lead, half connector joint to be insulated with 3 layers of crepe paper after making proper connection.

2.1.9 ASSEMBLY OF VALVES

Valves which may affect the loading gauge, or will be subjected to damages, should be dismounted before delivery. Re-mount the valves as per the positioning appear from the OGA drawing and part list. The gasketting surfaces shall be cleaned well and new gaskets fitted. Check that all valves are closed.

2.1.10 ASSEMBLY OF COOLING DEVICES

Valves which are not dismantled like shut-off valves for radiators, coolers and possible headers shall be provided with blanking plates during the transport. Remove the blanking plates when the assembling of the coolers is to be started. Check first that the valves are closed. Check that each radiator and possible header is assembled in the correct positions according to OGA drawing. In case of OFAF or OFWF cooler mounting shall be done as per the relevant leaflet given in Vol.I

The shut-off valves against the transformer tank shall be closed until the oil-filling is started.

2.1.11 ASSEMBLY OF OIL CONSERVATOR

The conservator, which may be with or without aircell is assembled either on the transformer, or on a separate frame. Before the conservator is assembled it shall be checked that belonging equipment -e.g. Oil-level indicator -functions satisfactorily.

The breather is connected to the oil conservator, and it is very important that joints and couplings in the pipe between breather and conservator are air tight. Refer Clause 2.6 for detailed instruction for oil filling.

2.1.12 ASSEMBLY OF PIPE WORK

Pipes with flanges for connection of conservator, radiators, as well as pipes for equalizing of turrets etc. are mostly delivered completely ready for assembling according to OGA & part list. In certain cases -e.g. at a separately assembled oil conservator –certain fitting and welding of pipes and flanges on site is however required. Instruction for such assembly of external pipes is given in Clause 2.3. Before assembly, all associated pipework for cooler system/radiators to be physically inspected for the presence of any dirt/dust etc. and all visible dirt/dust to be thoroughly cleaned with clean cloth. Individual radiator/cooler and pipework to be flushed with compressed air followed by carrying out Pressure test on individual radiator/cooler Bank to check any leakages/damages before start of Erection at site

2.1.13 FLANGES, BLANKING PLATES

When re-mounting blanking plates, connection flanges etc., the gasketting surface shall be cleaned well and new gaskets fitted.

2.1.14 ACCESSORIES

Accessories like cooling fans, pumps, OLTC and components for supervision and control, oil-level indicator, flow indicators, gauges, Buchholz relay, PRV, thermometers etc. are assembled according to leaflet/description valid for the components (refer Vol. I).

2.1.15 CONTROL CABLING

Re-assemble the control cables according to the drawing of wiring system and connect the cable ends to terminal blocks in instruments, terminal boxes, junction boxes and control cabinets according to valid connection diagram.

2.1.16 GASKETS

The sealing system normally used against oil and gas in BHEL's transformers and belonging components has rubber gaskets in grooves and nitrile rubber bonded cork gaskets at other places. Refer clause 2.8 for general information and assembly instructions for gasket mounting.

2.1.17 OIL FILLING

The completely mounted Transformer is oil-filled according to directions in Clause 2.5 & 2.6. The oil shall be treated according to Clause 2.4. The lower and upper shut-off valves for radiators/coolers and possible headers shall be open during evacuation and oil-filling. If coolers are placed on suspension beams, which are mounted at right angle to the tank, the suspension beams shall be supported against the ground during the evacuation. Also radiators mounted on the tank wall shall be supported in a similar way. The hose for filling of oil is connected to the bottom valve of the transformer which must not be opened until the hose has been de-aerated and completely filled with oil.

2.1.18 CLEANING & PAINTING

The transformer and its equipment are cleaned carefully from dirt, oil, lubricating grease, and damaged surfaces are touch-up painted with the primer paints and finish paints delivered as per clause 2.11.

2.1.19 EXCHANGE OF BUSHING

When it is required at site to replace the Bushing (HV/ IV/ LV/ Neutral) due to reasons associated with the deviation in test results from the standard acceptable values or any other reason, following process to be adopted –

Close the Gate valve and Butterfly valve provided in the pipeline (80 NB) between Transformer / Reactor Main Tank and Conservator .

Drain out the oil from Transformer Main tank into the storage Tank up to the level of stress shield.

Fill the Transformer Tank with Dry Nitrogen, UHP grade of Dew point less than -50 or better, if the replacement is not planned to be carried out immediately after draining out of oil from Main Tank up to the required level.

While carrying out the replacement, release the filled in Dry Nitrogen inside the Main Tank (as mentioned in step 3 of replacement procedure). During replacement of Bushing keep the Transformer tank pressurized from continuous flow of Dry air of UHP grade of Dew point less than -50 or better in order to avoid the ingress of moisture.

Before replacement of the Bushing, carry out IR, Tan Delta and capacitance measurement test on the new Bushing's to be replaced. Replacement of the bushing shall be carried out after clearance of pre-erection test results from concerned Division.

Carry out the replacement of bushing as per BHEL standard procedure, in case of replacement of 400 KV HV bushing having half connector joint between bushing and winding lead at Turret level care shall be taken that hardware used should be of appropriate length and after connection the bolt used in connection shall not be protruded from profile of half connector.

During replacement the half connector joint between Bushing and winding lead shall be wrapped by three layer of Crepe paper with half overlap.

Carry out the profile inspection of winding lead entering inside the bottom of stress shield of Bushing replaced. Also take the photographs of winding lead profile after replacement for record purpose. In case of any doubt during bushing replacement contact concerned Service division.

All Nitrile rubber cord of the inspection cover opened during the bushing replacement needs to be replaced by new Nitrile rubber cord.

After replacement of bushing, apply vacuum in the Main Tank and start filling the filtered oil (as per BHEL standard) in the main Tank under vacuum .

Equalize the Main Tank and Conservator after opening the valves in the pipeline between Main tank and Conservator of Transformer (as mentioned in step 1 of the process).

Carry out the de aeration from Turrets, Bushing and Main Tank, cooler bank and if required carry out conservator commissioning as per site requirement.

After replacement carry out the Tan Delta and Capacitance measurement of the bushing replaced and provide the test results to BHEL.

2.2 STORING OF TRANSFORMER/REACTOR DESPATCHED FILLED WITH NITROGEN

2.2.1 STORING BEFORE COMPLETE ASSEMBLING

The storing place should be easily accessible for inspection and maintenance of the transformer. The bedding for the equipment should be larger than its bottom surface and dimensioned for the load. The transformer is placed on boardings or beams so that good ventilation is obtained underneath the transformer bottom.

Before storing, the transformer is inspected according to directions in Clause 2.1 "Reception and assembling of transformer/reactors dispatched partly dismantled and filled with nitrogen".

A transformer without remarks may be stored up to 6 months after arrival at the site without oil-filling. During the storing time, the inert gas (nitrogen) filling shall be maintained and pressure regulated, so that exposure of active part to atmosphere is avoided. If the storage time is judged to exceed 6 months, the transformer should be provided with oil conservator including oil-level indicator and breather, and oil-filled according to Clause 2.5. "Oil filling under vacuum". Certain valves must be re-mounted to enable the oil-filling being carried out. Furthermore, at the time at oil-filling of a completely assembled transformer, certain rules in Clause 2.5 & 2.6 must be complied with absolutely.

The oil quality should also be periodically monitored. If for some reason, oil filling cannot be carried out after a storage period longer than 6 months, the nitrogen pressure shall be maintained and supervised carefully. If the storage time without oil exceeds 18 months BHEL should be consulted about measures to be taken.

Wherever it is desired to keep the transformer energized at a low voltage so that its temperature is higher than the ambient temperature, the low voltage may be applied to LV winding with other winding in open circuit or short circuit conditions depending upon the current to be fed. However, before energizing the transformer, protection system of transformer (including electrical protection) must be checked. It may also be ascertained whether partial cooling is required in this case.

2.2.2 STORING OF COMPONENTS AND ACCESSORIES BEFORE COMPLETE ASSEMBLING

Independent of the duration of the storing time, the directions below apply for dismounted components and accessories, as well as for material to be used in connection with the assembling work.

(a) Storing indoors

In such a room, the following articles should be stored:

1. Insulation material as paper, pressboard, Bakelite, wood, cotton tape etc.
2. Insulated details as paper-insulated conductors, pressboard insulated shielding bodies etc.
3. Chemicals as solvents, glues, varnishes, hardeners etc.
4. Breathers, drying agents.
5. Terminal boxes, connection boxes, control cabinets.
6. Gas relays, oil-level indicators, thermometers, pressure valves etc.
7. M Box, OLTC motor drive, Fans, Pumps, Instruments & fittings. (Heating elements provided shall be connected to supply)
8. Online DGA, Online moisture removal system, sudden pressure relay, Conservator isolation valve

(b) Storing outdoors

The below components may be stored outdoors. They should be placed above ground and covered with tarpaulin etc.

1. Oil-conservator with blanking plates for all openings.
2. Radiators and coolers with blanking plates for all openings.
3. Structures, A frames, Pipe supports, Supports for oil-conservators, radiators, control cabinets etc.

2.2.3 SUPERVISION

During the storing time, the storing place, transformer/reactor components and accessories are inspected regularly. Tap changer if provided should be operated at 6 monthly intervals. Two or three runs from one end of the range to the other and back are sufficient. Observations, readings, measures and dates should be noted and BHEL should be contacted for directions about possible measures. Check at even intervals -and further more at weather changes as rain, storm, frost or thawing the foundation material (boardings, beams etc.) and the condition of the ground.

Inspect the transformer/reactor periodically with regard to possible external faults and/or rust-damage.

Check also that screws and nuts in sealing joints (covers, lids etc.) are tightened. Check every second week that the connected-in heating elements in control cabinets function.

If the Transformer is inert gas filled, one shall check every second week the overpressure or inert gas consumption.

2.3.7 RADIATORS/COOLERS

The positioning of the radiators/coolers is indicated on OGA drawing. These are positioned so that the highest point of the oil-pipe system is always positioned below the bottom level of the conservator.

The pipe system is provided with filter valves at the start and finish to enable pumping the oil through the system.

All places where air may be collected are provided with air release plugs/ valves.

2.3.8 RADIATORS/COOLERS PIPES

The pipe having dimensions as per OGA drawing and may be provided with weld-flanges, expansion joints. No pipe part is allowed to be so long that internal inspection and cleaning will be difficult.

The pipes shall be placed so that air release plugs will be positioned at the highest point of the pipe part. The pipes shall be painted internally with a yellow, oil-resistant paint and externally according to the paint as per specification.

2.3.9 SHORTING LINKS / EARTHING STRIPS

All shorting links on tanks, turrets and fittings to be provided as per OGA

Note – 2: The documents, relevant to Oil, are prepared based on the IEC standard applicable as on October-2016. If user wants to refer the latest standard applicable, the confirmation shall be obtained from manufacturer.

Note - 3: For Mixing of oil, please refer IEC: 60296. Please ask the OEM, before mixing the oil.

2.4.3 HANDLING

Transformer oil should be carefully handled at site to ensure satisfactory service. Drums used for transport and storage should be kept under cover. In practice owing to contamination in the containers, difficulty may be experienced in maintaining the purity of the oil when it is transferred from one vessel to another, and once a vessel or drum has been filled with moist oil it is extremely difficult to clean. Drums should be clearly marked to indicate whether they are for clean or for dirty oil and should be reserved for the type indicated.

Oil drums should be stored at site preferably on pallets or Bricks layer, in horizontal position, with both the bung closures horizontally opposite (in 3 & 9 o'clock position) so that ingress of moisture is prevented. It is always recognized that storage of oil in drums is not always satisfactory, particularly when oil is stored in drums which have been bent or otherwise damaged in transit or storage, and the transfer of oil from such containers to electrical equipment should normally be through a suitable treatment plant.

In substations with fixed oil handling equipment like oil storage tank, the pipe work from the clean oil tank to the electrical apparatus should be kept clean and free from moisture. Where portable oil handling equipment is used, flexible pipe work and hand pump should be carefully inspected to ensure that they are free from dirt and water and should be flushed with clean oil before use. If the clean oil is being used from drums, it should have been recently tested and filling orifices of the drums should be clean. Hoses used for clean oil and dirty oil should be clearly marked and provided with plugs for sealing the ends when not in use.

Special care must be taken for oil filtration machine, which is used during treatment of oil. It is to be ensured that there is on residual quantity of oil left in oil filtration machine. The paper filters or centrifuges used with filtration machine shall be cleaned or replaced periodically as per supplier's recommendation. The pipe/hoses used with filtration machine should be properly blanked after use.

Before using oil tankers and filtration plant for handling of oil, the internals/chambers need to be thoroughly cleaned using good transformer oil so that the residual of earlier used chemical/oil is removed totally.

2.4.4 RECONDITIONING

Transformer oil is usually contaminated during handling, transport and storage due to ingress of moisture and solid impurities. Hence, oil shall be vacuum filtered separately at 50^0C to 60^0C using a suitable filtration machine and a spare clean tank before filling in the transformer. Details of filtration are given in Clause 11 of IEC: 60422-2013. Oil treatment shall be terminated when the following parameters are attained.

Table 2.1

Sl. no.	KV Class of the transformer	Recommended Permissible limit	
		Electrical strength (BDV) in kV (min)	Moisture content ppm (Max)
1	Upto 170 kV	65	15
2	245	70	10
3	420 to 765 kV	70	05

Storage Tank oil shall be tested for Electrical strength (BDV)/ Moisture content and Tan delta from NABL accredited lab / CPRI / ERDA/NETRA . Test Results carried out on Units mounted on filtration Machine will not be acceptable. Storage tank shall be as per typical arrangement shown in Fig 2.2 Electric strength and moisture content shall be determined following the test procedure of IEC: 60296-2012.Final oil test also needs to be carried out through NABL accredited lab / CPRI / ERDA

2.4.5 Evaluation of mineral insulating oil in new equipment

After reconditioning, Insulating Oil is filled into Transformer/ Reactor. As the oil comes into contact with insulating and other materials, it can no longer be considered as “unused oil” as defined in IEC 60296-2012. Therefore its properties are regarded as those applicable to oil in service, even though the electrical equipment itself may not have been energized. Oil properties should be appropriate to the category and functions of the equipment (see Annexure- 4.3).

The extent of the changes in properties may vary with the type of equipment due to the different types of material and ratios of liquid-to-solid insulation, and should be within the limits of Annexure- 4.3. Properties not included in Annexure- 4.3 (with the exception of oxidation stability for which no in-service limits have been established) should be within the limits of IEC 60296-2012.

2.5 OIL FILLING UNDER VACUUM

2.5.1 APPLICATION

Transformers and Reactors with vacuum-proof tanks shall be filled with oil according to this method.

2.5.2 STORING TIME

Generally it applies that Transformers and reactors which during transport are filled with dry nitrogen on arrival at the site shall be evacuated and oil filled. Before storing, the equipment shall be inspected according to the directions given in Clause 2.1 "Reception and assembling of transformer/reactor dispatched partly dissembled and filled with nitrogen". During the storing time, overpressure shall be maintained, and nitrogen consumption checked according Clause 2.2.

2.5.3 FLOW CHART FOR HANDLING

In Annexure 2.1 is given a flow chart of handling procedures. The pressure should be measured at different times. The pressure is OK if it is maintained according to instructions given in Clause 2.2. Reference is also drawn to para 9.0 of IS: 1866 regarding handling and filling of oil.

2.5.4 UNITS

Annexure 2.1 gives the relation between different units.

2.5.5 PROCEDURE OF DRY OUT BY N2 / ASSOCIATED HEATING METHOD

For effective and faster removal of moisture from Transformer / Reactor, method of dry out by vacuuming followed by N2 filling and if required heating is to be adopted. The detail procedure are as under

2.5.5.1 FIRST CYCLE

(i) Blank all the openings on the Transformer / Reactor Main Tank. Transformer / Reactor Main Tank is than subjected to vacuum up to 1.00 torr (1 mm of Hg) to be pulled and maintained for 72 hrs duration. During this first dry out cycle leakages if any observed in the system to be attended and rectified in this cycle.

(ii) After vacuum cycle Dry Nitrogen of dew point more than -60°C or of UHP grade (purity 99.9999%) to be pushed in Main Tank under vacuum till Min. pressure of 2.0 psi is achieved in Transformer Main tank. The Transformer Tank is to be kept pressurized for a duration of 24 hrs.

(iii) At the end of Nitrogen pressure cycle of 24 hrs, measure dew point values and recorded as dry out values of first dry out cycle. Moistened N2 inside transformer tank will be removed during second dry out vacuuming cycle.

2.5.5.2 SECOND CYCLE

(i) Again start vacuuming of Transformer Main Tank up to 1.00 torr (1 mm of Hg) and vacuum is to be maintained for 48 hrs in second dry out cycle.

(ii) Dry Nitrogen of dew point more than -60°C dew point or nitrogen of UHP grade (purity 99.9999%) is again pushed inside Main Tank under vacuum till pressure of Min. 2.0 psi is achieved in Transformer Main Tank. The Transformer Tank is to be kept pressurized for a duration of 24 hrs.

(iii) Measure dew point after 24 hrs in second N2 cycle and record these dew point values as dew point values of second dry out cycle and refer these values with BHEL standard norms or contact concerned Services Deptt..

(iv) If the dew point values of second cycle is in line with the BHEL Standard norms, Transformer is cleared for further vacuuming followed by filling of filtered oil under vacuum and carrying out Hot Oil Circulation process.

(v) In case desired value of dew point is not achieved than Transformer tank is to be again subjected for vacuum pulling for 24 hrs, followed by N2 filling for duration of 24 hrs. After each dry out cycle measure the Dew point values and compare with BHEL standard norms.

As per BHEL standard norm's minimum 2 Dry out cycle of Transformer has to be carried out before filling of filtered oil under vacuum in Transformer Main Tank.

Note: If the dew point values were not achieved as per BHEL standard norms in 2 dry out cycle and higher content of moisture was noticed as per Dry out process carried out in 2 cycle, than further Dry out process shall be carried out in consultation with BHEL Transformer Services Deptt.

However for improving Dry out values it is suggested that Nitrogen Dry out cycle associated with heating cycle shall be carried out. In this process after vacuuming cycle pressurized Dry Nitrogen in Main Transformer Tank shall be heated externally to raise the temperature of Transformer upto 55-65°C during 24 hours duration followed by measurement of Dew point after completion of heated Nitrogen Dry out process. These Dew point values shall be compared with BHEL standard norms and the process of vacuum followed by insertion of Dry Nitrogen and heating is to be repeated till the dew point values were not achieved as per BHEL standards.

The equipment required for vacuum treatment and oil-filling under vacuum should generally be as per Annexure 2.2. The transformer tank and electrical terminals shall be earthed for safety reasons.

No electrical test on the Transformer is permitted during the evacuation.

Fig. 2.3 shows a typical example of pipe work and valve positioning.

2.5.6 OIL FILLING

2.5.6.1 OIL QUALITY

The transformer/reactor shall be filled under vacuum with oil which has been purified and degassed according to Clause 2.4

2.5.6.2 OIL FILLING IN MAIN TANK

For main tank, the oil shall be heated to a temperature of 50°- 60°C measured at the filter outlet valve. The pressure during the filling shall be max. 1 torr. During the oil-filling, a transparent plastic tube (5) can be used as an oil-level gauge. The tube which

should be a wall thickness of 5-8 mm, may be connected to a top and a bottom valve on the transformer.

Oil-filling of the tank is done through valve (12) at a low level on the transformer and at a maximum rate of 4-5 kL/hour. The pressure in the oil pipes shall be kept positive and shall be checked by a manometer 13 (if provided).Oil filling to be done as per cl. 2.6.9.

For oil filling in diverter switch assembly of an OLTC refer leaflet (Vol.1).

Separate vacuum-proof cooler system/radiators can be evacuated for about 1-2 hours and filled separately with purified and degassed oil. The oil is then circulated through the vacuum filter at least twice via drain valves as near as possible to the transformer. Oil circulation is considered completed until the oil parameters as per table 2.3 is achieved. Care should be taken to keep all air release plugs and valves open to allow escape of trapped air during oil filling operation. These valves/plugs should be closed after completion of oil filling.

2.5.7 HOT OIL CIRCULATION/ DRYING OUT, OIL RINSING, PARTICLE REDUCTION AND PARTCLE COUNTING

To facilitate oil-penetration and absorption of possible gas bubbles, the temperature of transformer shall-after completed oil-filling-be increased by circulating the oil through the vacuum filter and with circulation direction according to Fig. 2.4.

The oil will be circulated through a high vacuum filter machine at 57 °C to 60 °C of transformer oil temperature for minimum 3 days. The start time for hot oil circulation is considered after achieving the stabilized temperature of oil i.e. Inlet and out let oil temp difference should not be more than 3 degree and the Oil temperature to be achieved in the process is between 57- 60 degree centigrade and record the IR value at an interval of 4 hrs after achieving the stabilized oil temperature values. Also record the IR value along with temperature, vacuum of M/c & IR value till oil parameter achieved as per table 2.3. Polarisation Index should be preferably more than 1.75. Other than this limit please refer the case to BHEL Bhopal.

TABLE 2.3

kV Class of Transformer	Recommended Permissible Limits			
	Electric Strength (BDV) in kV (min)	Moisture Content ppm (Max)	Resistivity * at 90°C (Ohm-cm)	Tan delta* at 90°C
Upto 170	60	15	$1x10^{12}$	0.005
245	70	10	$1x10^{12}$	0.005
420 & above	70	5	$1x10^{12}$	0.005

* Subject to availability of testing facility at site.

Method of test for Electric Strength and moisture content shall be as per IS: 335. / IEC-60296

CAUTION:

The temperature during oil circulation should not increase beyond 70°C otherwise this may cause oxidation of oil.

For transformer & reactor of 400 kV class or above, after completion of the hot oil circulation in main tank and cooler/radiator system separately, the valves between main tank and cooler/radiator system to be opened to allow the mixing of oil. The oil rinsing shall be carried out by connecting transformer/reactor to the oil rinsing plant connected with particle counter. Initially the oil inlet is connected to the lower portion of the tank and the outlet to the upper portion and start rinsing plant for circulation and creating turbulence of oil for approx. 1 hour. Thereafter the connection to be reversed (Oil inlet to the top of tank and oil outlet to the bottom of tank) and start rinsing plant. This process to be continued till the 3 consecutive readings at the interval of 1 hour of particle content of the insulation oil is achieved as per below:

If measured with particle counter which works on ISO 4402 and ISO 4406:1987	≥ 2 microns cumulative particle count should be <10000 particle/litre
If measured with particle counter which works on ISO 11171 and ISO 4406:1999	≥ 4 microns cumulative particle count should be <15000 particle/litre

Relevant ISO count for 4 Micron particle is in the range of 10.

2.5.7.1 SAMPLING

Oil sampling at various stages shall be done in accordance with IS: 6855 / IEC-60475. When samples are taken from transformer tank, oil will be drawn from Top & bottom of the tank. When it is desired to know gas content and composition of dissolved gases in transformer oil before commissioning for reference purposes (required for interpretation of Dissolved Gas Analysis results during service), sampling shall be done as per IS 9434 / IEC: 60567.

2.5.8 STANDING TIME

Standing time is the time between 'finished oil circulation' and 'energization'. The time appears from table 2.2.

2.5.9 FINAL OIL FILLING OF TRANSFORMERS/REACTORS DESPATCHED OIL FILLED.

Smaller transformers/reactors are often factory-filled with degassed oil up to about 10% below the cover and transported in this condition. The final filling up to the correct level in the conservator is made at site.

2.5.9.1 TRANSFORMERS / REACTORS WITH SYSTEM VOLTAGE < 36 KV

Previously degassed oil (e.g., at the factory) stored in tight drums may be used for the filling. Check the dielectric strength of the oil which should be as per Clause 2.4.4. If accepted, the oil is pumped into the conservator and in this way fed into the transformer / reactor. To prevent any free water in the drums from entering the

transformer / reactor the opening of the suction tube must lie 0.1 m above the lowest point in the drum. A suitable valve on the cover and/or valves or upper tightening nuts at the bushings have to be opened for complete removal of air below the cover and in the bushings. When the oil is seeping out at these points, shut the valves and tighten the nuts at the bushings.

2.5.9.2 TRANSFORMERS/REACTORS WITH SYSTEM VOLTAGE > 36 KV

The filling is performed as described above, but at least a paper filter must be used for drying the oil.

2.6 OIL FILLING INSTRUCTIONS FOR CONSERVATORS WITH AIR CELL

2.6.1 INTRODUCTION

In all transformers specially in high voltage class, maintenance of insulating oil notably its dielectric property forms one of the determining factors of reliability of equipment in service. Oxidation and contamination of transformers/reactor oil can be avoided in a simple and effective way by use of above oil preservation system. The complete system is known as "Conservator with Air Cell". In this oil preservation system a flexible air cell made of oil resistant

Nitrile rubber is placed inside the conservator and floats on the oil surface. The air cell inflates or deflates as the oil level in the conservator falls or rises depending on the ambient temperature and load on the reactor. The inside of the rubber bag (Air Cell) is put into communication with atmosphere by means of a silica gel breather which ensures dry atmosphere inside the air cell. In addition to the above this system provides following advantages.

i. It avoids saturation of absorbed gases.

ii. As no gas is used in this system, which operates at constant pressure, this formation of gas bubbles at low ambient temperature and load is eliminated. The system thus preserves the oil quality particularly its dielectric properties.

The conservator with air cell is provided with a magnetic oil gauge having one electrical contact. The indication shown on the dial physically corresponds to the oil level in the conservator which is due to balance of static pressure between the oil of the conservator and the atmospheric air inside the air cell. This system is also provided sometimes with a set of pressure and vacuum valves. These valves operate to pass either oil or air in the event of over filling or under filling the conservator during installation.

When oil is to be filled by taking vacuum through conservator refer section 2.6.9 whereas when conservator is to be isolated during oil filling in transformer refers section 2.6.2. For deciding the applicability of either process consult OGA drawing / BHEL representative

2.6.2 DESCRIPTION OF OPERATION

Figure 2.5 indicates the general arrangement of oil preservation system. The oil connection between conservator and transformer tank is made through Buchholz relay and valves are provided in between.

The flexible air cell is connected to the top of the conservator through gasket joint. Under normal condition air cell is completely surrounded by oil and floats in the conservator. The air cell inflates/deflates as the oil volume changes. The float of the MOG which is always in contact with under side of the air cell moves up and down and indicates the oil level. The cell will sink in the remote event if it is damaged and MOG alarm will operate. The conservator then functions as a conventional conservator without affecting the performance of the transformers/reactor.

2.6.3 INSTALLATION

This system is shipped separately from main tank. The air cell is shipped fitted in the conservator. A low positive pressure of less than .07 kg/sq.cm (1 psi) is maintained to avoid excessive movement of air cell in the conservator during transit. MOG is also shipped fitted on the conservator. Install the conservator and associate parts except breather as per transformers/reactor outline drawings and assemble oil pipe work.

2.6.4 OIL FILLING

The following procedure is recommended.

i. Close and blank the valve (14) to isolate the conservator from main tank. Fill the oil in transformer under vacuum upto Buchholz level as per instructions given elsewhere. '

ii. After filling the oil in transformer and breaking the vacuum, oil can be filled in the conservator either through reactor or by drain valve (4).

iii. Remove the inspection cover (11) provided on the side of the conservator and check the air cell assuring that it is inflated. The air cell must remain in fully inflated condition during oil filling operation. If the air cell is found deflated fit the inspection cover and inflate the air cell with dry air/nitrogen gas to 0.035 kg/sq.cm max. through connection (8). A gauge may be put by removing plug (10). After filling close these connections.

iv. Remove air release plugs (5) (6) and (7) provided on top of the conservator.

v. Slowly pump the oil through the main reactor/drain valve (4). Temporarily stop filling operation when oil starts coming from opening (5) and (6) after ensuring that no air bubbles come out through these air release holes. Fit the two air release plugs.

vi. Continue oil filling till oil start coming from air release plug (7) stop oil after ensuring that no air bubbles come out. Fit the plug (7).

vii. Now release the air pressure held inside the air cell from point (8) and continue oil filling until magnetic oil gauge (3) indicates 35°C level.

viii. Remove oil pump and connect air cell to breather (9) from point (8). Also remove pressure gauge and put plug (10).

ix. The system is now properly filled. Air release plugs (5), (6) and (7) are fitted in normal operation.

2.6.5 PRECAUTIONS

i. Oil filling in the conservator and also draining whenever required must be done very slowly. During oil filling, pressure in the air cell should not exceed 0.1kg/sq.cm (1.5 psi).

ii. If a pressure or vacuum is ever applied to the main reactor tank the conservator must be disconnected and a blanking plate fitted on shut off valve.

iii. Do not weld on conservator to avoid damage to the air cell.

iv. Once all the air has been driven out during oil filling in the conservator do not remove air release plugs (5), (6) and (7). Otherwise air will be sucked inside the conservator.

2.6.6 MAINTENANCE

Little maintenance work will normally be required except routine visual inspection. However, it is desirable to check the breather opening to ensure it is not blocked. Further silica gel should be regenerated/replaced when its colour changes from blue to pink.

2.6.7 AIR CELL

Air cell is made from Nylon fabric coated with Nitrile rubber, In the event it becomes necessary to replace or test the air cell for leaks the following method is recommended.

i. De-energise the transformers/reactor.

ii. Isolate the conservator by closing the valves (14).

iii. Drain the oil from the conservator through the valve (4) by removing air release plugs (5) and (6).

iv. Remove inspection cover (11) if necessary, Install the pressure gauge on point (10).

v. Pressurize the air cell (2) by dry air/nitrogen to a max. pressure of 1.5 psi and seal. Check the pressure for 6 hours.

vi. If leaks are found, air cell to be repaired by patching or replaced by a new air cell.

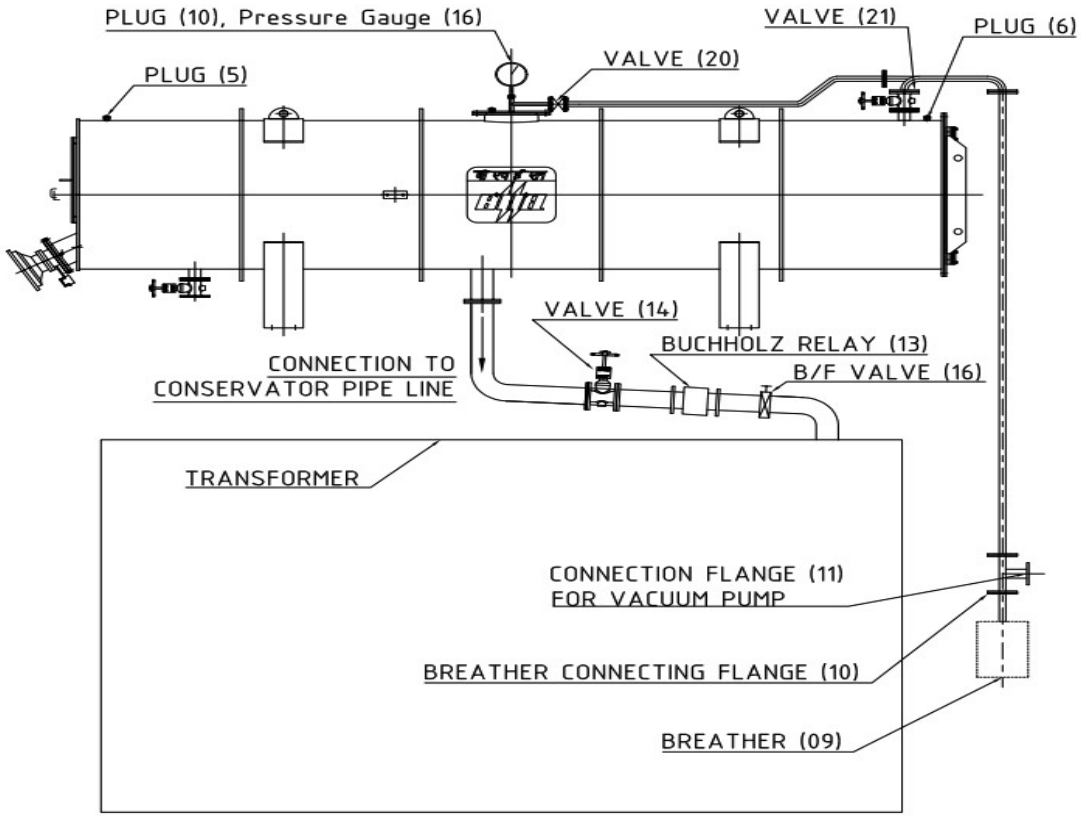
vii. For taking out the air cell from conservator, remove the air cell flange and loops from hooks provided on inside of the conservator top. Collapse the air cell slowly and fold, remove it from conservator very carefully.

viii. In the event air cell is not available immediately, conservator may be used as a conventional conservator.

2.6.8 OIL PRESSURE TEST

Oil pressure test on fully erected Transformer / Reactor to be conducted as per annexure 2.3 before hot oil circulation.

2.6.9 INSTRUCTION FOR EVACUATING OF THE TRANSFORMER / REACTOR VIA THE CONSERVATOR FOR FILLING OIL.



1. Release the overpressure in the Air cell by unscrewing the Plug (10). Open the plug (5) and (6) on the top of the conservator and blow dry compressed air for a short while, to relieve the air cell from the walls of the conservator. Wait for at least an hour to allow the Air cell to collapse completely. Tighten the plug (10) and close plug (5) and (6).
2. Remove the breather (09) and blank the flange (10).
3. Open the shut off valve (14) and (16) between conservator and transformer. Open the bypass pipe valve (20) between conservator and Air cell and valve (21). Connect the Vacuum pump to pipe flange (11) hanging down from conservator.
4. Filling of the oil through the tank can start when vacuum has reached below 1 torr. When the oil level reaches the Buchholz relay in the pipe between tank and conservator, the Shut off valve (14) located in same pipe to be closed.
5. End the vacuum and close the bypass pipe valve (20) between conservator and Air cell and open the plug 5 and 6 on top of conservator.

6. Open the Plug (10) provided on top of conservator.
7. Mount the pressure gauge (16) in position of plug (10) and close the valve (21).
8. Fill the Air in Air cell by opening valve (20) up to 1.5 PSI and close the Valve (20) when pressure reached.
9. Open the Shut off valve (14) between conservator and transformer and press up oil slowly.
10. Continue the Oil flow until oil flows from the plug (5) and (6).
11. Close the Shut off valve (14) and the plug (5) and (6), open the valve (20) and breather flange (9) to release air from Air cell.
12. When the pressure in the Air cell has decreased to atmospheric pressure, the pressure gauges (16) shows no detection open the Shut off valve (14) again and continue oil filling until the oil level specified has been reached and MOG shows 35 °C reading.
13. Connect the Breather (09) to flange (10) and blank flange (11) .

Note: The above Oil Filling under Vacuum to be followed for 765 kV & above transformers /reactors in case of specific requirement.

2.7 UNTANKING OF ACTIVE PART

2.7.1 GENERAL

If for some reason it becomes necessary to un-tank the active part (core and windings) of a large reactor/transformer, it ought to be done under supervision by BHEL erectors. Universal instruction for the un tanking procedure cannot be given, as the design practices of large equipment vary. The following general directions are, however, applicable in most cases.

The un tanking must be done indoors. If there is no suitable hall available, lifting can be done in the temporarily arranged room. e.g. a tent. The oil & the internal parts of the transformer must not in any case be exposed to rain or humidity.

In case of bell shaped transformer, only bell cover is lifted for access to active part.

2.7.2 OIL DRAINAGE

Drain off the oil from the transformers/reactor either partly or completely.

2.7.3 DISCONNECTING

Open all inspection covers for observation. Disconnect leads to bushings, current transformers, winding temperature devices, Oil temperature devices and earthing leads (common CC-CL-G) between active part and cover or tank side from earthing terminal board and any other connections like fiber optic probes from feed through plate welded on tank wall. Disconnections mentioned above can usually be made through hand holes in cover or tank side.

2.7.4 REMOVAL

Remove all large bushings, tank cover or top tank mounted conservator, lightning arrestors (if provided), thermo siphon (if provided), PRV pipe work, heavy gate valves (150 NB, 200 NB, 250 NB), neutral grounding arrangement : post insulator, copper strips & connectors (if provided). Break all connections between tank cover or top tank and tank-piping to oil conservator and cooler thermometers etc.

Remove the cover bolts. If the cover is welded to the tank flange, free the cover according to directions given in Clause 2.9.

2.7.4.1 COVER OR TOP TANK

Before lifting tank cover or top tank, refer the instructions given in outline general arrangement and on lifting bollard on tank wall. When lifting the cover or top tank use the cover-lifting eyes or lifting bollard which are designed for a minimum angle of 60 degrees between sling branches and the horizontal plane. The length of the sling should therefore be sufficient for at least this angle. Wall shunts with press board barriers (if provided) and tap changer should be properly mounted on tank wall and on tap changer mounting bracket welded on end frame or stool locked on bottom tank respectively. HV, IV, tapping & neutral leads should be properly clamped with supporting cleats provided with Terminal gear. to avoid damage.

Place the cover on suitable wooden supports and in such a way that thermometer pockets, small bushing etc. underneath the cover are not damaged.

No grinding or cleaning up of the tank flange is to be carried out before the active part is lifted out of the tank.

2.7.4.2 UNTANKING

Loosen locking devices, if any, between top core clamps and tank side.

Refer instructions given in outline general arrangement before lifting. Lift the active part by means of lifting eyes or lifting lugs provided on the top core clamps. To avoid damages on the active part it is important that it is centered carefully in the tank during lifting procedure.

After un-tanking, place the active part on a horizontal foundation.

2.7.5 RE-TANKING

Grinding or/and cleaning up of the tank flange has to be done before the active part is lowered into the tank. Check that the tank inside is free from contaminations.

Re-tanking is then done in the reverse order that is outlined above. Note that guiding pins or blocks are welded to the tank bottom to prevent the active part from moving in the tank. When lowering the active part, check that it fits exactly the guiding pins or blocks.

2.7.6 REASSEMBLING

Wipe the underside of the cover free from any dirt or foreign matter before lifting it into correct position above the reactor tank. Lower the cover the last few inches exactly into position without sliding on the gaskets.

Reassemble bolts nuts of supporting devices. Weld the cover when the welded construction is used. Reassemble Bushings, conservator etc., and reconnect pipings, leads to bushings, current transformers, etc. Reassemble inspection covers.

After the transformer is completely assembled, it may be necessary to dry it before oil fining- see clause 2.5.

2.8 MOUNTING OF GASKETS

2.8.1

The gaskets have a circular/flat cross-section and are made of oil and heat- resistant synthetic nitrile rubber/nitrile rubber bonded cork. For small gaskets, O-rings are used with diameter 3,5.0 or 8.0 mm, while round rubber cords with diameters 8,12 or 19 mm are used for large gaskets.

The groove is normally milled or turned, but for large flanges the groove is created by means of steel bars welded on top of the flange. The width of the groove is slightly smaller than the cross-section diameter of the gasket in order to keep the gasket in position during the assembling work.

Opened sealing joints may be sealed again using the new gasket. When handling and lifting flange, cover etc. with gasket grooves, care should be taken when using tools and lifting devices to avoid that the grooves getting damaged or deformed.

Before assembling of groove gaskets, it is checked that the grooves and contact-surface in the joint are free from foreign particles and that the paint is free from thick coatings, trickles and drops.

When assembling the rubber cord in the groove, the cord length shall be continuous. The gasket is given a small surplus length to compensate for shrinkage.

The gasket is pressed down into the groove without stretching or slackening.

To prevent the gasket from falling from the groove on vertical surfaces, the gasket may necessarily be spot-glued to the bottom of the groove.

The screws in the sealing joint shall be tightened so that an even pressure is obtained on the gasket. This is obtained preferably by means of a moment spanner. Rubber gaskets in grooves need not normally be re-tightened.

Above description is followed generally for turrets, inspection cover etc. For main tank rim joint, LV turrets of Generator Transformers where metallic stops are provided, nitrile rubber bonded cork is used, for which following instructions shall apply.

2.8.2

i. Gaskets when supplied loose, have no bolt holes in them. They are usually cut to the size and shape required, although they may be supplied as straight, angled pieces from which complete gaskets can be built up.

ii. Scarfed joints should be used. A 40 mm scarf in 5 mm thick material is recommended. Joints should be located away from corners and bolt holes, and should be well bonded, smooth and free from local thickening. Neoprene solution is used as an adhesive for joints.

iii. Gaskets are best stored in hermetically sealed containers in a cool place. They must be protected from damp, oil and grease-

iv. To make a gasket joint, first clean the metal surfaces by thinner to ensure that they are free from oil, rust, scale etc. Using one of the flanges as a template, punch the necessary bolt holes. Insert the bolts and tighten the bolts sequentially, a little every time so that uniform pressure is exerted on the gasket until the gasket is compressed to about 2/3 of its original thickness. Joints should not be subjected to pressure until tightening is complete. If care is taken in making joints, and in handling the gasket, it is possible to break and remake a joint several times, using the same gasket.

v. For making leak proof and good gasket joints, it is necessary that uniform pressure is achieved all over the gasket after matching rims/ flanges have been clamped with bolts/studs.

Following instructions be followed for proper tightening of bolts/studs.

a) Tighten lightly the bolts/studs diagonally in the sequence as shown in the fig. 2.6.

b) Tighten again bolts/studs in the same sequence with the torque given below :

Bolt Stud Size	Max Toque in Kg.m		
	IS 1367 Cl. 4.6	IS 1367 Cl. 8.8	IS 1367 Cl. 12.9
M 10	3	5	8
M 12	5	9	14
M 16	12	23	35
M 20	12	47	69
M 24	17	81	119
M 27	23	117	172
M 30	28	160	234

In case of metallic stoppers tighten until metal to metal contact is achieved.

c) Do not overtighten, otherwise gasket will get crushed.

2.9 WELDED COVER (IF APPLICABLE)

In order to obtain a good sealing between the transformer tank and the cover a welded joint is recommended. The welding is performed in a certain way to permit opening and new welding repeated a number of times. The chiselling up and re-welding will take about the same time as dismantling and reassembling of bolted cover.

If the welded cover for any reason has to be removed proceed as follows:

2.9.1 OPENING THE COVER

When opening the cover the welding joint should be removed by a suitable grinding wheel. The cover should be clamped to the frame by means of G-clamps to prevent iron chips from penetrating into the tank. Any parts of the weld which may possibly remain on the tank flange should be removed by a chisel to enable a good result of the re-welding.

2.9.2 RE-ASSEMBLY

When fitting the cover again cork-rubber gaskets, 25 x 5 or as specified are fitted on the tank flange, see fig. 2.7.

The gaskets are kept in the correct position with glue base on rubber base. The cover should be clamped to the tank flange by means of G-clamps evenly distributed along the flange with about 600 mm spacing. Tack welding is carried out with about 100 mm spacing. An extra G-clamp is used during the tack welding and is moved along the flange during the progress of the work. The continuous weld is then applied. Finally the weld should be cleaned and painted.

WARNING

When welding, a fire-extinguishing equipment should be available, and the work supervised by fire-protection personnel.

2.10 EARTHING OF ACTIVE PART AND CORE INSULATION TEST

2.10.1 REACTORS

The ground-connection terminals for the reactor active part are located in a box at the tank end, close to the bottom. Please see fig. 2.8.

The terminals are protected by a cover. The cover can be removed with the tank oil-filled.

The terminal box contains a terminal block with three terminals.

- The terminal marked CL is connected to the core laminations.
- The terminal marked CC is connected to the core clamps.
- The terminal marked G is connected to ground (the tank).

For the core-insulation test, remove the cover. Disconnect the closing link that connects the two terminals CL-G. Use preferably 1000V mega direct voltage between CL and CC + G. The tank shall be grounded during the test. The insulation value after

1 min. test- time shall be minimum 1000 k-ohms. There is no general requirement on the insulation level CC-G .

2.10.2 TRANSFORMERS

For checking core insulation in case of transformers refer Fig. 2.9 for connection details.

2.11 TOUCH-UP PAINTING

2.11.1 PURPOSE

A basic principle at touch-up painting should be to restore a damaged paint coat on a surface to the same quality and finish as of the surrounding surface. The touch-up painting should be limited to a surface as small as possible.

2.11.2 CLEANING

Both damaged and surrounding surface should be cleaned so that all grease, dust and other impurities will be removed.

2.11.3 GRINDING OF DAMAGES

Large damages and defects are ground by means of a coarse abrasive paper, e.g. No.100. The surface is then ground with a finer paper in connection with the damage, e.g. 150 or 180. Damages that are limited to the paint coat only should be ground off completely at which glazing can be avoided.

2.11.4 FINISHING PAINT

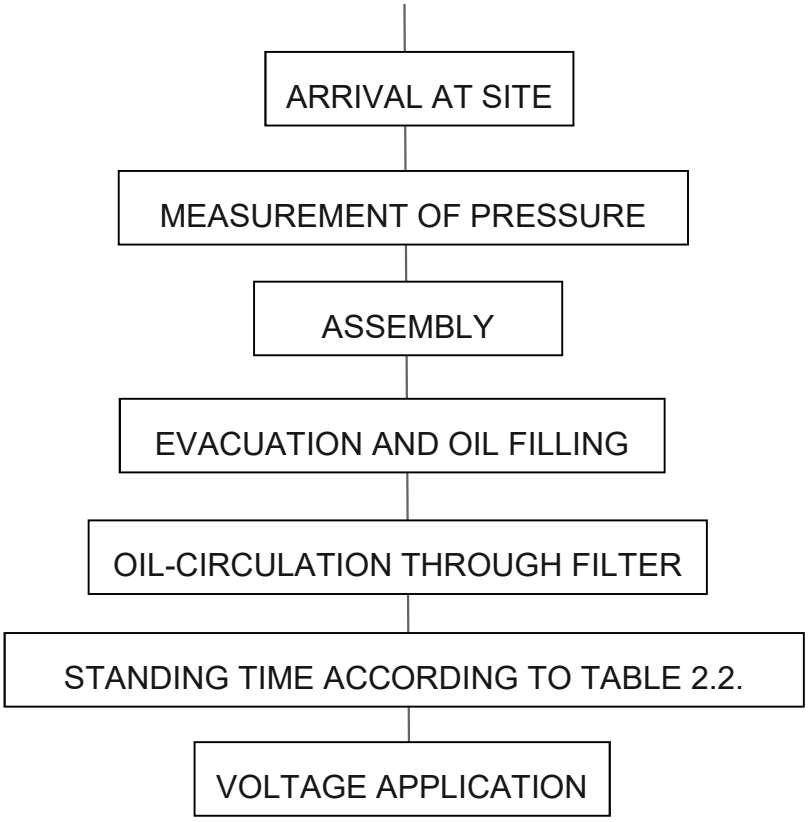
Two coats of finishing paint should be applied as per specification which is generally light grey shade No.631 of IS: 5. Please refer Table 2.4 for suppliers reference.

TABLE 2.4

Paint Make	Internal Surface	External Surface		
Asian	APCODUR CF699 WHITE	APCODUR RAPID RECOAT ZP PRIMER GRAY	APCODUR RAPID RECOAT HB MIO	APCOTHANE CF678
Akzo Nobel	INTERLINE 1012 WHITE	INTERGUARD 251	INTERGUARD 966	INTERTHANE 990
Jotun	PENGUARD HB WHITE	PENGUARD HSP ZP	PENGUARD MID COAT MIO	HARD TOP XP
Ching	CHING EP EMC 182 WHITE	CHING EP PRIMER EMD 183	CHING EP MIO EMD 30	CHING EP TOP COAT ADD47

ANNEXURE 2.1

FLOW CHART FOR HANDLING



Relationship between different units

1 bar = 10^5 Pa = 750 Torr = 14.5 psi = 1.02 kg/sq.cm

1 Torr = 1.33 mbar = 0.133 kPa

1 kPa = 10^3 Pa = 10 mbar = 7.501 Torr

1 MPa = 10^6 Pa

Force

1 kp = 9.807 N

Volume

1Liter = 0.26 US gallons

1 US gallon = 3.781Liters

1Liter = 0.22 Imp gallons

1 Imp gallon = 4.551Litres

Temperature

C = 5 x (F-32)/9

F = 9 x (C+32)/5

ANNEXURE 2.2

EQUIPMENT FOR OIL-FILLING UNDER VACUUM

i. High-vacuum 2 stage oil filtration plant provided with thermostat controlled

ii. oil heaters and vacuum-proof hoses with independent vacuum pumping system for tank evacuation. Capacity: 6000 LPH

iii. Oil-storage tanks provided with silica-gel breathers and inlet/outlet valves for oil circulation. Recommended capacity 20 kL -30 kL (Clause2.4)

iv. Vacuum gauges provided in filtration plant.

v. Equipment for measurement of electric strength (BDV) of oil- 100 kV set.

vi. Equipment for moisture content of oil.

vii. Equipment for measurement of Resistivity and Tan delta at 90°C .

viii. Oil-sampling cans or bottles.

ix. Transparent vacuum-proof tubes for checking of oil-level during oil filling.

x. Valves, fittings, gaskets etc.

xi. Dry nitrogen cylinders.

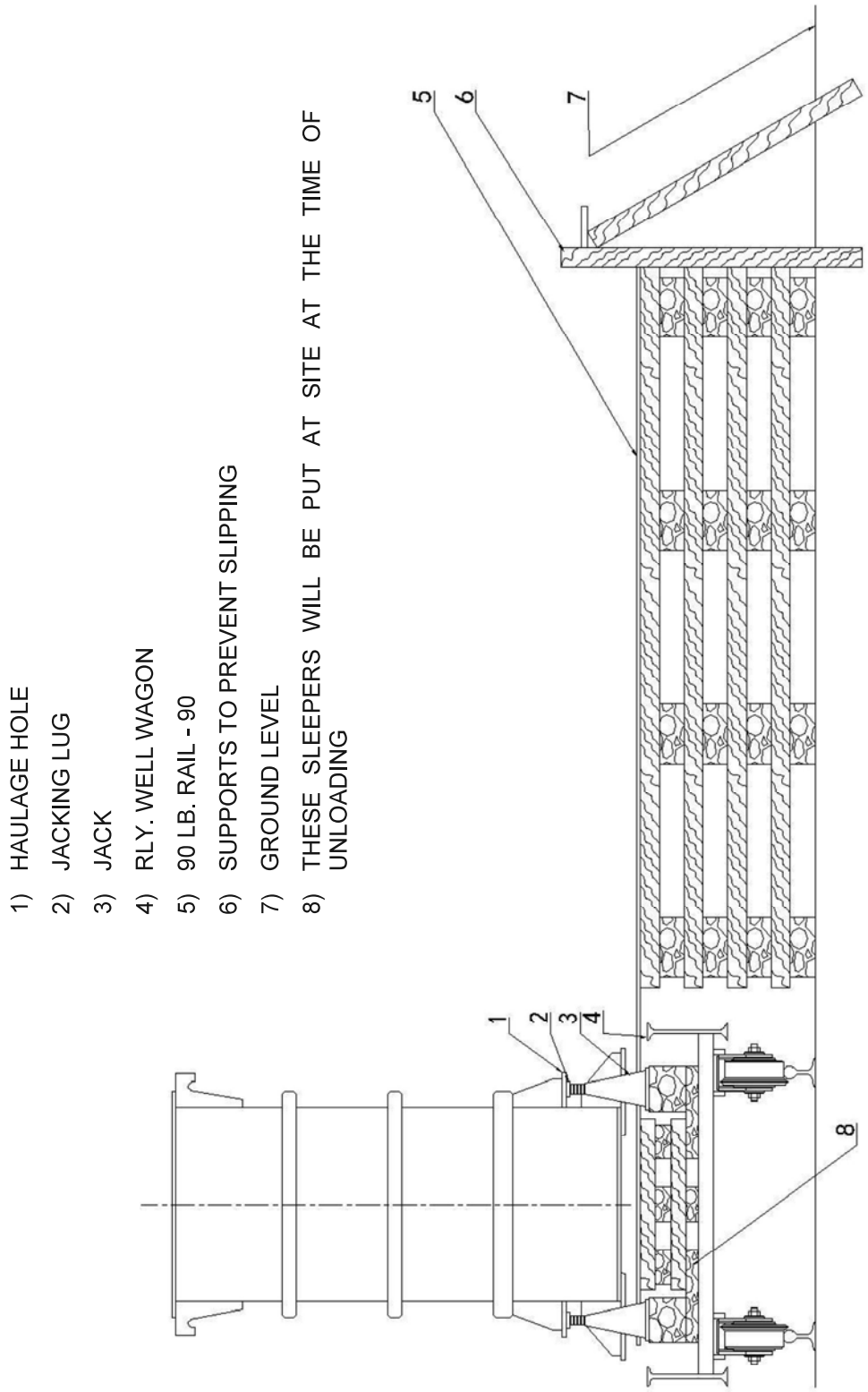


Fig. 2.1 Typical Unloading Arrangement of the Transformer

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Rev No. 00

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2	GENERAL LIST OF TEST EQUIPMENT TO BE ARRANGED BY CONTRACTOR	Annexure-B
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2	Special tools & tackles and testing instrument for 400kV GIS to be arranged by GIS OEM/ manufacturer (M/s Hitachi)	Annexure-1B
3	General tools & tackles for 220kV GIS to be arranged by contractor	Annexure-2A
4	Special tools & tackles and testing instrument for 220kV GIS to be arranged by GIS OEM/ manufacturer (M/s Toshiba)	Annexure-2B
5	List of Mandatory Maintenance & Testing Equipment	Annexure- ME
6	List of Mandatory Spares for 400kV GIS	Annexure-400kV GIS spares
7	List of Mandatory Spares for 220kV GIS	Annexure-220kV GIS spares
8	Standard scope for ETC works	Annexure- Standard Scope
9	Project specific scope for ETC works	Annexure- Project Scope
10	Project specific Drawings	
11	400/220kV GIS Substation Ersama - Single Line Diagram	
12	400/220kV GIS Substation Ersama - Layout Drawing	
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14	220 kV GIS Layout Plan & Section Drawings for Ersama	
15	400/220kV GIS Substation Ersama - Structure Loading Diagram	
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22	Procedure for welding of aluminium buses	Annexure-Aluminium_Welding
23	Technical specification for Equipment Fixing Hardrware	TB-XXX-618-002a
24	N2 filling/ vaccuming/ purging and heating (if required) as per BHEL Bhopal procedure for Transformers/ Reactors	Annexure-TRF
25	OPTCL Contract specification for Erection, Commissioning, cabling, earthing and other relevant works	ANNEXURE-OPTCL

Remarks: The enclosed drawings/ documents are provisional and may subject to change during contract stage.

Annexure_Aluminium_Welding

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. TUNGESTEN-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 defection.

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 form 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 2597o 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 t pores may be permitted in 1000 mm sq. area of radiograph.
    b) Where pore size is 0.8 mm or less, up to 19 t 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 9t 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.

ANNEXURE_INSULATING_ MAT

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.

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

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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.

02	06.09.13				90° Bends added.
01	30.11.10	-SD-	-SD-	-SD-	Document revised.
Rev No.	**Date**	**Altered**	**Checked**	**Approved**	**REVISION DETAILS**

Distribution	**To**	**TBMM**	**OFFICE COPY**
	Copies	1	1

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

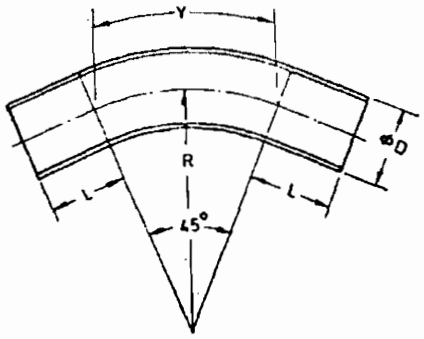


FIG. 1 45° BEND

*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 $\frac{45°}{360°} \times 2\pi R$.

†*R, radius of the bend, is equal to 3 times the nominal outside diameter (D).*

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:

a) Manufacturer's name 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

d) The bend shall be marked in colour as indicated below for different classes of fittings:

Class of Fitting	*Colour*
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)
(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 $\frac{90°}{360°} \times 2\pi R$.

†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

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		GROUP	**TBEM**		
		W.O. No			
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Rev	Date	Altered	Checked	Approved	
04	18.11.10	BVG	PLK	RMS	Unit wt of hardware added
02	13.4.06.	BVG	PLK	RMS	Eqpt mounting hardwares added.
Distribution				To	
				Copies	

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 hardwares 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 Hardwares.

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:

Bolt Diameter	Thickness of Spring washers
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**

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.

TS_Shield Wire

G.I EARTH WIRE

SECTION – II

S.NO.	DESCRIPTION
1.	SCOPE
2.	STANDARDS
3.	MATERIALS
4.	SIZE AND CONSTRUCTION
5.	LENGTH OF JOINING
6.	TESTS AND TEST CERTIFICATES
7.	PACKING AND MARKING
8.	SAG AND TENSION CHARTS AND SAG TEMPLATE
9.	OVERHEAD EARTH CONDUCTORS

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TECHNICAL SPECIFICATION FOR G.I. GROUND WIRE.

(7/3.15 mm and 7/3.66mm)

1. **SCOPE** :

1.1 This specification provides for the manufacture, testing before despatch, supply and delivery of Ground wire for the purpose of earthing and protection of power transmission line, as per the particulars given in Appendix-I attached. The ground wire shall consist of standard galvanized steel wire.

2. **STANDARDS** :

2.1 The ground wire shall comply in all respect with the Indian Standard (IS) 2141-1979

3. **MATERIALS** :

3.1 The material offered shall be of best quality and workmanship. The steel wires (Strands) shall be manufactured from steel produced by any suitable process. The steel wire shall not contain sulphur and phosphorous exceeding 0.040 percent each as per IS : 2141-1971.

3.2 The steel wires shall be evenly and uniformity quoted with zinc complying with IS: 209-1965 specification for zinc (Retired). Only virgin zinc shall be used and reclaimed zinc is not permitted. The virgin zinc shall be of zn 99.95 percent quality.

3.3 The content of carbon shall not be more than 0.55 percent, manganese and silicon contents shall be 0.40 to 0.90 and 0.15 to 0.35 respectively.

4. **SIZE AND CONSTRUCTION** :

4.1 The size of ground wire shall be as given in Appendix-I. The physical properties have been given in the same Appendix. The lay of the strands shall be of lengths as given in the Appendices. The wires shall be so stranded together that when any evenly distributed pulls applied at the end of the completed strands each wire will take on equal share of the pull.

5. **LENGTH OF JOINING**:

5.1 The ground wire may be supplied in the standard length as per manufacturers standard practice and such length will be specifically indicated in the tender. However random length of ground wire upto a maximum of 10 (Ten) percent may be allowed.

5.2 The length of strand which may be supplied without joints in the individual wires comprising it depends on the length of wire which may be carried by the bobbin in a normal stranding machine. The normal lengths of strand which shall be supplied without joints in individual wires, excluding welds made in the rod before drawing shall be as given in Appendix – I.

5.3 Each coil shall be warranted to contain no weld joints or splice ether than in the rod before it is drawn and those permitted in 5.3 above. The wire shall be circular and shall be free from scale or irregularities, imperfections, flow spite and other defects. The zinc coating shall be smooth even and bright.

6. **TESTS AND TEST CERTIFICATES**:

6.1 Ground wire shall be subjected to the tests as specified in the IS:2141-1979 before despatch.

6.2 Al the coils of the galvanized strand shall be of the same grade, diameter and construction manufactured under similar condition shall be grounded to constitute one lot.

6.3 Samples from each lot shall be tested for ascertaining the conformity to the requirements of the ground wire specified herein. The coils selected shall be tested for length of the lay and joints. The lot shall be declared conforming to the requirements of these characteristics if all the coils are found satisfactory. One test specimen from each wire of the strand shall be drawn, from every selected coil and subjected to tensil tests, ductility test and coating test. One specimen of the completed strand from each coil shall be subjected to tensil strength. The lot shall be declared conforming to the requirements of these characteristics if the entire best specimen satisfy the relevant requirements.

6.4 **Chemical Analysis** : One sample shall be drawn from the lot for chemical analysis. Unless otherwise agreed to between the purchase and supplier the chemical analysis shall be carried out.

6.5 **Tensile Test** : The wire when tested in accordance with IS : 1521-1960 shall have minimum tensile strength specified in the Appendix – I. The tensile strength of the finished strand shall not be less than 95% of the aggregate of the single wires.

6.6 **Ductility test** : The wire shall be subjected to wrapping test in accordance with IS : 1755-1961. When wrapped eight times round its own diameter and on being subsequently straightened the wire shall not break or split.

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6.7 **Coating test** : The uniformity of zinc coating shall be tested as per IS: 2633-1964. The wire shall withstand the number of dips specified in Appendix – I.

6.8 Three copies of manufacturers test certificate shall be submitted by the contractor to the purchaser for approval immediately after such tests have been conducted on the strands and the wire.

6.9 The purchaser reserves the right to inspect the material at Manufacturer's works before despatch.

7. **PACKING AND MARKING** :

7.1 The ground wire shall be supplied in non-returnable reals or drums of non-perishable or treated wood conforming to IS: 1778-1991 specification for Reals and Drums for Bare wire. Each coil shall be provided with a level fixed firmly on the inner part of the coil, bearing the following information.

(a) Trade name, if any.
(b) Name of manufacturer
(c) Type of wire, size and length of wire.
(d) Not weight of the wire.
(e) Total weight, and
(f) Number of lengths on the real or drum unless otherwise agreed to between the purchaser and the supplier, the stranded wire shall be supplied in 50 Kg. coil.

8. **SAG AND TENSION CHARTS AND SAG TEMPLATE** :

8.1 The successful tenderer shall be required to submit six copies of sag templates and strings charts for different temperatures and spans, One set of charts shall be ink on tracing cloth. The design date of the lines on which the ground wire will be used are given in Appendix – II



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APPENDIX–I

TECHNICAL SPECIFICATION OF GROUND WIRE

(i)	Material	:	Steel
(ii)	Purity of material	:	Sulphur and phosphorous contents not exceeding 0.040 percent each. Carbon content not exceeding 0.55 percent. Total silicon contents shall be 0.15 to 0.35 and Manganese contents shall be 0.40 to 0.90 respectively.
(iii)	Standing and wire diameter	:	7/3.15 mm
(iv)	Weight	:	428 Kg / Km.
(v)	Single wire before stranding		
	Diameter of wire	:	3.15 mm
	Tolerance	:	+ 0.060 mm - 0.030 mm
	Minimum elongation in 100 mm.	:	4 mm.
	Minimum breaking strength	:	857 kg.
	Minimum tensile strength	:	85.7 kgf / mm2
(vi)	**Stranded wire length of lay**		
	Maximum	:	175 mm
	Minimum	:	145 mm
	Minimum breaking load	:	5810 kg
	Over all diameter	:	9.45 mm
	Modulus of elasticity	:	1.938 x 106 Kg/Cm2
	Co-efficient of linear expansion	:	11.50 x 10^{-6} per deg. C.
	D.C. resistance at 20^0C	:	3.375 Ohms/Km.
(vii)	**Zinc coating** :		
	Number of one minute dips	:	Three
	Number of half-minute dips	:	One
	Quality of zinc	:	Zn 98 IS:209/1966
	Weight of coating on wire process of galvanising	:	275 g/m^2
	Process of galvanising	:	Hot-dip.
(viii)	Joints	:	There shall be no joint in any of the wires constituting the ground wire.
(ix)	**Lengths** -		
	Standard length	:	1500 metres.
	Tolerance on standard length	:	± 5 percent
	Random lengths	:	Not more than 5 percent of the lengths ordered.
(x)	**Tests** : -	:	A sample of the finished ground wire when tested in tensile testing machine shall not fail at a stress less than 100% of UTS value of the ground wire. The length of the test sample shall be not less than 5 meters.
	Type tests Ultimate tensile strength test.		
	Electrical Tests	:	As per BS : 182/1972 and BS :

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			3229/1960
	Routine Tests	:	As per clause No. 6 of IS: 2141 1968. In addition to these tests, the weight and adherence of Zinc coating tests shall be conducted as per clause 4 and 5 of IS : 4826/1968.
(xi)	Test Reports	:	Three copies of manufacturer test certificates shall be submitted by the Contracts to the purchaser for approve immediately after such test have been conducted on the galvanised steel strand and the wire.



9. Overhead earth conductors

General(7/3.66mm)

Where earth conductors are erected to provide the specified degree of lightning protection, they shall consist of stranded galvanised steel and shall comply with IEC 888 and IEC 1089 in so far as it applies to steel wires.

Galvanising shall comply with the requirements of IS 2141.

The arrangement of earth conductors shall be such that failure of a single conductor cannot predictably result in a fall across both bus bars in a duplicate bus bar substation.

Technical parameters

SI No.	Parameter		Value
1	Stranding and wire diameter		7/3.66mm
2	Number of strands		1/6
3	Total sectional area		73.65 mm^2
4	Overall diameter		10.98mm
5	Approximate weight		583 kg/km
6	Calculated DC resistance at 20C		2.5 ohms/m
7	Minimum ultimate tensile strength		68.4kN
8	Direction of outer lay		Right hand
9	Tolerances		
9a	Diameter	standard	3.66mm
		maximum	3.75mm
		minimum	3.57mm
9b	Lay length	standard	181mm
		maximum	198mm
		minimum	165mm
10	Steel composition	Carbon	≤ 0.55%
		Manganese	0.4 to 0.9%
		Phosphorous	≤ 0.04%
		Sulphur	≤ 0.04%
		Silicon	0.1 to 0.35%
11	Zinc for galvanising		Electrolytic high grade zinc of 99.95% purity to *209 1979*

Table for Technical parameters for earth wires



Welding at any joint shall be completed uninterrupted. If this cannot be followed for some reason, the weld shall be insulated for slow and uniform cooling.

Welding shall be done by manual oxy-acetylene or manual shielded metal arc process. Automatic or semi-automatic welding processes may be done only with the specific approval of Engg. Incharge (Divisional Engr).

As far as possible welding shall be carried out in flat position. If not possible welding shall be done in a position as close to flat position as possible.

Downward technique is not allowed while welding pipes in horizontal position, unless permitted by the Engg. Incharge (Divisional Engr.).

Combination of welding processes or usage of electrodes of different classes or makes in a particular joint shall be allowed only after the welding procedure has been duly qualified and approved by the Engg. Incharge (Divisional Engr.).

No backing ring shall be used for circumferential butt welds.

Welding carried out in ambient temperature of 5C or below shall be heat treated.

A spacer wire of proper diameter may be used for weld root opening but must be removed after tack welding and before applying root run.

Tack welding for the alignment of pipe joints shall be done only by qualified welders. Since tack welds form part of final welding, they shall be executed carefully and shall be free from defects. Defective welds shall be removed prior to the welding of joints.

Electrodes size for tack welding shall be selected depending upon the root opening.

Tack welds should be equally spaced.

Root run shall be made with respective electrodes/filler wires. The size of the electrodes shall not be greater than 3.25 mm (10 SWG) and should preferably be 2.3 mm (12 SWG). Welding shall be done with direct current values recommended by the electrode manufacturers.

Upward technique shall be adopted for welding pipes in horizontally fixed position. For pipes with wall thickness less than 3 mm, oxyacetylene welding is recommended.

The root run of butt joints shall be such as to achieve full penetration with the complete fusion of root edges. The weld projection shall not exceed 3 mm inside the pipe

On completion of each run craters, weld irregularities, slag etc. shall be removed by grinding or chipping.

During the process of welding, all movements, shocks, vibration or stresses shall be carefully avoided in order to prevent weld cracks.

Fillet welds shall be made by shielded metal arc process regardless of thickness and class of piping. Electrode size shall not exceed 10 SWG. (3.25 mm). At least two runs shall be made on socket weld joints.

12. WIRING, CABLING AND CABLE INSTALLATION

12.1. Cubicle wiring

Panels shall be complete with interconnecting wiring between all electrical devices in the panels. External connections shall be achieved through terminal blocks. Where panels are required to be located adjacent to each other all inter panel wiring and connections between the panels shall be carried out internally. The Contractor shall furnish a detailed drawing of such inter panel wiring. The Contractor shall ensure the completeness and correctness of the internal wiring and the proper functioning of the connected equipment

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All wiring shall be carried out with **1.1 kV** grade, **PVC** insulated, single core, stranded copper wires. The PVC shall have oxygen index not less than **'29'** and Temperature index not less than **250C**. The wires shall have annealed copper conductors of adequate size comprise not less than three strands

The minimum cross sectional area of the stranded copper conductor used for internal wiring shall be as follows :

- All circuits excepting CT circuits and energy metering circuit of VT 2.5 sq.mm
- All CT circuits and metering circuit of VT 2.5 sq. mm

All internal wiring shall be supported neatly arranged, readily accessible and connected to equipment terminals and terminal blocks. Wiring gutters and troughs shall be used for this purpose.

Cubicle connections shall be insulated with PVC to IEC 227. Wires shall not be jointed or teed between terminal points

Bus wires shall be fully insulated and run separately from one another. Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panels running throughout the entire length of the panel suite. Longitudinal troughs extending throughout the full length of panel shall be preferred for inter panel wiring.

All inter connecting wires between adjacent panels shall be brought to a separate set of terminal blocks located near the slots of holes meant for the passage of the inter connecting wires. Interconnection of adjacent panels on site shall be straightforward and simple. The buswires for this purposes shall be bunched properly inside each panel.

Wire termination shall be made with solderless crimping type and tinned copper lugs which firmly grip the conductor Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks. Numbers 6 and 9 shall not be included for ferrules purposes unless the ferrules have numbers underscored to enable differentiation. (i.e. 6 and 9).

Fuses and links shall be provided to enable all circuits in a cubicle, except a lighting circuit, to be isolated from the bus wires.

The DC trip and AC voltage supplies and wiring to main protective gear shall be segregated from those for back-up protection and also from protective apparatus for special purposes. Each such group shall be fed through separate fuses from the bus wires. There shall not be more than one set of supplies to the apparatus comprising each group. All wires associated with the tripping circuits shall be provided with red ferrules marked "Trip"

It shall be possible to work on small wiring for maintenance or test purposes without making a switchboard dead.

The insulation material shall be suitably coloured in order to distinguish between the relevant phases of the circuit.

When connections rated at 380 volt and above are taken through junction boxes they shall be adequately screened and "**DANGER**" notices shall be affixed to the outsides of junction boxes or marshalling kiosk.

Where connections to other equipment and supervisory equipment are required the connections shall be grouped together

12.2. LV power cabling

LVAC cable terminals shall be provided with adequately sized, hot pressed, cast or crimp type lugs. Where sweating sockets are provided they shall be without additional clamping or pinch bolts. Where

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crimp type lugs are provided they shall be applied with the correct tool and the crimping tool shall be checked regularly for correct calibration. Bi-metallic joints between the terminals and lugs shall be provided where necessary.

Terminals shall be marked with the phase colour in a clear and permanent manner.

A removable gland plate shall be provided by the Contractor. The Contractor shall be responsible for drilling the cable gland plate.

Armoured cables shall be provided with suitable glands for terminating the cable armour and shall be provided with an earthing ring and lug to facilitate connection of the gland to the earth bar.

12.3. Multi-core cables and conduit wiring

External multi-core cabling between items of main and ancillary equipment shall form part of the Contract Works and shall consist of un-armoured multi-core cable with stranded copper conductors PVC insulated and PVC over sheathed complying with the requirements of IEC 227 and 228 as applicable.

Multi-core cable for instrumentation and control purposes shall be supplied with 2.5 mm^2 stranded copper cores. Multi-core cables for CT and VT circuits shall be supplied with two by 2.5 mm^2 stranded copper cores and the cores shall be identified by the phase colour.

Where conduit is used the runs shall be laid with suitable falls and the lowest parts of the run shall be external to the equipment. All conduit runs shall be adequately drained and ventilated. Conduits shall not be run at or below ground level.

Multi-core cable tails shall be so bound that each wire may be traced to its cable without difficulty. All multi-core cables shall be provided with 20 % spare cores and the spare cores shall be numbered and terminated at a terminal block in the cubicle. Where cables are terminated in a junction box and the connections to a relay or control cubicle are continued in conduit, the spare cores shall be taken through the conduit and terminated in the cubicle. The dc trip and ac voltage circuits shall be segregated from each other as shall the circuits to main protective gear be segregated from those for back-up protection.

The screens of screened pairs of multi-core cables shall be earthed at one end of the cable only. The position of the earthing connections shall be shown clearly on the diagram.

All wires on panels and all multi-core cable cores shall be crimped with the correct size of crimp and crimping tool and will have ferrules which bear the same number at both ends. At those points of interconnection between the wiring carried out by separate contractors where a change of number cannot be avoided double ferrules shall be provided on each wire. The change of numbering shall be shown on the appropriate diagram of the equipment. The same ferrule number shall not be used on wires in different circuits on the same panels.

The Contractor shall provide a two (2) metre loop of spare cable at both ends of all multi-core cable runs and shall leave sufficient lengths of tails at each end of the multi-core cables to connect up to the terminal boards. The Contractor shall also sure, insulate, ring through and tag the tails and shall also seal the cable boxes. The Contractor shall be responsible for re-checking the individual cores and for the final connecting up and fitting of numbered ferrules within all equipment provided on this contract.

The drilling of gland plates, supply and fitting of compression glands and connecting up of power cables included in the Contract scope of work shall be carried out under this contract.

12.4. Laying and installing of cables

12.4.1 General

For cable laying the following shall apply

- Switchyard area — In concrete cable troughs (cable trench having cable racks with cable trays)

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- Control Room — On cable racks consisting of slotted type and ladder type cable trays
- Buildings — Conduits

Directly buried cables shall be used wherever necessary with the approval of Engg. Incharge (Divisional Engr.).

12.4.2. Laying of cable

Cables shall be laid in concrete troughs provided under this contract or drawn into pipes or ducts or on cable racks or directly buried as may be required by the Engg. Incharge (Divisional Engr.). Concrete troughs shall be designed so that the cables are supported on cable support systems and the supports shall be arranged so as to allow the segregation of power, control (including CT and VT circuits) and communications cables onto different layers of cable supports. All cable supports shall be earthed in accordance with IS 3043. The minimum vertical separation between layers of cable tray shall be not less than 300 mm.

The cable support system shall be designed and constructed to carry the required cables without undue crowding of the supports and without overloading the supports. The maximum number of layers of cable that shall be permitted on a single cable support shall be three. The width of the cable supports shall be selected to ensure that the supports are not crowded, the cable supports are not overloaded and that sufficient space is provided in the cable trough to allow for personnel access during and after cable installation. The width of cable supports should not exceed 750 mm.

Cables shall be laid direct in the ground only at the discretion of the Engg. Incharge (Divisional Engr.). All cables laid direct in the ground outside buildings shall be laid in a trench and protected by reinforced concrete slabs or cable tiles.

For auxiliary cables the top of the slab or tile shall be at a depth not less than 300 mm below the surface of the ground and there shall be a layer of fine well packed riddled earth 75 mm thick in between the cable and the bottom of the trench and between the top of the cable and the underside of the slab.

The Contractor shall be responsible for the proper laying of all cables in the ground. Where cables in the same trench are laid over each other, they shall be separated by not less than 75 mm of riddled earth. The riddled earth used for this purpose shall have been passed through a screen having a 12 mm square mesh.

Where cables pass under roadways they shall be laid in pipes at a depth not less than 800 mm below the surface.

The Contractor shall be responsible for the excavation of trenches which shall include all pumping and baling required and the provision of all necessary labour, plant, tools, water, additional soil, fuel or motor power for such purposes.

Cables in trenches will be inspected by the Engg. Incharge (Divisional Engr.) before the trenches are backfilled.

The running of communications and power cables along the same route shall be avoided as far as possible. Where this is not possible they shall be segregated, the one group from the other. Power and communication cables shall be laid in separate tiers. For other than directly buried cables the order of laying of various cables shall be as follows:

- Power cables on top tiers.
- Control, instrumentation and other service cables in bottom tiers.

12.4.3. Cable tags and markers

Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

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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.

Location of cables laid directly in the ground shall be clearly indicated with cable marker made of galvanised iron plate

Location of buried cable joints shall be indicated with a cable marker having an additional inscription **"Cable joint"**.

Cable markers 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.

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 every twenty meters (20 m) in cable tray/trench runs. Cable tags shall be provided inside switchgear, motor control centres, control and relay panels etc. and wherever required for cable identification when a number of cables enter together through a gland plate

The price of cable tags and markers shall be included in the installation rates for cables/conduits quoted by the Bidder.

12.4.4. Cable supports and cable tray mounting arrangements in control room

The control room will normally be provided with embedded steel inserts on concrete floors/walls for the purpose of cabling in the control room. The supports shall be secured by welding to these inserts or available building steel structures. However, in cases where no such embedded steel inserts are available, the same shall have to secured to the supports on walls or floors by suitable anchoring

12.4.5. Cable support structure in switchyard cable trenches

The contractor shall fabricate and install cable support structures in cable trenches. These supports shall be provided at 750 mm spacing along the run of cable trenches.

Cable supports and cable racks shall be fabricated from standard structural steel members, channels, angles and flats of required size. The fabrication, welding and erection of these structures shall conform to the relevant clauses of this Specification, in addition to the specification given herein.

12.5. Termination of cables and wires

Where cables leave the apparatus in an upward direction the cable boxes shall be provided with a barrier joint to prevent leakage of cable oil or compound into the apparatus. Where cable cores are liable to contact with oil or oil vapour the insulation shall be unaffected by oil.

PVC sheathed cables shall be terminated by compression glands complying with BS 6121 (or equivalent).

Auxiliary PVC insulated cables shall be terminated with compression type glands, clamps or armour clamps complete with all the necessary fittings.

Colours shall be marked on the cable box, cable tail ends and single core cables at all connecting points and/or any positions the Engg. Incharge (Divisional Engr.)may determine. Cable boxes shall be provided with suitable labels indicating the purpose of the supply where such supply is not obvious or where the Engg. Incharge (Divisional Engr.)may determine.

All cables shall be identified and shall have phase colours marked at their termination.

All incoming and outgoing connections shall be terminated at a terminal block. Direct termination into auxiliary switches will not be accepted.

13. DEGREES OF PROTECTION

Degrees of protection shall be provided in accordance with IEC 144 and IEC 529 and be as follows

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suitable for operating manually electrically (remote) and via SCADA system from a remote control centre.

Control shall be achieved at bay level, substation level and remote control centre level through conventional MMI or computer based automated system, as specified in this Specification.

The system shall be designed, along with the communication system so that there shall be high availability of bay protection associated with automatic functions such as auto reclosing. The systems shall function autonomously and independently of adjacent bays, substation functions and units etc.

6. 0 EARTHING SYSTEM

Electrical measurements of the subsoil at various depths up to 20 metres shall be made at the site of each substation in order to determine the layered effects of the ground from which the effective ground resistivity and hence the expected resistance of the proposed earth grid system may be predicted Wagner's 4 - Electrode method as per IEEE-Std 81 may be followed for measurement of earth resistivity.

The earthing system shall comprise a mesh grid formed by hot dip galvanised iron flat bar (GI flat) of 75 X 10 mm(for 220/132 KV & 132/33 KV) and 40 mm MS rod (for 400 KV) buried directly in the ground and arranged so as to utilise fully the available site area. A continuous conductor shall be laid outside the periphery of the substation site at a distance of two metres from the switchyard fence and at a depth of at least 0.7 metres (the earth mat top shall be at 700 mm below the finished ground level) below the surface. A mesh system shall be formed by interconnection at various points to the perimeter conductor. The distance between two buried earth mat (flat/rod) shall be maximum 5 meters both way. The mesh system shall be designed such that the grid potential rise limits the touch voltage to a value not greater than the maximum tolerable touch potential; the fault clearance time to be used in the earthing calculations shall be taken as one second.

The earthing system shall be designed to meet the requirements of this specification and shall be in accordance with IEEE 80 and IS 3043. The Contractor shall present calculations to show the earthing system meets these requirements and can be shown to be safe in terms of touch, step and transferred potentials. The calculations shall be carried out considering a layer of crushed metals of thickness 100mm and without the same and if applicable recommend suitable site surfacing . The resistance of the earth mat shall not exceed 0.5Ω

In the event of the substation resistance obtained with the foregoing installation being of a magnitude unacceptable to the Engg Incharge (Divisional Engr.), then where practicable, the ground area enclosed by the earth system should be increased by installing directly in the ground a GI flat /MS rod conductor in the form of a ring around the site at a significant distance from the boundary fence. Alternatively earth conductors can be directly buried radially outside the substation perimeter fence. The use of earth plates as current carrying electrodes is not acceptable.

The earthing system shall be designed so as to include all overhead line terminal towers, which shall be earthed by extending the system so as to envelope all towers within the earth system. Each tower shall be bonded directly to the earth system from at least two locations. Structures and masts for lighting and security surveillance equipment shall also be within the perimeter of the earth grid. No fixed low voltage equipment, with the exception of a warning or alarm button and intruder alarms which shall be of the double insulation type, shall be erected outside the perimeter of the earth grid.

Where a metal substation fence is provided, this shall be bonded electrically to the earthing grid on each side at spacing not exceeding 0.25r (where r is the equivalent circular plate radius), at points adjacent to each corner and immediately below any overhead line entering or leaving the Site. The location of the mesh conductors shall be such as to enable all items of equipment to be connected to the earth system via the shortest possible route.

Gate posts forming part of the substation fence shall be bonded together with below ground connections and the gates themselves shall be electrically bonded to the posts at two points through flexible braids.

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The current density of the earth conductor shall be not greater than 100A/mm^2 Single connections between equipment and the earth system shall carry the total short circuit current, but the cross sectional area of branch connections may be reduced to take account of current distribution in two or more conductors. A distribution of 60 per cent shall be assumed for this purpose, i.e. the cross sectional area of branch connections may be reduced to 60 per cent of the corresponding single conductor

The earth conductor may be sized as per IEEE 80 and sufficient allowance for corrosion may be taken in to account

The grid voltage rise under fault conditions shall not exceed 15 kV. If the calculated grid voltage rise exceeds 430V, the local Telephone Authority shall be advised, by the Contractor, of the grid voltage rise and the distance of the 650V contour from the substation grid periphery.

The alternative approach of independently earthing the fence and placing it outside the earth grid area shall only be adopted if the above mentioned procedures prove insufficient or impracticable. The Contractor shall provide calculations to show that this approach produces safe touch voltages at the fence and shall ensure that the fence is isolated from all other buried metalwork.

Metal parts of all equipment, other than those forming part of an electrical circuit, shall be connected directly to the main earth system at two points For the same the size of the G.I flats shall also be 75X10mm.This is the raiser of the earth to the structures of column, beam and all equipment structures. The arrangement of the mesh earth system shall be such as to minimise the length of these connections.

A separate set of earth electrodes (at least two). GI pipe, perforated, 50mm dia, heavy duty having 3000mm long in a treated earth pit, shall be provided for the earthing for high frequency coupling equipment (CVT etc), surge arresters, IVT, each neutral of the transformers and reactors at a position immediately adjacent to the equipment being earthed in addition to the normal earth connection.

All main members of structural steelworks shall be earthed by GI flat(size 75X10mm) earthing connections being bonded to the steelworks. The Contractor shall be responsible for earthing of the transformers and circuit breakers installed on the substation site as per recommended.

Connections to apparatus and structures shall be made clear of ground level, preferably to a vertical face and protected against corrosion.

Earth bars installed directly into the ground should normally be laid bare and the trench back-filled with a fine top soil. Where the soil is of a hostile nature, precautions must be taken to protect the earth bar.

All exposed joints shall be at a minimum height of 150 mm above floor or ground level.

A facility shall be provided on the earth bar run between the equipment and the base of the structure, comprising a looped copper strip(test link), so as to permit the attachment of portable earth connections for maintenance purposes.

After installation of the earth system the Contractor shall measure the resistance of the substation. The method used shall preferably be the "fall of potential" method, requiring the availability of a local low voltage supply, but other methods using an earth resistance meter will be acceptable in the event of a local supply being unavailable.

The fencing of the switch yard also to be earthed by using G.I flats of size 75X10mm to each post and a continuous earth strip of size 50X6mm shall run all through the fence. The periphery of the switch yard shall be provided with non-treated earth pit at a distance of 5 mtrs all along the periphery The size of the non-treated pit conductor shall be 40 mm dia MS rod of length 3000mm. The said earth MS Rod to be placed in earth pit as per standard practice and the pit shall be filled with Bentonite powder mixed with lomy soil at a ratio 1:10. There shall be provision of watering into the earth pits. A pipe of adequate size should run all along the periphery and outlets shall be provided to each pit The pipe shall be connected to the overhead tank provided on the control room building and proper water control valve should be provided. Contractor shall prepare a detail earthing provision considering as per specification and shall obtain approval from OPTCL and the top of the MS rod shall be welded to the buried earth mats.

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- For outdoor applications, IP 55.
- For indoor applications where purpose built accommodation is provided, e.g. switch and control and relay rooms in auxiliary plant buildings, IP 41
- Where dust can adversely affect equipment within the enclosure, this equipment should be separately housed with a degree of protection of IP 51
- For indoor applications where the equipment is housed in the same building as that enclosing water and steam operated equipment, the degrees of protection stated in the previous paragraph shall be up-rated to IP 44 and IP 54 respectively.

Where more severe environments exist, e.g. steam and oil vapour or other deleterious chemical environments, special measures will be necessary and the degree of protection required will be specified separately.

The Contractor shall submit a schedule for providing the degree protection to various control boxes, junction boxes etc. for the Engg. Incharge (Divisional Engr.)s approval.

14. SUPPLY VOLTAGE

All incoming supplies of greater than 125 V to earth shall have their termination shrouded by a suitable insulating material.

The auxiliary supply voltages on site shall be as follows.

Nominal Voltage V	Variation	Frequency Hz or DC	Phase	Wires	Neutral Connection
430	±10%	50±5%	3	4	Solidly earthed
240	±10%	50±5%	1	2	Solidly earthed
220	187V - 242V	DC	DC	2	Isolated 2 wires
50	45V - 55V	DC	DC	2	+ve earthed

15. MAINTENANCE TELEPHONE POSITIONS

Telephone jack plug points shall be provided at each circuit breaker, at each power transformer marshalling kiosk and on each control and relay panel. At each substation these plug points are to be connected in parallel to form a site telephone circuit for use during maintenance and testing operations.

16. ERECTION CONDITIONS

16.1. General

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 on this Contract to be performed at Site

16.2. Regulation of local authorities and statutes

The Contractor shall comply with all the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the Minimum Wages Act 1948 and the

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payment of Wages Act (both of the Government of India and Govt of Orissa) and the rules made thereunder in respect of any employee or workman employed or engaged by him or his Sub-Contractor

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 provisions of the statutory laws and its amendments from time to time during erection in respect of the substation ultimately to be owned by the Employer shall be to the account of the Employer Should any such inspection or registration need to be re-arranged due to the fault of the Contractor or his Sub-Contractor, the additional fees to such inspection and or registration shall be borne by the Contractor

The Contractor shall ensure that he obtains, from the Government of Orissa, an Electrical Contractor's Licence and a supervisory certificate of the appropriate grade to allow him to execute the electrical works included in the Contract. The Contractor shall ensure that all workmen possess Workman Permits, issued by the Government of Orissa, for engagement in the Contract Works

16.3. Inspection, testing and inspection certificates

The provisions of the General Conditions of Contract shall also be applicable to the erection portion of the Works. The Engg. Incharge (Divisional Engr.)shall have the right to re-inspect any equipment though previously inspected approved by him at the Contractor's works, before and after the same are erected at Site.

16.4. Contractor's field operation

16.4.1 General

The Contractor shall inform the Engg. Incharge (Divisional Engr.)in advance of field activity plans and schedules for carrying-out each part of the works. Any review of such plans or schedules or methods of work by the Engg. Incharge (Divisional Engr.)shall not relieve the Contractor of any of his responsibilities towards the field activities. Such reviews shall not be considered as an assumption of any risk or liability by the Employer 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 of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.

16.4.2. Progress Report

Progress reports shall be provided by the Contractor to the Engg. Incharge (Divisional Engr.)in accordance with the relevant parts of this specification. Appropriate photographs shall accompany the monthly progress reports.

16.5. Facilities to be provided by the contractor

16.5.1 Unloading

Contractor shall make his own arrangement for unloading the equipment at site.

16.5.2. Tools, tackle and scaffoldings

The Contractor shall provide all the construction equipment tools, tackle and scaffoldings required for offloading, storage, pre-assembly, erection, testing and commissioning of the equipment covered under the Contract. He shall submit a list of all such materials to the Engg. Incharge (Divisional Engr.)before the commencement of pre-assembly at Site These tools and tackles shall not be removed from the Site without the written permission of the Engg. Incharge (Divisional Engr.).

16.6. First-Aid and general hygiene

The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the site At all times at least ten percent of all Contractors personnel assigned to the worksite shall be shall be trained in administering first-aid

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The labour colony, offices and residential areas of the Contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of the Engg. Incharge (Divisional Engr.). Proper sanitary arrangements shall be provided by the Contractor in work-areas, offices and residential areas of the Contractor.

Waste oil shall be disposed of in a manner acceptable to the Engg. Incharge (Divisional Engr.). Under no circumstances shall waste oil be dumped into uncontrolled drains.

16.7. Security

The Contractor shall have total responsibility for all equipment and material 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, equipment and works from theft, fire, pilferage and any other damages and loss.

16.8. Materials handling and storage

All the equipment furnished under the Contract and arriving at Site shall be promptly received, unloaded and transported and stored in the stores by the Contractor.

Contractor shall be responsible for examining the complete shipment and notifying the Engg. Incharge (Divisional Engr.)immediately of any damage, shortage, discrepancy etc. for the purpose of Engg. Incharge (Divisional Engr.)'s information only. The Contractor shall submit to the Engg. Incharge (Divisional Engr.)every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages during transit, handling, storage and erection of the equipment at Site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.

The Contractor shall maintain an accurate and exhaustive record detailing all equipment received by him for the purpose of erection and keep such record open for the inspection of the Engg. Incharge (Divisional Engr.).

All equipment shall be handled carefully to prevent any damage or loss. All equipment stored shall be properly protected to prevent damage. Equipment from the store shall be moved to the actual location at an appropriate time so as to avoid damage of such equipment at Site.

All the materials stored in the open or dusty location shall be covered with suitable weather-proof and flameproof covering material.

The Contractor shall be responsible for making suitable indoor facilities for the storage of all equipment which requires to be kept indoors.

17. CONSTRUCTION MANAGEMENT

17.1. General

Time is the essence of the Contract and the Contractor shall be responsible for performance of his Works 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 delays by increasing his work force or by working overtime to accelerate the progress of the work and to comply with schedule and shall communicate such actions in writing to the Engg. Incharge (Divisional Engr.), providing evidence that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

17.2. Field office records

The Contractor shall maintain at his Site office up-to-date copies of all drawings, specifications and other supplementary data complete with all the latest revisions 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 in the field. On completion of his total assignment

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under the Contract, such drawings and engineering data shall be submitted to the Engg. Incharge (Divisional Engr.)in the required number of copies.

17.3. Protection of property and Contractor's liability

The Contractor will ensure provision of necessary safety equipment such as barriers, sign-boards, warning light and alarms, personal protective equipment etc. to provide adequate protection to persons and property. The Contractor shall be responsible for giving reasonable notice to the Engg. Incharge (Divisional Engr.)and the owners of public or private property and utilities when such property and utilities are likely to be damaged or injured during the performance of his works, and shall make all necessary arrangements with such owners, related to removal and or replacement or protection of such property and utilities.

18. CODE REQUIREMENTS

The erection requirements and procedures to be followed during the installation of the equipment shall be in accordance with the relevant Indian/International Standards Regulations, ASME codes, accepted good engineering practice, drawings and other applicable Indian codes and laws and regulations..

19. EMPLOYER'S SUPERVISION

To eliminate delays and avoid disputes and litigation, it is agreed between the Parties to the Contracts that all matters and questions shall be referred to the Employer and without prejudice the Contractor shall proceed to comply with the,Employer's decision.

The work shall be performed under the direction and supervision of the Engg. Incharge (Divisional Engr.). The scope of the duties of the Engg. Incharge (Divisional Engr.), pursuant to the contract, will include but not be limited to the following:

- Interpretation of all the terms and conditions of these documents and specifications.
- Review and interpretation of all the Contractors drawing, engineering data etc.
- Witness or authorise his representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the Contract.
- Inspect, accept or reject any equipment, material and work under Contract.
- Issue certificate of acceptance and/or progressive payment and final payment certificates.
- Review and suggest modification and improvements in completion schedules from time to time.
- Supervise the Quality Assurance program implementation at all stages of the Works.

20. TESTING AND INSPECTION

The Contractor shall carry out the tests stated in accordance with the conditions of this Specification, without extra charge for such additional tests as in the opinion of the Engg. Incharge (Divisional Engr.)are necessary to determine that the Contract Works comply with this Specification. The tests shall be carried out generally in accordance with the relevant IEC's or IS or equivalent standards. The specific details of testing and inspection are given in the appropriate section of this Specification.

The Contractor shall submit Type Test Reports for all equipment being supplied by him for the Engg. Incharge (Divisional Engr.)'s approval. The Engg. Incharge (Divisional Engr.)may also give instruction to carry out Type Tests, routine tests or acceptance tests. Type Test Charges shall be paid as per the rates indicated in the Price Schedules.

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All materials used shall be subjected to such routine tests as are customary in the manufacture of the types of plant included in the Contract Works. These materials shall withstand satisfactorily all such tests.

All tests shall be carried out to the satisfaction of the Engg. Incharge (Divisional Engr.), in his presence, at such reasonable times as he may require, unless agreed otherwise. Not less than three weeks notice of all tests shall be given to the Engg. Incharge (Divisional Engr.)in order that he may be represented if he so desires. As many tests as possible shall be arranged together. Six copies of the Contractor's test reports and test sheets shall be supplied to the Engg. Incharge (Divisional Engr.)for approval.

Measuring apparatus shall be approved by the Engg. Incharge (Divisional Engr.)and if required shall be calibrated at the expense of the Contractor at an approved laboratory.

The Contractor shall be responsible for the proper testing of the work completed or plant or materials supplied by a sub-contractor to the same extent as if the work, plant or materials were completed or supplied by the Contractor himself.

All apparatus, instruments and connections required for the above tests shall be provided by the Contractor, but the Engg. Incharge (Divisional Engr.)may permit the use for the tests on site, any instruments and apparatus which may be provided permanently on site as part of the contract works conditional upon the Contractor accepting liability for any damage which may be sustained by such equipment during the test.

The contractor shall supply suitable test pieces of all materials as required by the Engg. Incharge (Divisional Engr.). If required by the Engg. Incharge (Divisional Engr.), test specimens shall be prepared for check testing and forwarded at the expense of the Contractor to an independent testing authority selected by the Engg. Incharge (Divisional Engr.).

Any costs incurred by the Employer in connection with inspection and re-testing as a result of a failure of the subject under test, or damage during transport, or erection on site before take-over by the Employer, shall be to the account of the Contractor.

No inspection or lack of inspection or passing by the Engg. Incharge (Divisional Engr.)of work, plant or materials, whether carried out or supplied by the Contractor or sub-contractor, shall relieve the Contractor from his liability to complete the Contract Works in accordance with the Contract or exonerate him from any of his guarantees.

21. FIRE PRECAUTIONS

All apparatus, connections and cabling shall be designed and arranged to minimise the risk of fire and any damage which might be caused in the event of fire. When cabling is carried out as part of this Contract the Contractor shall be responsible for sealing all holes in floors, walls, roofs etc. through which the cabling may pass.

The work procedures that are to be used during the erection shall be those which minimise fire hazards to the maximum 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 site and equipment and material stores in appropriate safe containers.

All Contractor's supervisory personnel and at least ten percent all of workers shall be trained for fire fighting and shall be assigned specific fire protection duties. At least ten percent of all personnel assigned to site at any one time shall be trained for fire fighting.

The contractor shall provide sufficient fire protection equipment of the types and sizes for the ware-houses, office temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all time.

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VII. Other important information.

The times at which the various training courses will take place shall be stated, and fully documented notes shall be available to the Employer not later than two months before the commencement of the course

All training course notes and documentation shall be in the English language

An estimate of the total number of the Employer's staff required to run, operate and service the works covered by this Specification shall be given if this is different to the numbers specified.

The prices of the training courses shall be detailed in full such that additions or deletions to personnel or courses can be calculated by the Employer without necessarily having to contact the Contractor. This is particularly important for the 'Software management' courses where prices for formal course days and practical course days shall be individually detailed.

9.0 ERECTION AT SITE AND ACCOMMODATION

The Contractor shall provide, at his own cost and expense, all labour, plant and material necessary for unloading and erection at the Site and shall be entirely responsible for its efficient and correct operation.

The Contractor shall be responsible for arranging and providing all living accommodation services and amenities required by his employees. He shall also provide suitable office accommodation at each substation site for the sole use by the Engg Incharge (Divisional Engr.) **for new substations only**.

10 .0 SITE CONSTRUCTION SUPPLIES

The Contractor shall provide at his own cost and expense, any site supplies of electrical energy which he may require for supplying power for heavy erection plant, welding plant or other tools and lighting and testing purposes.

All wiring for such tackle and for lighting from the point of supply shall be provided by the Contractor and all such installations shall comply with all appropriate statutory regulations to which the Employer is subject.

Wiring shall be of the best quality double insulated flexible cable, suitably fixed, protected and maintained. All necessary precautions shall be taken to ensure the safety of every person employed or working on the Site and this shall include routine inspection of all temporary installations and portable equipment

The Engg Incharge or his authorised representative may require the disconnection or alteration of any parts which he may consider dangerous.

As soon as any part or the whole of the Contractor's installation is no longer required for the carrying out of the works, the Contractor shall disconnect and remove the same to the satisfaction of the Engg Incharge or his authorised representative.

The contractor shall be responsible for arranging construction water at his own cost.

How ever in case water is available at any substation site, Contractor may request Engg Incharge for availing water at one point, which shall be charged to the contractor at prevailing rates for supply of water by Govt. Dept Municipal Authorities.

In no case the work shall suffer on account of the Employer not making available the supply of water and electricity for construction purposes.

11.0 SUPERVISION AND CHECKING OF WORK ON SITE

All work on site included in the Contract scope of works shall be supervised by a sufficient number of qualified representatives of the Contractor

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Before putting any plant or apparatus into operation the Contractor shall satisfy himself as to the correctness of all connections between the plant and apparatus supplied under this and other contracts. The Contractor shall advise the Engg Incharge in writing, giving the period of notice as specified in the General Conditions of Contract, when the plant or apparatus is ready for inspection or energisation.

12 .0 RESPONSIBILITY FOR THE RUNNING OF PLANT BY CONTRACTOR

Until each Section of the Contract Works has been taken over or deemed to have been taken over under the Conditions of Contract, the Contractor shall be entirely responsible for the Contract Works, whether under construction, during tests, or in use for the Employer's service.

The Contractor shall instruct the Employer's operating staff in the recommended method of operation of the plant supplied. Such instruction shall commence prior to the commissioning of the plant and shall be followed by practical instruction for a period of up to one month after the plant is taken over by the Employer. During this one month period the Contractor shall provide an engineer, on each site that is taken over, to assist with operation of the plant and to provide on-site training of the Employer's operating staff. The training schedule and programme for each substation shall be submitted to the Engg Incharge for approval, three months prior to the substation's planned completion date.

If the Employer shall so require, the Contractor shall provide the services of a skilled engineer acquainted with the running of the plant for any period required by the Employer between commencing of use of any portion of the plant (whether taken over or not) and the expiry of the period of maintenance, the wages for such services being paid by the Employer to the Contractor, except in respect of the carrying out of any work already covered by the Contractor's obligations under this Contract.

When the Contractor ceases to be obliged to maintain a supervising engineer on the Site under the foregoing provisions of this clause, the Contractor shall, until the expiration of the period of maintenance, make such arrangements as to ensure the attendance on site within 24 hours of being called upon by the Engg Incharge of a competent supervising engineer for the purpose of carrying out any work of maintenance or repair for which the Contractor shall be liable. During such part or parts of the said period as the Engg Incharge shall deem it necessary the said representative shall be continuously available on the Site.

Any work which may be necessary for the Contractor to carry out in pursuance of his obligations under the Conditions of Contract shall be carried out with the minimum of interference to the normal operation of the substation. Work on the Site shall be carried out at such time and during such hours as the Engg Incharge may require.

13 .0 COMPLIANCE WITH REGULATIONS

All apparatus and material supplied, and all work carried out shall comply in all respects with such of the requirements of all Regulations and Acts in force in the country of the Employer as are applicable to the Contract Works and with any other applicable regulations to which the Employer is subject.

The Contractor shall fully inform himself of the requirements of the local Laws, Regulations and rules in-force in the State of Orissa, especially with respect to local employment laws, licensing requirements, electrical safety rules and regulations, building regulations and planning procedures.

The Contractor shall be responsible for applying for all necessary licenses, including Electrical Contractors License, Workman's Permits and Certificates of Competency for Supervisors, and local government approvals required for the contract works and for the payment of all necessary fees associated with such licenses and approvals.

Correspondence with the Electrical Inspector shall be conducted through the Engg Incharge (Divisional Engr.), but the Contractor shall provide all necessary information, regarding the contract works as may be required by the Electrical Inspector.

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Additionally the Contractor shall also follow the minimum regulations on safety, employees welfare, industry etc. as stipulated under the relevant Clause of this section.

14 .0 MAINTENANCE AND CLEARING OF SITE

The placing of materials and plant near the erection site prior to their being erected and installed shall be done in a neat, tidy and safe manner. The Contractor shall at his own expense keep the site area allocated to him and also the erection area of the Contract Works reasonably clean and shall remove all waste material as it accumulates and as directed by the Engg Incharge from time to time.

15 .0 INSURANCE

15.1 General

In addition to the conditions covered under the Clause titled insurance in the Special Conditions of Contract, the following provisions will also apply to the portion of works to be done beyond the Suppliers own or his sub-Contractors manufacturing Works.

15.2 Workmen's Compensation Insurance

This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948 (Government of India). This policy shall also cover the Contractor against the claims for injury, disability, disease or death of his or his sub-contractor's employees, which for any reason are not covered under the Workman's Compensation Act, 1948. The liabilities shall not be less than:

I.	Workmen's' Compensation	As per statutory provisions
II.	Employee's liability	As per statutory provisions

* According to the Govt. rules.

15.3 Comprehensive auto mobile insurance

This insurance shall be in a such a form to protect the Contractor against all claims for injuries, disability, disease and death to members of public including the Employer's men and damage to the property of others arising from the use of motor vehicles during on or off the Site operations, irrespective of the ownership of such vehicles. The minimum liability covered shall be as herein indicated:

I.	Fatal Injury	Rs. 100,000 - each person
II.	Property	Rs. 200,000/- each occurrence
III	Damage	Rs. 100,000/- each occurrence

* As per latest prevailing Govt. rules

15.4 Comprehensive General Liability Insurance

This insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members or public or damage to property of others, due to any act or omission on the part of the Contractor, its agents, its employees, its representatives and sub-contractors or from riots, strikes and civil commotion.

The hazards to be covered will pertain to all works and areas where the Contractor its sub-contractors, agents and employees have to perform work pursuant to the Contracts.

The above are only an illustrative list of insurance covers normally required and it will be the responsibility of the Contractor to maintain all necessary insurance coverage to the extent both in time and amount to take care of all its liabilities either direct or indirect in pursuance of the Contract

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16.0 PROTECTION OF MONUMENTS AND REFERENCE POINTS

The Contractor shall ensure that any finds such as relics, antiques, coins, fossils, etc. which he may come across during the course of performance of his works either during excavation or elsewhere, are properly protected and handed over to the Employer. Similarly, the Contractor shall ensure that the bench marks, reference points, etc. which are marked either with the help of Employer or by the Employer shall not be disturbed in any way during the performance of his works. If any work is to be performed which disturbs such reference points, the same shall be done only after these are transferred to other suitable locations under the direction of the Employer. The Contractor shall provide all necessary materials and assistance for such relocation of reference points etc.

17 .0 WORK AND SAFETY REGULATIONS

The Contractor shall ensure safety of all the workmen, plant and equipment belonging to him or to others, working at the Site. The Contractor shall also provide for all safety notices and safety equipment required by the relevant legislation and deemed necessary by the Engg Incharge .

The Contractor will notify, well in advance to the Engg Incharge, his intention to bring to the Site any container filled with liquid or gaseous fuel, explosive or petroleum substance or such chemicals which may involve hazards. The Engg Incharge shall have the right to prescribe the conditions under which such a container is to be stored, handled and used during the performance of the works and the Contractor shall strictly adhere to and comply with such instructions. The Engg Incharge shall also have the right, at his sole discretion, to inspect any such container or such construction plant and equipment for which materials in the container is required to be used and if in his opinion, its use are not safe, he may forbid their use.

No claim due to such prohibition or towards additional safety provisions called for by him shall be entertained by the Employer.

Further any such decision of the Engg Incharge shall not, in any way, absolve the Contractor of his responsibilities and in case use of such a container or entry thereof into the Site areas is forbidden by the Engg Incharge the Contractor shall use alternative methods with the approval of the Engg Incharge without any cost implication to the Employer or extension of work schedule.

Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934 Explosives Act 1948 and amendments thereof and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Engg Incharge. In case, any approval is necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.

All equipment used in construction and erection by Contractor shall meet Indian or International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the Contractor in accordance with manufacturers operation manual and safety instructions and as per any existing Guidelines Rules in this regard.

Periodical examinations and all tests for all lifting and hoisting equipment and tackle shall be carried out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity (Supply) Act and associated Laws Rules in force, from time to time. A register of such examinations and tests shall be properly maintained by the Contractor and will be promptly produced as and when desired by Engg Incharge.

The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by the Engg Incharge who will also have the right to examine such safety equipment to determine it's suitability, reliability, acceptability and adaptability.

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Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced and qualified competent person, strictly in accordance with the Code of Practices/Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosive.

Contractors employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract shall employ at least one full time officer exclusively as Safety Officer to supervise safety aspects of the equipment and workmen. Such an officer will co-ordinate with the Project Safety officer of the Employer

The name and address of the Safety Officer of the Contractor will be promptly informed in writing to the Engg Incharge with a copy to the Safety Officer-in-charge before he starts work or immediately after any change of the incumbent is made during currency of the Contract.

In case any accident occurs during the construction, erection or other associated activities undertaken by the Contractor, thereby causing any minor or major or fatal injury to his employees due to any reason whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Engg Incharge and also to all the authorities envisaged under the applicable laws.

The Engg Incharge shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way as may cause accidents or endanger the safety of the persons and/or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall remove shortcomings immediately. The Contractor, after stopping the specific work, can if felt necessary appeal against the order of stoppage of work to the Engg Incharge within three days of such stoppage of work and the decision of the Engg Incharge in this respect shall be conclusive.

The Contractor shall not be entitled for any damages or compensation for stoppage of work due to safety reasons and the period of such stoppage of work will not be taken as an extension of time for completion of work, nor will it be the grounds for waiver of any part of suppliers liability for timely completion of the works.

The Contractor shall follow and comply with all Safety Rules, relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any conflict between statutory requirement and Safety Rules referred above the most stringent clause shall be applicable.

If the Contractor fails in providing safe working environment as per Safety Rules or continues the works even after being instructed to stop work by the Engg Incharge, the Contractor shall promptly pay to the Employer on demand, compensation at the rate of Rs. 5,000/- per day or part thereof till the instructions are complied with and so certified by the Employer However, in case of accident taking place causing injury to any individual, the provision contained in subsequent paragraph as here below shall also apply in addition to the compensation mentioned in this paragraph.

If the Contractor does not take all safety precautions and comply with Safety Rules as prescribed by the Engg Incharge or as prescribed under the applicable law, to safeguard equipment, plant and personnel the Contractor shall be responsible for payment of compensation to the Employer as per the schedule given below

If the Contractor does not prevent hazardous conditions which may cause injury to his own employees, employees of other Contractors, or the Employer or any other person at Site or adjacent thereto, the Contractor shall be responsible for payment of compensation to the Employer as per the following Schedule:

Fatal injury or accident causing death.	Rs 100,000.- per person	Applicable for injury or death to any person whomsoever
Major injuries or accident causing 25% or more permanent disability	Rs 20,000.- per person	Applicable for injury or death to any person whomsoever

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* As per prevailing Govt. rules.

Permanent disability shall have the same meaning as indicated in Workmen's Compensation Act. The compensation mentioned above shall be in addition to the compensation payable to the workmen/employees under the relevant provisions of the Workmen's Compensation Act and rules framed thereunder or any other applicable law as applicable from time to time. In case the Employer is made to pay such compensation, the Contractor will reimburse the Employer such amount(s) in addition to the compensation indicated above.

18 .0 FOREIGN PERSONNEL

If necessary for the execution of the works, the Contractor shall bring foreign supervisors for the execution of the Contract at his own cost. The Contractor shall submit to the Employer data on all personnel he proposes to bring into India for the performance of the works under the Contract, at least Sixty (60) days prior to their arrival in India. Such data shall include the name of each person, his present address, his assignment and responsibility in connection with the works, and a short resume of his qualifications and experience etc. in relation to the work to be performed by him.

Any person unsuitable and unacceptable to the Employer shall not be brought to India. Any person brought to India, and found unsuitable or unacceptable to the Employer shall be immediately removed from Site and repatriated. If found necessary, he may be replaced by other personnel acceptable to the Employer

No person brought to India by the Contractor for the works shall be repatriated without the consent of the Employer in writing, based on a written request from the Supplier for such repatriation giving reasons for such an action to the Employer. The Employer may give permission for such repatriation provided the Employer is satisfied that the progress of work will not suffer due to such repatriation.

The cost of passports, visas and all other travel expenses to and from India, shall be to the Contractor's account. The Employer will not provide any residential accommodation and/or furniture for any of the Contractors personnel including foreign personnel. Contractor shall make his own arrangements for such facilities.

The Contractor and his expatriate personnel shall respect all Indian Acts, Laws, Rules and Regulations and shall not in any way, interfere with Indian political and religious affairs and shall conform to any other rules and regulations which the Government of India, and the Employer may establish on them. The Contractor's expatriate personnel shall work and live in close co-operation and co-ordination with their co-workers and the community and shall not engage themselves in any other employment either part-time or full-time nor shall they take part in any local politics.

The Employer shall assist the Contractor, to the extent possible, in obtaining necessary certificates and other information needed by the Government agencies

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comply with the requirements of IEC 455. The Contractor shall provide full details of the coating process to the Engg. Incharge (Divisional Engr.)for approval.

It is the responsibility of the Contractor to ensure that the quality of paints used shall withstand the tropical heat and extremes of weather conditions specified in the schedules. The paint shall not peel off, wrinkle, be removed by wind, storm and handling on site and the surface finish shall neither rust nor fade during the service life of the equipment.

The colours of paints for external and internal surfaces shall be in accordance with the approved colour schemes.

10.3.2. Works painting processes

All steelworks, plant supporting steelworks and metalwork, except galvanised surfaces or where otherwise specified, shall be shot blasted to BS 7079 or the equivalent ISO standard. All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS 6005 "Code of Practice for phosphating iron and sheet steel". All surfaces shall then be painted with one coat of epoxy zinc rich primer, two pack type, to a film thickness of 50 microns. This primer shall be applied preferably by airless spray and within twenty minutes but not exceeding one hour of shot blasting.

All rough surfaces of coatings shall be filled with an approved two pack filler and rubbed down to a smooth surface.

The interior surfaces of all steel tanks and oil filled chambers shall be shot blasted in accordance with BS 7079 or the equivalent ISO, and painted within a period of preferably twenty minutes, but not exceeding one hour with an oil resisting coating of a type and make to the approval of the Engg. Incharge (Divisional Engr.).

The interior surfaces of mechanism chambers, boxes and kiosks, after preparation, cleaning and priming as required above, shall be painted with one coat zinc chromate primer, one coat phenolic based undercoating, followed by one coat phenolic based finishing paint to a light or white colour. For equipment for outdoor use this shall be followed by a final coat of anti-condensation paint of a type and make to the approval of the Engg. Incharge (Divisional Engr.), to a light or white colour. A minimum overall paint film thickness of 150 microns shall be maintained throughout.

All steelworks and metalwork, except where otherwise specified, after preparation and priming as required above shall be painted with one coat metallic zinc primer and two coats of micaceous iron oxide paint followed by two coats of either phenolic based or enamel hard gloss finished coloured paint to the approval to an overall minimum paint film thickness of 150 microns.

Galvanised surfaces shall not be painted in the works.

All nuts, bolts, washers etc., which may be fitted after fabrication of the plant shall be painted as described above after fabrication.

The painted metal works shall be subjected to paint qualification test as per draft ANSI IEEE-Std 37.21 -1985 clause 5.2.5.

10.3.3. Site painting

After erection at site, the interior surfaces of mechanism chambers and kiosks shall be thoroughly examined, and any deteriorated or mechanically damaged surfaces of such shall be made good to the full Specification described above.

After installation erection at site all surfaces of steelworks and metalwork shall be thoroughly washed down. Any deteriorated or otherwise faulty paint-work removed down to bare metal and made good to the full Specification described above, then painted one further coat of phenolic based undercoating and one coat phenolic based hard gloss finishing paint to provide an overall minimum paint film thickness of 200 microns.

Any nuts, bolts, washers, etc. which have been removed during site erection or which may be required to be removed for maintenance purposes shall be restored to their original condition.

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All paint work shall be left clean and perfect on completion of the works.

10.3.4 Colour Schemes The Contractor shall propose a colour scheme for the sub-station for the approval of Engg. Incharge (Divisional Engr.). The decision of Engg. Incharge (Divisional Engr.) shall be final. The scheme shall include:

- Finishing colour of indoor equipment
- Finishing colour of outdoor equipment
- Finish colour of all cubicles
- Finishing colour of various auxiliary system equipment including piping.
- Finishing colour of various building items.

All steel structures, plates etc. shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all Employer's electrical equipment in Employer's switchyard are painted with shade 631 of IS:5 and Employer will prefer to follow the same for this project also. All indoor cubicles shall be of same colour scheme and for other miscellaneous items colour scheme will be subject to the approval of the Engg. Incharge (Divisional Engr.).

Sl. No.	Equipment	Application Environment			
		Indoor		Outdoor	
		Colour	Code IS:5	Colour	Code IS:5
400kV/220kV/132kV Class Equipment					
1	Transformers	—	—	Light grey	631
2	Marshalling boxes, CTs, PT's, CVT's surge counter casings, junction boxes etc	Light Admiralty grey	697	Light Admiralty grey.	697
3	Control and relay panels PLCC cabinets etc	Smoke grey	692	—	—
4	Porcelain parts i.e. insulators	Dark brown	412	Dark brown	412
5	All structures/ metallic parts exposed to atmosphere	Hot dip galvanised			
33kV Class equipment					
6	Switchgear cubicles	Smoke grey	692	Light grey	631
7	Control and relay panels	Smoke grey	692	—	—
	LT switchgear				
8	LT switchgear exterior	Smoke grey	692	Light grey	631
9	ACDB/ MCC	Smoke grey	692	Light grey	631
10	DCDB	Smoke grey	692	—	—
11	LT bus duct in side enclosure	Matt Paint		—	—
12	LT bus duct outside enclosure	Smoke grey	692	—	—
13	Motors	Smoke grey	692	Light grey	631
14	Diesel generator engine	Smoke grey	692	—	—
15	Diesel generator	Smoke grey	692	—	—
16	LT transformers	Smoke grey	692	Light grey	631
17	Battery charger	Smoke grey	692	—	—
18	Mimic diagram				
	400kV	Dark violet	796	—	—
	220kV	Golden yellow	356	—	—
		Sky blue			
	132kV	Signal red	101	—	—
	33kV	Canary yellow	537	—	—
	11kV	Middle brown	309	—	—
	415V		411	—	—
	Miscellaneous				
19	Control modules and console inserts	Smoke grey	692	Light grey	631
20	Lighting package equipment outside	Light grey	631	Light grey	631
21	Lighting package equipment inside	Glossy white		Glossy white	
22	Water pipes	sea green	217	sea green	217

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ODISHA POWER TRANSMISSION CORPORATION LIMITED

TECHNICAL SPECIFICATION

FOR

ELECTRICAL EQUIPMENT INSTALLATION AND COMMISSIONING

BHEL Transmission Busin
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1.0 ELECTRICAL EQUIPMENT INSTALLATION AND COMMISSIONING

1.1 SCOPE

This chapter describes board guidelines for installations, testing and commissioning of electrical equipment. The work shall, however, be carried out strictly as per the instruction of the MANUFACTURER / EMPLPOYER.

1.2 CODES AND STANDARDS

The electrical installation work shall comply with the latest applicable standards, regulations, electricity rules and safety codes of the locality where the installation is carried out. Nothing in this specification shall be construed to relieve the CONTRACTOR OF HIS RESPONSIBILITY

1.3 GENERAL

The CONTRACTOR shall transport the equipments where required in actual position. Erect, assemble all parts of the equipments and test and commission the same.

The CONTRACTOR shall furnish all tools, welding equipment, rigging materials, testing equipment, test connections and kits, etc. required for complete installation, testing and commissioning of the items included in the contract work.

The EMPLOYER may engage specialist Employer to supervise the installation, testing and commissioning of their equipment. The CONTRACTOR shall extend full co-operation to these Employers and carry out the works as per their instructions. The CONTRACTOR'S work shall include minor rewiring modifications as may be necessitated during commissioning. Providing such assistance shall be deemed to be included in the CONTRACTOR'S basic scope.

The CONTRACTOR shall co-operate through the EMPLOYER with other contractors at site, in all matters of common interest, so as not to abstract operation of others and to ensure the safety of all personnel and works covered under this specification.

It will be the CONTRACTORS responsibility to assist the OWNER to obtain approval/ clearance from local statutory authorities including electrical inspector wherever applicable, for conducting any work or for installation carried out which comes under the purview of such authorities.

The work shall be carried out strictly as per the instructions and layout drawings of the EMPLOYER/ manufacturer. In case of any doubt/ misunderstanding as to correct interpretation of the drawings or instructions, necessary clarifications shall be obtained from the EMPLOYER. The CONTRACTOR shall be held responsible for any damage to the equipment consequent to not following the MANUFACTURER'S instructions correctly. All necessary drawings, MANUFACTURER'S instructions correctly All necessary drawings, MANUFACTURER'S equipment manuals will have to be arranged by the contractor as this is a Turn-key contract.

All thefts of equipment/component parts till the including executed portion handed over to the EMPLOYER shall be made good by the CONTRACTOR.

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The CONTRACTOR shall have a separate cleaning gang to clean all equipment during erection and as well as the work area and the project site at regular intervals to the satisfaction of the EMPLOYER. In case the cleaning is not to the Employer's satisfaction, he will have the right to carry out the cleaning operations and any expenditure incurred by the OWNER in this regard will be the CONTRACTOR'S account

In order to avoid hazards to personnel moving around the equipment such as switcher etc. which is kept charged after installation before commissioning, such equipment shall be suitably cordoned off to prevent any one accidentally going near it.

Safety of the Contractor's personnel engaged in erection and commissioning job will be Contractor's responsibility.

The CONTRACTOR shall carry out touch-up painting on any equipment indicated by the EXMPLOYER if the finish paint on the equipment is soiled for marred during installation handling.

The CONTRACTOR shall ensure workmanship of good quality and shall assign qualified supervisors/Employers and competent labour who are skilled, careful and experienced in their several trades in similar works. The EMPLOYER shall reserve the right to reject non-competent persons employed by the CONTRACTOR, if the workmanship is not of good order.

It shall be the responsibility of the CONTRACTOR to obtain necessary Licence/ Authorisation, Permit for work from the Licensing Board of the Locality/ state where the work is to be carried out. The persons deputed by the CONTRACTOR'S firm should also hold valid permits issued or recognized by the Licensing Board of the locality/State where the work is to be carried out. A list of the personnel engaged in erection and commissioning work should be submitted to the Employer before commencement of the work.

2. 0 INSTALLATION WORK SCOPE

Equipment shall be installed in neat, workmanlike manners so that it is level, plump, square and properly aligned and oriented. Tolerances shall be established in the Manufacturer's drawings or as stipulated by the EMPLOYER. No equipment shall be permanently bolted down to foundation or structure until the alignment has been checked and found acceptable by the EMPLOYER.

Care shall be exercised in handling to avoid distortion to stationary structures, the marring of finish, or damaging of delicate instruments or other electrical parts. Adjustment shall be made as necessary to the stationary structures for plumb and level, for the sake of appearance or to avoid twisting of frames, binding of hanged members, etc.

The CONTRACTOR shall move all equipment into the respective building through the regular doors or floor opening provided specially for lifting the equipment.

All external cabling including end connections and earthling shall also be carried out

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2.1 POWER AND INSTRUMENT TRANSFORMERS

Physical inspection on receipt, storage, installation, testing and commissioning of transformers shall be in accordance with the specified code of practice and Manufacturer's instructions.

Transformer may be delivered without oil filled with inert gas and without bushings and external mounted accessories. As applicable, the CONTRACTOR shall

a) Assemble the transformers with all fittings such as bushings, cooler banks, radiator, conservators, valves, piping, cables boxes, marshalling boxes OLTC cooling fans/pumps, etc.
b) Arrange for vacuum and oil filtration of the transformers. Oil filtration shall be done as per the standard practice. Oil tanker in this effect are to be used and filtration to be done while the oil is inside the tanker. On getting the standard value of the oils the same shall be pushed into the main tank and other portion of the transformer. Final filtration to be done after entire oil is filled in the transformer. Prior to that vacuum treatment of the tank of the transformer with the windings are to be taken up.
c) Provide wedges/clamps to rigidly station all transformers on rails.
d) Connect up the transformer's terminals.
e) Lay and terminate cables/ conduits between all the accessories mounted on the transformer tank/cooler and the transformer-marshalling kiosk and RTCC panels etc.
f) Pre commissioning checks shall be carried out as per relevant standards and Employer's instructions.

The CONTRACTOR shall arrange the oil filtration equipment.

Care shall be taken during handling of insulating oil to prevent ingress of moisture or foreign matter. In the testing, circulating, filtering or otherwise handling of oil, rubber hoses shall not be used, circulation and filtering of oil, the heating of oil by regulated short-circuit current during drying runs and sampling and testing of oil shall be in accordance with the MANUFACTURER'S instructions and specified Code of Practice.

2.2 SWITCHGEAR, CONTROL/ RELAY PANELS

Switchgears and control relay panels/desks shall be installed in accordance with specified Code of Practice and the Manufacturer's instructions. The switchgear panels shall be installed on finished surfaces or concrete or steel sills. The CONTRACTOR shall be required to install and align and channel sills which form part of the foundations. In joining shipping sections of the switchgear panels control centers together with adjacent housing or panes sections provided shall be bolted together after alignment has been completed. Power bus, enclosures, ground and control splices of conventional nature shall be cleaned and bolted together, being drawn up with torque wrench of proper size or by other approved means. Tape or compound shall be applied where called for by the MANUFACTURER'S drawings.

The CONTRACTOR shall take utmost care in handling instruments Relays and other delicate mechanisms. Wherever the instruments and relays are supplied separately, they shall be mounted only after the associated control panel/desks have been erected and aligned. The blocking materials/mechanism

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employed for the safe transit of the instruments and relays shall be removed after ensuring that the panels/desks have been completely installed and no further movement of the same would be necessary. Any damage to relays and instruments shall be immediately reported to the EMPLOYER.

Pre-commissioning checks on relays have to be carried out on all relays in accordance with manufacturers instruction and in presence of Employer.

2.3 BATTERY AND CHARGERS

Installation and testing of battery and battery chargers shall be done in strict compliance with the manufacturer's instructions. Each cell shall be inspected for break ate and condition of cover seals as soon as received at site. Each cell shall be filled with electrolyte in accordance with the MANUFACTURER'S instructions. Battery shall be set up on racks as soon as possible after receipt, utilizing lifting devices supplied by the MANUFACTURER. The cells shall not be lifted by the terminals. Contact surfaces of battery terminals and inter-cell connectors shall be cleaned, coated with protective grease and assembled. Each connection shall be properly tightened. Each cell shall be tested with hydrometer and results logged. Freshening charge, if required, shall be added. When turned over to the EXPLOYER, the battery shall be fully charged and electrolyte shall be at full level and of specified specific gravity.

Battery shall be put in commercial use only after carrying out charge/discharge cycle as per Manufacturer's instruction.

3.0 SWITCHYARD

The CONTRACTOR shall carry out switchyard installation as required as per approved plan and elevation drawings of switchyard showing bus bar configurations, sizes, tensions, insulator details, etc. All equipment including connectors (unless otherwise specified) will be supplied by the VENDOR The bus bar arrangement shall be two Bus system, main Bus-1 and main Bus-2 for 220 KV side and Main bus and transfer bus arrangement for 132 KV side.

The CONTRACTOR shall install complete set of bus bars and all bays' conductors, complete with tension with tension suspension insulator strings, bus-post insulators, equipment connections, bus bar connections to equipment, lightning shield wires including down comers up to a height of 1000 mm From ground level where they shall be connected to the Employer's test links

Installation work of breakers and isolators shall include adjustment/ alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All insulators and bushings shall be protected against damage during installation. Insulators and bushings damaged due to negligence or carelessness of the CONTRACTOR shall not be in any way accepted and shall be replaced by him at his expense.

General requirements of Installation of Cabling

i) The supplier shall install, test and commission the cables. Cables shall be laid on cable trays and supports, in conduits and doctor or bare on walls, ceiling, etc. as required. The supplier's scope of work includes laying, fixing, jointing, bending and terminating cables. The supplier shall also supply necessary materials and equipment required for jointing and terminating of cables. The supplier shall prepare detailed layout drawing for cable trenches, cable tray layouts for approval by Employer and construct cable routes strictly according to these drawings

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ii) Sharp bending, twisting and kinking of cables shall be avoided. The bending radius for various types of cables shall not be less than those specified by cable manufacturer.

iii) In each cable run, some extra length shall be kept at a suitable point to enable one or two straight through joints to be made. Should the cable develop fault at a later date.

iv) Cable joints in the middle of the run for control cables will not be a accepted.

v) All cable terminations shall be made in a neat, Workmanlike manner. Terminations shall be made for each type of wire or cable in accordance with instructions issued by cable manufacturers and the Employer.

vi) Metal sheath and Armour of the cable shall be bounded to the earthing system of the sub-station.

3.1. GENERAL REQUIREMENTS OF INSTALLATION FOR CONDUITS, PIPES AND DUCTS.

i) The supplier shall supply and install conduits pipes(PVC thick but flexible suitable for taking inside the roof and walls) and ducts as necessary for the lighting system. All accessories/fittings required for making installation complete Including but not limited to ordinary and inspection tees and elbows, check nuts, make and female reducers and enlargers, wooden plugs, caps, squat headed male plugs, nipples, gland sealing fittings, motion boxes, pull boxes, conduit outlets, outlet boxes, splice boxes, terminal boxes, glands, gaskets and box covers, saddles and all steel supporting work shall be supplied. Conduit fittings shall be of the galvanized one. Flexible metallic conduits shall be used for termination of connections to equipment such as motors or other apparatus to be disconnected at periodic intervals.

ii) Conduits(thick and flexible PVC) and accessories shall be adequately protected against mechanical damage as well as corrosion.

3.2. GENERAL REQUIREMENTS OF INSTALLATION FOR EARTHING AND LIGHTNING PROTECTION SYSTEMS

4. 0 SCOPE OF INSTALLATION

i) The supplier shall install steel conductors(GI flats) and braids, as required for system and individual equipment earthing. All work such as cutting, bending, supporting, painting coating drilling, brazing/soldering/welding, clamping, bolting and connection on to structures, equipment frames, terminals, rails or other devices shall be in the scope of work. All incidental hardware and consumables such as fixing cleats/clamps, Anchor fasteners, lugs, bolts, nuts, washers, bituminous compound, anticorrosive paints as required for the complete work shall be deemed to to be included as part of the installation work

ii) The quantities, sizes and material of earthing conductors and electrodes to be installed and routes of the conductors and location of the electrodes shall be as per specification mentioned elsewhere and approved drawings for the optimal capacity of the Sub-station taking the future requirement in to account..

iii) The scope of installation of earth conductors in outdoor areas, buried in ground shall include excavation in earth at least upto 700 mm. Deep and 450 mm. wide (unless

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otherwise stated). brazing/welding as required of main grid conductor joints as well as risers of 500 mm. Length above ground at required locations and back filling. Back filling material to be placed over buried conductor shall be free from stones and other harmful mixtures. Backfill shall be placed in layers of 150 mm. uniformly spread along the ditch and tempered utilizing pneumatic tempers or other approved means.

vii) The scope of installation of earth connection leads to equipment and risers on steel structures/walls shall include laying the conductors, welding/ cleating, at specified intervals, welding/brazing to the main earth grids risers, bolting at equipment terminals and coating welded/brazed joints by bituminous paint. Galvanized conductors shall be touched up with zinc rich paint, where holes are drilled at site for holding to equipment/ structure.

viii) The electrodes shall be installed either directly in earth or in constructed earth pits as shown in approved drawings.

ix) The scope of installation of lightning conductors on the roof of buildings shall include laying, anchoring, fastening and cleating of horizontal conductors, grouting of vertical rods where necessary, laying, fastening/cleating/welding of the down comers on the walls/columns of the building and connection to the test links above the ground level.

x) The scope of installation of the test links shall include mounting of the same at specified height on wall/column by suitable brackets and connections of the test link to the earth electrodes.

4.1 Earthing connections:

i) All connections in the main earth conductors buried in earth/concrete shall be welded/brazed type.. Connection between main earthing conductor and earth leads shall also be of welded/brazed type.

ii) Welding and brazing operations and fluxes/alloys shall be of approved standards.

iii) All connections shall be of low resistance. Contact resistances shall also be minimum.

iv) All bi-metallic connections shall be treated with suitable compound to prevent moisture ingress.

4.2 Earth Electrodes:

i) Electrodes shall as far as practicable, be embedded below permanent moisture level.

ii) Some electrodes shall be housed in test pits with concrete covers for periodic testing of earthing resistively. Installation of rod/pipe plate electrodes in test pits shall be convenient for inspection, testing and watering.

iii) Earth pits shall be treated with salt and charcoal.

iv) Soil, salt and charcoal placed around the electrode shall be finely graded free from stones and other harmful mixtures. Backfill shall be placed in the layers of 250 mm. Thick uniformly spread and compacted. If excavated soils are found unsuitable for backfilling, the contractor shall arrange for a suitable soil from outside

5. 0 TESTING OF EARTHING SYSTEM

The Supplier shall ensure the continuity of all conductors and joints. The Purchaser may ask for earth continuity tests, earth resistance measurements and other tests, which in his

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opinion are necessary to prove that the system is in accordance with the design; specifications and code of practices. The supplier shall have to bear the cost of all such tests.

5.1. GENERAL REQUIREMENTS OF INSTALLATION FOR LIGHTNING SYSTEM AND POWER RECEPTACLES

i) The supplier shall supply, install, test and commission complete lighting system and power receptacles in accordance with relevant Standards. Concealed conduit wiring (thick flexible PVC pipes suitable for taking inside the roof and walls) shall be adopted for the control building.

ii) Wiring shall be colour-coded so as to enable easy identification of phase and neutral conductors, and DC wire (colour-coded as follows – white – phase wire, black – neutral wire, grey / DC wires.)

iii) There shall be switch on each live conductor of supply mains at the point of entry. The wiring throughout the installation shall be such that there is no break in neutral wire in the form of switch or fuse unit.

iv) Fixtures shall be ground by 1.5sq mm .flexible PVC copper wires(green colour) and taken to earth strips.

v) All fixtures, associated accessories, conduits, wires, junction boxes, cables, switches, switch boxes, etc. required for complete wiring of the lighting system as per approved drawings shall be supplied.

5.2. TESTING AND COMMISSION

All checks and tests as per the Manufacturer's drawings/manuals, relevant code of installation/erection practices and commissioning checks for various types of equipment e.g. transformers, breakers, isolators, CTs, PTs, motors, relays, meters, etc. shall be carried out by the CONTRACTOR as part of the installation work.

The owner may ask for such additional tests on site as in his opinion are necessary to determine that the works comply with the specification, Manufacturer's guarantee/instructions or the applicable code of installation. The CONTRACTOR shall carry out such additional tests also.

The CONTRACTOR shall perform operating tests on all switchgear and panels to verify operation of switchgear/panels and correctness of the inter-connections between various items of the equipment. This shall be done by applying normal AC or DC voltage to the circuits and operating the equipment for functional checking of all control circuits e.g. closing, tripping, control interlock supervision and alarm circuits. All connections in the switchgear shall be tested from point for possible ground or short circuit.

Insulation resistance tests shall be carried out by following rating megger .

a)	Control circuits up to 220 V	:	By 500 V Megger
b)	Power circuits, busbars connections for 132 KV.	:	By 5000 Motor Operated Megger.
c)	Power circuits, busbars connections above 220 KV.	:	By 5000 V Motor Operated Megger.

The Employer's authorized representative shall be present during every test as called for by the EMPLOYER. The CONTRACTOR shall record all test values and furnish the required copies of the test data to the EMPLOYER. Electrical circuits and

BHEL, Transmission Business Group, Industry Sector, Noida-05

equipments shall be energized or used at nominal operating voltage only after such reports have been accepted as satisfactory by the EMPLOYER.

6. 0 COMPLETION CHECKS

a) Name plate details according to approved drawings/ specifications.
b) Any physical damage or defect and cleanliness.
c) Tightness of all bolts, clamps and connections
d) Oil leakages and oil level.
e) Condition of accessories and their completeness.
f) Clearances.
g) Earthing connections.
h) Correctness of installation with respect to approved drawings/ specifications.
i) Lubrication Moving parts.
j) Alignment.
k) Correctness and condition of connections.

6.1 COMMISSIONING TESTS

a) Insulation resistance measurement of equipment, accessories, cabling/ wiring, etc.
b) Dielectric tests on equipment, accessories, cabling/wires, etc.
c) Phase sequence and polarity.
d) Voltage and current ratios.
e) Vector group.
f) Resistance measurement of winding, Contacts, etc.
g) Continuity tests.
h) Calibration of indicators, meters, relays, etc.
i) Control and interlock checks.
j) Settings of equipment accessories.
k) Checking of accuracy/error.
l) Checking of operating characteristics, pick/up voltages and currents. Etc.
m) Operational and functional tests on equipment, accessories, control schemes, alarm/trip/indication circuits, etc.
n) Measurement of guaranteed/approved design values including lighting levels, earth resistance measurements, etc.
o) Complete system commissioning checks.

BHEL Transmission Business Group
BHEL Industry Sector
Noida-05

Annexure-1

INTEGRITY PACT

Between

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

and

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

Preamble

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

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

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

Section 1- Commitments of the Principal

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

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

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

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

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

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

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

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

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

Section 4 - Compensation for Damages

4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above , the Bidder(s)/ Cotractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be-entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee , whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

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

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

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.

8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.

8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.

8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.

8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.

8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Prinicpal should be looked into by the CVO of the Principal.

8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

8.13 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.

10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place NOIDA(UP)
Date _____

Witness:_____
(Name & Address) _____
_____

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

Tender REF.: TBSM/ERSAMA/ETC/TENDER/24-25 dated: 27.06.2024

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/ERSAMA/ETC/TENDER/24-25 **DATE: 27.06.2024**

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 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/ERSAMA/ETC/TENDER/24-25 DATE: 27.06.2024**

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	
Bank Branch NEFT IFSC code	(you can obtain this from branch where you have your account)
Your Email address	: **(not more than 20 character)**
Name of the Authorised Signatory	: (Please mention here name of person from your organization signing this letter.)
Contact Person's name	: (please mention here the name of a person in your company/organization)

I/We confirm that information provided above is correct & any consequences due to any mistake in above will be borne by us.

Thanking you

For
(Autorised Signatory)

We confirm that we are enabled for receiving RTGS/NEFT credits and we further confirm that the account number of (Please mention here name of the account holder), the signature of the authorised signatory and the MICR and IFSC Codes of our branch mentioned above are correct.

Bank's Verification
(Manager's/Officers signature under
bank Stamp)

Note:- Please attach cancelled original Cheque leaf.