INSTITUTE WORKS DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

E-TENDER DOCUMENT

For

"Design, manufacturing, loading and unloading, transportation and SITC of 10 MVA 33/11 kV transformer including required electrical works for 33 kV & 11 kV Bays at IIT Roorkee."

Indian Institute of Technology Roorkee
Roorkee-247667, Tel.no. 01332-284955 / 4858

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INSTITUTE WORKS DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

No. IWD/DI/10MVA/108/RT-1/137 **Dated:17.01.2025**

NOTICE INVITING TENDER

On behalf of BOG, I.I.T. Roorkee, online Tenders (Percentage Rate) are invited in two Bid systems (Technical and Financial) from eligible bidders having experience of working in Central / State Government, Public Sector Undertaking/Autonomous Organization of Central/State Government who fulfill the PQ criteria for the following work:

Name of the Work	Estimated Cost	Completion Period (Months)
"Design, manufacturing, loading and unloading, transportation and SITC of 10 MVA 33/11 kV transformer including required electrical works for 33 kV & 11 kV Bays at IIT Roorkee."	**Rs. 266.52 Lacs (Including GST@ 18% & 1% BOCWW Cess**	**08 Months**

1. Interested eligible Bidders may obtain further information from IIT Roorkee website: www.iitr.ac.in (http://mm.iitr.ac.in/mmweb/tenders) or from Central Public Procurement Portal (CPPP) https://eprocure.gov.in/eprocure/app.

2. Intending bidders are advised to visit IIT Roorkee website www.iitr.ac.in (http://mm.iitr.ac.in/mmweb/tenders) and Central Public Procurement Portal (CPPP) https://eprocure.gov.in/eprocure/app regularly till closing date of BID submission of tender for any corrigendum / addendum/ amendment.

Critical Data Sheet

Sr. No.	Name of Organization	Indian Institute of Technology Roorkee
1	Tender Type (Open/Limited/EOI/Auction/Single)	Open
2	Tender Category (Services/Goods/Works)	Works
3	Type/Form of Contract (Work/Supply/ Auction/ Service/ Buy/ Empanelment/ Sell)	Work Contract
4	Product Category (Civil Works/Electrical Works / Fleet Management / Computer Systems)	Electrical Works
5	Date of Issue/Publishing Original Tender	**17.01.2025 (17:30 Hrs)**
6	Document Download / Sale Start Date	**17.01.2025 (17:30 Hrs)**
7	Pre-bid Meeting	**NA**
8	Seek Clarification Start Date	**17.01.2025 (17:30 Hrs)**
9	Seek Clarification End Date	**24.01.2025 (12:00 Hrs)**
10	Bid Submission Start Date	**27.01.2025 (12:00 Hrs)**
11	Bid Submission Closing Date	**06.02.2025 (12:00 Hrs)**
12	Bid Opening Date	**07.02.2025 (12:00 Hrs)**
13	Tender Fee (Exemption not allowed)	**Rs.1000.00+18% GST** (non-refundable). Payment of Tender Fee can be made by RTGS, NEFT in below mentioned account no. 1. Account Name- **NON MHRD GOVERNMENT**

		FUND IIT ROORKEE 2. Address- **IIT Roorkee, Haridwar.** a. Account No.**- 00000032685865515** **4.** Account Description- **Regular SB Chq-Entities.** **5.** Branch- **IIT Roorkee,** 6. CIF No- **86531323246** 7. IFS Code. **- SBIN0001069,** 8. MICR Code. **- 247002094**
14	EMD (2%) (Exemption not allowed)	**Rs. 5,50,000.00/-** Payment of EMD can be made by RTGS, NEFT in below mentioned account no. The bidders shall be required to upload the scanned copies of the transaction of payment of tender EMD / Tender Fee including e-receipt (clearly indicating UTR No. &Tender Reference i.e. NIT No. must be entered in the remark at the time of online transaction of payment, failing which payment may not be considered) at the time of online bid submission on the e-tendering website. Tender fee /EMD may be submitted online as per the details given below. **1.** Account Name- **NON-MHRD GOVERNMENT FUND IIT ROORKEE** **2.** Address- **IIT Roorkee, Haridwar.** a. Account No.**- 00000032685865515** **4.** Account Description- **Regular SB Chq-Entities.** **5.** Branch- **IIT Roorkee,** 6. CIF No- **86531323246** 7. IFS Code. **- SBIN0001069,** 8. MICR Code. **- 247002094**
15	**Performance Guarantee (5%)**	5% of awarded value shall be submitted in the form of Bankers Cheque / DD / FDR / Bank Guarantee in the name of Institute Engineer, IIT Roorkee after issue of Letter of Acceptance (LOA).
16	Security Deposit (5%)	5% of awarded value shall be submitted in the form of Bankers Cheque / DD/FDR / Bank Guarantee in the name of Institute Engineer, IIT Roorkee after issue of Letter of Acceptance (LOA).
17	No. of Covers (1/2/3/4)	02 (Cover-1 for Technical+ Cover-2 for Financial)
18	Bid Validity Days (180/120/90/60/30)	90 days (from last date of opening of financial bid)
19	**Documents to be uploaded on CPP Portal (http://eprocure.gov.in/eprocure/app)(related to eligibility criteria) on or before due date of submission of tender.**	1) Affidavit (on Rs.10 non-judicial stamp with notarized) regarding establishment of proprietorship firm / partnership deed / letter of incorporation for private ltd / ltd firm with written power of attorney (in case of bidder is owner, not required) of the authorized signatory. 2) Self-certified copy of work orders along with work completion certificate as per eligibility criteria. 3) Proof of online deposit of tender fee and EMD. 4) Turnover certificate from CA preferably with UDIN Number, GST registration certificate, PAN Card, ESI registration certificate & EPF registration certificate and Solvency certificate as per the NIT. 5) Project specific Authorization certificate from OEMs for the items as mentioned in scope of work (only for

		Transformer and HT Panels) and undertaking from concerned OEM on the letter head for confirmation of data as per BoQ and technical specifications. 6) Valid Electrical Contractor License Class-A. 7) Qualifying information (Annexure-A), Notarized undertaking on Rs. 100 non-judicial stamp paper (Annexure-B), Certificate for Local Content (Annexure-C), Annexure-D), and mandatory Annexures M1 to M7.
20	**Price Bid**	To be uploaded only on CPP Portal (http://eprocure.gov.in/eprocure/app) in excel sheet.
21	Address for communication	**Executive Engineer (E/M), Institute Works Department, James Thomson Building, IIT Roorkee, Roorkee-247667 (India), Tel. No. 01332-284955 / 4858**
22	Email Address	tntiwari.eem2019@iitr.ac.in,pradeepelectenggaad@iitr.ac.in

Note: -

1. Bidders are advised to keep visiting the above-mentioned websites from time to time (till the deadline for bid submission) for any updates in respect of the tender documents, if any. Failure to do so shall not absolve the applicant of his liabilities to submit the applications complete in all respect including updates thereof, if any. An incomplete application may be liable for rejection.
2. In case any information furnished by the Bidder is found to be false / forged / incorrect at any stage, their bid shall be rejected and further action e.g. debarring from participating in future tenders, blacklisting etc. may be taken.
3. Clarification of Bids/ Shortfall Documents: IIT Roorkee may, at its discretion, ask the Bidder for clarifications / shortfall documents related to his bid. The request for clarification shall be given in writing. Depending on the reply of the Bidder, his bid shall be ignored or considered further.
4. Only 'Class-I local supplier' and 'Class-II local supplier', as defined in the Public Procurement (Preference to Make in India), Order 2017 shall be eligible to bid in the tender. For more details, please refer to: Order No.: P-45021/2/2017-PP (BE-II), DPIIT, Ministry of Commerce and Industry issued Dated: 16th Sept. 2020. A self- certificate must be provided in this regard that the item offered meets the local content requirement for 'Class-I local supplier' & 'Class-II local supplier'.
5. Before quoting the Bid, the Bidder may inspect the site to get the required information related to site condition and requirements.
6. IIT Roorkee reserves the right to reject any quotation wholly or partly without assigning any reason.
7. The decision of the institute in all matters relating to eligibility, acceptance, or rejection of the Bid will be final and binding on the applicants.

Institute Engineer,
IIT Roorkee

INSTRUCTIONS FOR ONLINE BID SUBMISSION

As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submit their bids online on the CPP Portal. More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app .

1. Registration

1.1 Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app) by clicking on the link "Click here to Enroll". Enrolment on the CPP Portal is free of charge.

1.2 As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

1.3 Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

1.4 Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify/TCS/nCode/eMudhra etc.) with their profile.

1.5 Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.

1.6 Bidder then logs in to the site through the secured log-in by entering their user ID/password and the password of the DSC/eToken.

2. Searching for Tender Documents

2.1 There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.

2.2 Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

2.3 The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

3. Preparation of Bids

3.1 Bidder should take into account any corrigendum published on the tender document before submitting their bids.

3.2 Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and 4 content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

3.3 Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF/XLS/RAR/DWF formats. Bid documents may be scanned with 100 dpi with black and white option.

3.4 To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

3.5 If any cell is left blank the same shall be treated as “0”. Therefore, if any cell is left blank and no rate is quoted by the bidder, the rate of such item shall be treated as “0” (ZERO). However, if a tenderer quotes nil rates against each item in item rate tender or does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.

4. Submission of Bids

4.1 Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

4.2 The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

4.3 Bidder shall submit tender fee as per critical data sheet.

4.4 A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the white coloured (unprotected)cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

4.5 The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

4.6 All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.

4.7 The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

4.8 Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

4.9 Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

5. Assistance to Bidders

5.1 Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority to the address provided in Critical Data Sheet for a tender or the relevant contact person indicated in the tender.

5.2 Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 0120-4001062 / 0120-4001002 / 0120-4001005 / 0120-6277787

6. General Instructions to the Bidders

6.1 The tenders will be received online through portal http://eprocure.gov.in/eprocure/app. In the Technical Bids, the bidders are required to upload all the eligibility criteria documents in .pdf format.

6.2 Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/etoken in the company's name is a prerequisite for registration and participating in the bid submission activities through https://eprocure.gov.in/eprocure/app. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://eprocure.gov.in/eprocure/app under the link “Information about DSC”.

6.3 Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e- submission of the bids online through the Central Public Procurement Portal for e Procurement at https://eprocure.gov.in/eprocure/app.

INFORMATION AND INSTRUCTIONS TO BIDDERS

1. On behalf of BOG, I.I.T. Roorkee, online Tenders (Percentage Rate) are invited in two Bid systems (Technical and Financial) from eligible bidders having experience of working in Central / State Government, Public Sector Undertaking/Autonomous Organization of Central/State Government who fulfill the PQ criteria for the following work **"Design, manufacturing, loading and unloading, transportation and SITC of 10 MVA 33/11 kV transformer including required electrical works for 33 kV & 11 kV Bays at IIT Roorkee."**

1.1 The work is estimated to cost as mentioned in the NIT. The estimate, however, is given merely as a rough guide.

1.2 Intending bidder is eligible to submit the bid provided, if he has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude specified below:

1.2.1 Criteria of eligibility for submission of bid documents:

(a) Intending bidder should not be a joint venture (Self Certified copy of relevant documents clearly establishing the status of bidder to be uploaded in Cover-1).

Should have successfully completed works in Central / State Government, Public Sector undertaking / Autonomous Organization of Central/State Government during last seven years ending last day of the month previous to the one in which applications are invited.

Three similar completed works costing not less than the amount equal to 40% of the estimated cost put to tender,

or

Two similar completed works costing not less than the amount equal to 60% of the estimated cost put to tender.

or

One similar completed work of aggregate cost not less than the amount equal to 80% of the estimated cost.

(Self-Certified photocopy of work order along with work completion certificate to be uploaded as proof of eligibility criteria in Cover-1)

Work completion certificate should have been issued by an officer not less than the rank of Executive Engineer / equivalent and must contain the name of the work, date of start, date of actual completion, and amount of work executed.

Explanation: The value of executed works shall be brought to the current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to the last date of receipt of applications for this tender.

Similar work means **"SITC / Repair Work of Sub Station Equipment at 33/11 kV or above level".**

(b) Average annual financial turnover should be at least 50% of the estimated cost during the last three consecutive financial years duly audited by a Chartered Accountant (Self Certified copy of the certificate from CA to be uploaded in Cover- The year in which no turnover is shown would also be considered for working out the average.

(c) Should have valid solvency certificate of the amount at least 40% of the estimated cost of the work issued by a scheduled bank which is not more than **one year old** from the last date of tender submission (including extension time). A certified copy of the original solvency certificate to be uploaded in Cover-1.

(d) The bidder should have valid Electrical Contractor License Class-A.

(e) Bidder shall provide the Project specific Authorization certificate from OEMs for the items as mentioned in scope of work (only for Transformer and HT Panels) and undertaking from concerned OEM on the letter head for confirmation of data as per BoQ and technical specifications.

2. Agreement shall be drawn with the successful bidder on prescribed format.
3. The time allowed for carrying out the work will be as per the NIT from the date of start as defined in Award of Work or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in tender documents.
4. The site for the work is available / shall be made available for start of the work.
5. The Tender document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents canbe seen / downloaded from IIT Roorkee website: www.iitr.ac.in (http://mm.iitr.ac.in/mmweb/tenders) or from Central Public Procurement Portal (CPPP) https://eprocure.gov.in/eprocure/app.
6. While submitting the bids, bidder can revise the rate, but before last date and time of submission of bids as notified. In this case, the last submitted bid before the last date and time will only be considered.
7. The scanned copies of documents as per critical data sheet shall be uploaded under Cover-1 on the e-tendering website.
8. Online Financial Bids submitted by intending bidders shall be opened only of those bidders, whose bid found technically qualified.
9. The bid submitted shall become invalid and cost of bid & tender processing fee shall not be refunded if: (i) the bidder is found ineligible. (ii) The bidder does not provide all the documents (including PAN No., GST registration etc.) as stipulated in the bid document.
10. Intending bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their Tender. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent upon any misunderstanding or otherwise shall be allowed. The bidder shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Institute and local conditions and other factors having a bearing on the execution of the work. Cost of site visit shall be borne by the bidder.
11. All tenders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidder shall be summarily rejected.
12. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the Tenders submitted by the bidders who resort to canvassing will be liable to rejection.
13. The bidder shall not be permitted to tender for works in the IWD, IIT Roorkee, if his near relative is posted as an officer in any capacity between the grades of Dean Infrastructure and Junior Engineer (both inclusive). Any breach of this condition by the bidder would render him liable to be removed from the Tendering process.
14. No Engineer of gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to act as a bidder within a period of one year after his retirement from Government service, without the previous permission of the Government of India in writing. This contract is liable to be cancelled if either the bidder or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the bidder's service.
15. The notice inviting bid shall form part of the contract document. The successful bidder, on acceptance of his bid by the Accepting Authority, have to sign the contract consisting of "The Notice Inviting bid, all the documents including Special Conditions, General Specifications/ Particular Specifications and drawings, if any, forming part of the bid as submitted at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto within 15 days from the stipulated date of start of the work.
16. The bid for the works shall remain open for acceptance for a period of 90 days from the date of opening of financial bids. If any bidder withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the Indian Institute of Technology Roorkee, then Indian Institute of Technology Roorkee, without prejudice to any other right or remedy, be at liberty to forfeit of the said earnest money as aforesaid. Further, the bidder(s) shall not be allowed to participate in the re-bidding process of the work.
17. Composite Tender (if applicable)

17.1 The competent authority is calling this bid for the composite work. The Earnest money is fixed with respect to the combined estimated cost put to tender for the composite tender.

17.2 The eligible bidders have to quote rates for all items given in the schedule of quantity.

17.3 After acceptance of the bid by competent authority, **Institute Engineer, IWD, IIT Roorkee** shall issue letter of Acceptance (LoA) on behalf of the Institute. After issue of LoA, the bidder will have to enter into one agreement with **Institute Engineer**.

17.4 Entire work under the scope of composite tender including major and all minor components shall be executed under one agreement.

17.5 Security Deposit will be worked out separately for each component corresponding to the quoted/accepted cost of the respective component of works. The Earnest Money will become part of the security deposit of the respective projects under the head Mega projects in ratio of the corresponding estimated value of these projects.

17.6 The bidder may associate agency(s) for minor component(s) conforming to eligibility criteria as defined in the tender document and has to submit detail of such agency(s) to Dean Infrastructure. Name of the agency(s) to be associated shall be approved by Dean Infrastructure. Before engaging such associate agencies, bidder has to inform to Dean Infrastructure along with his past experience and all credential's and got the approval of the same from him.

17.7 In case the bidder intends to change any of the above agency/ agencies during the operation of the contract, he shall obtain prior approval of respective Dean Infrastructure. The new agency/ agencies shall also have to satisfy the laid down eligibility criteria. In case Dean Infrastructure is not satisfied with the performance of any agency, he can direct the bidder to change the agency, and this shall be binding on the bidder.

17.8 The main bidder has to enter into an agreement with bidder(s) associated by him for execution of minor component(s). Copy of such agreement shall be submitted to the Engineer-in-charge in case of change of associate bidder, the main bidder has to enter into agreement with the new bidder associated by him.

17.9 The composite work shall be treated as complete when all the components of the work are complete. The completion certificate of the composite work shall be recorded by Engineer-in-charge of major component after record of completion certificate of all other components. Final bill of whole work shall be finalized by IWD, IIT Roorkee.

17.10 It will be obligatory on the part of the bidder to sign the tender documents for all components before the first payment is released.

Institute Engineer,
IWD, IIT Roorkee

A: GENERAL INSTRUCTIONS

1. Scope of Tender.

1.1 Indian Institute of Technology Roorkee (referred to as Owner in these documents) invites Tender as defined in these documents and referred to as “the works” detailed in the table given in the Notice Inviting Tenders (NIT).

1.2 The successful Bidder shall complete the works within the completion date specified in the Notice Inviting Tenders (NIT).

2. Non-Association / Relation

2.1 All bidders shall provide in the bid tender and Qualification Information, a statement that the Bidder is not associated, nor has been associated in the past, directly or indirectly, with the Indian Institute of Technology Roorkee or any other entity that has prepared the design, specifications, and other documents for the Project.

3. Qualification of the Bidder

3.1 All Bidders shall provide tender qualification information.

3.2 All Bidders shall include the following information by submitting relevant documents and certificate with their tenders: The Bidder must be registered with the GST Department and should submit the registration certificate of GST, ESI, EPF, Labour License (if applicable) etc.

4. Cost of tendering

4.1 The Bidder shall bear all costs associated with the preparation and submission of his tender, and the Owner will in no case be responsible and liable for those costs.

4.2 The Bidder, at its own responsibility and risk is encouraged to visit and examine the Site of Work and its surroundings and obtain all information that may be necessary for preparing the tender. The costs of visiting the Site shall be at the Bidder’s own expense.

B: DOCUMENTS INVITING TENDERS

5. Invitation: Tenders are hereby invited on behalf of Indian Institute of Technology Roorkee.

6. Contents of documents as mentioned in the relevant clauses mentioned:

6.1 The Bidder shall be deemed to have examined all instructions, forms, terms, and specifications in the Documents. Failure to furnish the information required in the Tender Document or submission of a Bid not substantially responsive to the Tender Documents in every respect will be at the Bidder’s risk and may result in the rejection of the bid.

6.2 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 drawing and figured dimensions in preference to scale and Special Conditions in preference to General Conditions.

6.3 In case of any discrepancy between the Schedule of Quantities, the specifications and/ or the drawings, given in the tender document the following order of preference shall be observed:

a) Description of Schedule of Quantities.
b) Particular Specification and Special condition, if any.
c) Drawings.
d) C. P. W. D. specifications/ IWD, IIT ROORKEE specification.
e) Latest edition Indian Standard Specifications of B. I. S.

7. Amendment of Tendering Documents

7.1 Before the deadline for submission of bids, the Indian Institute of Technology Roorkee may modify the Tender documents by issuing addenda/corrigendum.

7.2 Any addendum thus issued shall be part of the Tendering documents and shall be uploaded on e-Tendering

website https://eprocure.gov.in/eprocure/app and Institute website http://mm.iitr.ac.in/mmweb/tenders.

7.3 To give prospective Bidders reasonable time in which to take an addendum / corrigendum into account in preparing their bid, the IIT Roorkee may extend if necessary the deadline for submission of tenders.

C: PREPARATION OF DOCUMENT

8. **Earnest Money Deposit (EMD):** EMD as per critical data sheet must be submitted. Bids not accompanying EMD will be summarily rejected. The EMD of the unsuccessful Bidders will be discharged / returned within Thirty days.

(30) days from the date of opening of the financial bids. The EMD of the successful Bidder shall be converted as Security deposit. The EMD may be forfeited and further the bidder shall not be allowed to participate in the re- bidding process of the work, if the Bidder withdraws his bid during bid validity period or in case successful Bidder fails to sign the contract / fail to deposit security amount and performance guarantee.

9. **Period of validity of bid:** The bids shall remain valid for a period of 90 days after the date of financial bid / price bid opening. A bid valid for a shorter period shall be rejected by the Indian Institute of Technology Roorkee as non- responsive.

10. **Language of Bid:** The document shall be written in English/Hindi language. The total amount should be written in the same language.

11. **Document comprising the E-Tender:** No page of this tenders document shall be removed, and the set must be submitted as it is. Each page of the tenders document form is to be signed by the Bidder and must bear the Seal of the Company/Firm.

The tender submitted by the Bidder shall comprise as mentioned above in the relevant sections.

12. **Tender Prices**

12.1 The contract shall be for the whole works as described in priced Schedule of Quantities submitted by the Bidder.

12.2 The tender submitted on behalf of firm shall be signed by a person who has the proper legal authority on behalf of the firm to enter into the contract; otherwise, the bid is liable to be rejected. Each page of the tender document and each drawing accompanying is required to be signed by the authorized person submitting the bid, with the company seal as the token of their having examined and acquainted themselves with the General conditions of contract, drawings, specifications, special conditions of contract etc. The forms of tender are to be filled in completely. Any bid with any of the documents not signed is liable to be rejected.

12.3 The notation R.O. written against items of BOQ means ‘rate only” and the bidder is to quote only unit rate in such cases.

12.4 The Bidder shall fill in the percentage rate/in rates for items of the Works described in the Schedule of Quantities along with total bidding price. In case if the rates are not filled for any of the Items of Schedule of Quantities, in such cases the tender shall be summarily rejected. Failure to comply with either of these conditions will make the bid liable for rejection.

12.5 **Taxes:** All duties, taxes, and other levies payable by the Bidder under the contract, or for any other cause, shall be included in the rates, prices and total Bidding Price submitted by the Bidder. Bidders must include in their rates, the cost of transportation of materials to site, GST, labour cess as per Building & other construction workers cess act, excise duty, octroi, and any other tax and duty levied by the Central / State Government. None of the above taxes & levies will be entertained by the Owner and no tax exemption forms will be issued by the Owner.

Estimate has been prepared on current applicable GST rate. However actual payment will be done on the basis of prevailing GST rates at the time of execution of work and its payment.

12.6 **Labor Cess or BOCWW Cess**: Labour cess @1% shall be deducted from each bill.

12.7 The work shall be carried out by the Bidder in a manner complying in all respect with the requirement of relevant bye-laws/orders of the Local/Municipal bodies and paying all fees and charges which may be leviable at his own cost. The completion/ occupancy certificates including clearance from the fire committee, or any other statutory obligation shall be arranged by the bidder. Any official fees shall be paid by the Owner. All other cost of liasoning shall be borne by the bidder.

12.8 Bidder should also take a Group Insurance Policy for his Workmen, Supervisors and Engineers working on site for an adequate insurance cover. Indian Institute of Technology Roorkee shall not be responsible for any accident or happening of any untoward/unforeseen event involving workmen, labour, supervisor or engineer or any person directly or indirectly associated with the execution of work. The insurance policy to be obtained by the successful Bidder must be comprehensive and shall cover all associated risks (known and unknown).

12.9 The rates quoted in the tender shall include cost of electrical power supply, water supply, cost of all materials, labour, telephone, rent and call charges, water and meter rent charges, temporary electric wiring /lighting for execution of work at site, hire for any tools and plants, shed for materials, marking out and clearing of site, transportation complete in all respects. The rates quoted in the tender shall be treated as rate for finally completing the item of work.

12.10 The quantities furnished in the schedule of quantities are only probable quantities and are liable to alterations, by omission, deductions or additions to any extent at the discretion of Indian Institute of Technology Roorkee. Payments will be regulated on the actual quantities of work done at accepted rates.

12.11 Errors in the Schedule of Quantities shall be dealt with in the following manner:

i. In the event of a discrepancy between the rates quoted in words and the rates in figures, rate quoted in words shall be *considered* to be correct.

ii. In the event of an error occurring on account of arithmetical calculations the same shall be corrected according to rates written in words and quantities in B.O.Q.

iii. All the errors in totaling in the amount column and in carrying forward the totals shall be corrected. The tender total shall be accordingly amended. If the bidder doesn't accept the corrected amount, then his bid will be rejected.

12.12 The calculations made by the bidder should be based upon quantities of the items of work which are furnished in the Schedule of Quantities, but it must be clearly understood that the contract is not a lump sum contract. The Owners do not in any way assure, represent or guarantee that the said probable quantities are correct or that the work would correspond thereto. The items of work irrespective of the quantities which may vary shall be carried out at the same accepted bidding etender rates and no escalation in the rates will be entertained whatsoever. Any item of work may be omitted from the schedule of quantities and may be awarded to another agency at any time / stage of the work.

12.13 The bidders must obtain for themselves on their own responsibility and their own expenses all the information which may be necessary, including risks, contingencies and other circumstances to enable them in making a proper bid and for entering into a contract, and must examine the drawings, specifications and conditions and inspect the site of the work, nature of the work, availability of power, water, shelter for workmen and all the matters pertaining thereto before submitting the bid. They can also get any clarifications required from the Owner, before tendering, by contacting them at their office during working hours.

13. Format and signing of Tender document.

13.1 The bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. All pages of the tender where entries or amendments have been made shall be initialed by the person or persons signing the tender.

13.2 The tender shall contain no alterations or additions, except those to comply with instructions issued by

the Owner, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the bid. ANY CONDITIONAL BID WILL BE SUMMARILY REJECTED.

D: MODE OF SUBMISSION OF BID DOCUMENT

14. Sealing and marking of bids.

14.1 The entire document to be put in cover-1 and 2 should be scanned and uploaded under cover-1 and 2 respectively on the e-tendering website. No hard copy of any document (financial or technical) should be submitted. In case any hardcopy is submitted then the same will not accepted by the department.

15. Deadline for submission of bid: - As per Critical Data Sheet.

E: TENDER OPENING AND EVALUATION

16. Tender opening: The tender will be opened on the date and the place specified in the critical data sheet. In case of any unavoidable circumstances or unforeseen event on the specified date and time of tender opening, the bids will be opened at the appointed time and location on the next working day.

17. Clarification of Tenders: To assist in the examination, evaluation and comparison of bids, the Owner may, at his discretion, ask any Bidder for clarification of his bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by fax, but no change in the price or substance of the tendering shall be sought, offered, or permitted.

18. Examination of Bids and Determination of Responsiveness:

18.1 Prior to the detailed evaluation of bids, the Owner will determine whether each bid

a) Meets the eligibility criteria defined
b) Has been properly signed and meets the requirements mentioned
c) is accompanied by the required securities and;
d) is responsive to the requirements of the tendering documents.

18.2 A responsive bid is one which conforms to all the terms, conditions and specifications of the tendering documents, without material deviation or reservation. A material deviation or reservation is one

a) Which affects in any substantial way the scope, quality, or performance of the works;
b) which limits in any substantial way, inconsistent with the tender documents, the Indian Institute of Technology Roorkee rights or the Bidders' obligations under the contract; or
c) Whose rectification would affect unfairly the competitive position of other Bidders presenting responsive bids.

18.3 If a bid is not responsive, it will be rejected by the Indian Institute of Technology Roorkee, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

19. Evaluation and Comparison of Bids:

19.1 The Owner along will evaluate and compare only the bids determined to be substantially responsive.

19.2 In evaluating the bids, the Owner will determine for each bid the evaluated bids Price by adjusting the bid. Price as follows:

a) Making any correction for errors; or
b) Making an appropriate adjustment for any other acceptable variations, deviations; and
c) Making appropriate adjustments to reflect discounts offered.

20. The Owner reserves the right to accept or reject any variation, deviation, or alternative

offer and other factors which are more than the requirement of the tender.

F: AWARD OF TENDER

21. Award criteria:

21.1 The acceptance of bid will rest with the Owner, which does not bind itself to accept the lowest bid and reserves to itself the authority to reject completely / partially, any or all of the bid/s received without the assignment of a reason.

21.2 The owner reserves to itself the right of accepting the whole or any part of the Bid and the Bidder shall be bound to perform the same at the rate quoted.

21.3 The Owner reserves to itself the right of omission of any item of work from the awarded tender at any time / stage during the execution of work and awards the same to another agency / bidder.

22. Notification of award: The successful Bidder will be issued a Letter of Acceptance (LoA) by the Owner. The issuance of LoA shall not constitute an award of work.

23. Performance Guarantee: Within ten (10) days of LoA the successful Bidder shall furnish the performance guarantee @ 5% of value of work in the form of DD/FDR/ Bankers cheque /Bank Guarantee from Scheduled bank provided in the tender document. The Performance Guarantee must be valid two months beyond the work completion period (Part-A). It may be further extended. The Performance guarantee shall be returned / refunded to the bidder on completion of the work (Part-A) and recording of the completion certificate. In case the bidder fails to deposit it the said performance guarantee within the period as indicated, the Earnest Money deposited by the bidder shall be forfeited automatically without any notice to the bidder.

24. Signing of contract form: On the acceptance of LoA and Performance Bank Guarantee of the successful Bidder whose tender has been accepted in writing, the Indian Institute of Technology Roorkee will sign an agreement. Article of agreement shall be as per IIT Roorkee.

G: DURING EXECUTION

25. During Execution: The Bidder shall carry out all the works strictly in accordance with the drawing, details and instructions of the Owner. If in the opinion of the Owner, changes have to be made in the design, and they desire the bidder to carry out the same, the Bidder shall be bound to comply. The Owner decisions in such cases shall be final.

The Bidder is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the schedule of quantities and rates. Schedule of instructions in respect of such additional items and their quantities with the prior consent from the Owner. Rates for such items of work will be approved by the Owner on the basis of Analysis of Rates which will be derived from actual prevailing market rates of similar item along with 15% as bidder's profit & overhead (or service charge as quoted by the bidder). The rates approved by the Owner in such cases will be final.

The Bidder shall get the quality of work done inspected for material and workmanship at different stages of execution as per instructions given by the Owner or their representative from time to time. Any item of work done which is found not conforming to the Contract shall be rejected by the Owner. The decision of the Owner in such cases shall be final.

The Owner may instruct at any stage of execution for testing of samples of any material taken at random. The Owner will decide the testing laboratory / agency and the cost of testing including the expenses for sending the samples to the laboratory / agency and receipt of test reports shall be borne by the Bidder. The material shall be rejected if the test reports are not within the

permissible limits.

The Bidder shall have to present the invoice for purchased material from the manufacturer or from the dealer along with the certificate from the manufacturer. In case material is found to be of substandard quality, the same shall be rejected by the Owner. The decision of the Owner in such cases shall be final.

The Bidder shall not be entitled to any compensation for the Loss suffered by him on account of delays in commencing or executing the work whatever the cause of delay may be, including delays arising out of modifications to the work entrusted to him or in any subcontracts connected therewith or delays in awarding contracts for other trades of the project or in commencement or completion of such other works or in procuring Government controlled or other building materials for any other reasons whatsoever. The Owner shall not be liable for any sum besides the e-tender amount, subject to such variations as are provided for herein and as instructed by Owner. However, necessary time extension will be given if the delays are not attributed to the Bidder.

ANNEXURE - A

QUALIFYING INFORMATION

Please furnish the following information along with documentary evidence only in this format (as eligibility criteria)

1.	Name of the bidder		
2.	Legal Status of the bidder		
3.	Place of registration and registration of the bidder		
4.	Year of establishment of the firm.		
5.	Permanent Address		
6.	Email id		
7.	Contact Numbers		
8.	Principal place of the registration		
9.	PAN No.		
10.	GST No.		
11.	EPF		
12.	ESI		
13.	Tender fee details		
14.	Solvency certificate details		

16. The average annual financial turnover during the last 3 years, ending 31st March of previous financial year, should not be less than 50% of the estimated cost. CA certificate be enclosed as documentary proof. Copies of balance sheets duly certified by ***CA preferably with UDIN Number*** to be submitted.

Sl. No.	Financial Year	Amount (in Lakhs)
1	2021-2022	
2	2022-2023	
3	2023-2024	

17. PROFORMA FOR LIST OF WORKS EXECUTED BY THE BIDDER DURING THE LAST 5 YEARS AND ABOVE

Sl. No	Name of work/ project with address	Name & postal address of the owner & contact person	Contract Value	Date of Start	Date of Completion	Actual Date of Completion

Note: Bidder may furnish the above information in separate sheet if the space is not sufficient.

18. PROFORMA FOR LIST OF WORKS IN HAND

Sl. No	Name of work/ project with address	Name & postal address of the owner & contact person	Published Value	Date of Start	Stipulated date of completion	Present Progress

Note: Bidder may furnish the above information in separate sheet if the space is not sufficient

19. DETAILS OF KEY PERSONNEL

Sl. No	Name & Designation	Qualification	Experience	Nature of Works Handled	Date from which employed in your organization

Note: Bidder may furnish the above information in separate sheet if the space is not sufficient.

20. List of equipments, tools and tackles (in applicable).

GENERAL CONDITIONS OF CONTRACT(GCC)

A: GENERAL

1.0 Definitions:

1.1 In this contract, the following terms shall be interpreted as indicated:

a. "The Contract" means the agreement entered into between the Owner and the Bidder, as recorded in the contract form signed by the parties, including all the attachments and appendices thereto and all documents incorporated by reference therein.

b. "The Contract Value" means the amount payable to the Bidder under the contract for the full and proper performance of its contractual obligations.

c. "Contract Data" means any information provided in the tender document and agreed to by the Bidder.

d. "The Work" means all labour, materials, tools and plant, equipment including government taxes and transport that may be required in preparation of and for and in the full and entire execution and completion of "the Work".

e. "Services" means services ancillary to the execution of the work such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training and other obligations of the Bidder covered under the contract.

f. "GCC" mean the General Conditions of Contract contained in this section.

g. "SCC" means the Special Conditions of Contract.

h. "The Owner" means the Indian Institute of Technology Roorkee or its representative.

i. "The Owner" means the Owner/Project Management Consultant appointed by the Owner for preparing all the drawings, details and specifications of items required for the execution of the work and supervise and monitor the execution at site along with checking and verifying Bidder's bill. The Bidder shall offer the Engineer or any representative of Owner every facility and assistance for examining the works and materials. The Engineer or any representative of the Owner shall have power to give notice to the Bidder or to his staff, of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Owner. Such examinations shall not in any way exonerate the bidder from the obligations to remedy any defects which may be found to exist at any stage of the work or after the same is completed.

j. "The Bidder" means the individual or the firm executing the work.

k. "The Project Site" where applicable, means the place or places named in SCC.

l. "Day" means calendar day.

m. "Engineer-in-charge (EIC)" means Assistant Executive Engineer.

2.0 Interpretation and Application

2.1 These general conditions apply to the extent that provisions in other parts of the contract do not supersede them.

2.2 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Owner will provide instructions clarifying queries about the Conditions of Contract.

2.3 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended completion date are for the whole of the Works.

3.0 Standards

3.1 The works executed by the Bidder should be carried out in most professional manner, both as regards material and otherwise, in every respect, in strict accordance with the Technical Specifications. All materials and workmanship shall so far as procurable be of the respective kinds described in the priced schedule of quantities and/ or specifications and in accordance with the Owner' instructions, and the Bidder shall upon the request of the Owner, furnish them with all invoices, accounts; receipts and other vouchers to prove that the material procured complies therewith. When no applicable standard is mentioned, the work shall be carried out as per the directions of the Owner. The Bidder shall at his own cost arrange for and/or carry out any test of materials which the Owner may require. In case of discrepancies in tender wording as regards the specifications of materials, workmanship etc., written instructions will supersede the tender wording unless otherwise mentioned.

3.2 The Owner in their absolute discretion from time to time shall issue further drawings and/ or written instructions, details, directions and explanations which are hereafter collectively referred to as "the Owner's instructions" in regard to: -

a. The variation or modification of the design quality or quantity of works or the addition or omission or submission on any work.
b. Any discrepancy in the drawings or between the schedule of quantities and / or drawings and /or specifications/ dimensions etc.
c. The removal and / or re-execution of any works executed by the Bidder.
d. The removal from the site of any materials brought thereon by the Bidder and the substitution of any other materials therefore / or rejection of the material brought on site.

4.0 Use of Contract Documents and Information

4.1 The Bidder shall not, without the Owners' prior written consent, disclose the contract or any provision thereof, or any specifications, plan, drawing, pattern, sample or information furnished by or on behalf of the Owner in connection therewith, to any person other than a person employed by the Bidder in performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far, as may be necessary for purposes of such performance.

4.2 The Bidder shall not, without the Owner's prior written consent make use of any document or information enumerated in Para 4.1 except for the purposes of performing the contract.

4.3 All documents included but not limited to contract agreement shall remain the property of the Owner and shall be returned (in all copies) to the Owner on completion of the Bidder's performance under the contract, if so required by the Owner.

5.0 Owner's Decisions: Except where otherwise specifically stated, the Owner will decide contractual matters between the Owner and the Bidder, in the role of representing the Owner.

6.0 Performance Guarantee: The proceeds of the performance guarantee shall be payable to the Owner as compensation for any loss or dues resulting from the Bidder's failure to complete its obligations under the contract.

7.0 Program and Reporting

7.1 The bidder shall furnish to the Indian Institute of Technology Roorkee a bar chart laying down weekly financial and physical targets to complete the project within stipulated time for approval within fifteen days from the date of receipt of notification of award. Weekly progress report shall be furnished to the owner showing the progress.

7.2 The bidder must submit every week the following information to the Owner in writing:

i. Number of men employed, trade wise;
ii. Progress achieved;
iii. Expected dates for completion of work;
iv. Any actual or potential delay in completion schedule.

8.0 Assignment and Sub-contracting

8.1 The whole of the works included in the Contract shall be executed by the bidder and the bidder shall not directly or indirectly transfer, assign or underlet the contract or any part, share or interest therein without the written consent of the Owner.

8.2 No sub-contracting shall relieve the Bidder from the full and entire responsibility of the Contract or from the active superintendence of the work during their progress.

9.0 Bidder to provide everything necessary for proper execution of work

9.1 The Bidder shall provide everything necessary for the proper execution of the works according to the intent and meaning of the drawings, priced schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred there from. If the Bidder finds any discrepancy therein, he shall immediately and in writing refer the same to the Owner whose decision shall be final and binding. Further, if any sample(s) of material(s), fittings, fixtures or finished item(s), to be used in the construction work, has/have been called for from the bidder, no work related to it/these shall be executed unless the same has/ have been approved by the Owner failing which no payment shall be made to the bidder on this account. Any sample, duly approved by the Owner shall become part of the supply to be used in “the works”.

9.2 IIT Roorkee will provide water and power supply at site free of cost for the entire work.

9.3 The Bidder shall supply fix and maintain at his cost, during the execution of any works, all the necessary power supply, water supply, centering, scaffolding, watching and lighting by night as well as by day, required not only for the proper execution but also for protection of the public and the safety of any adjacent roads, streets, pavements, walls houses, building and other erections, matters or things. The Bidder shall take down and remove any or all such centering, scaffolding, staging, planking, timbering, strutting, shoring pumping, fencing, hoarding, watching, and lighting by night as well as by day, required not only for the proper execution but also for protection of the public and the safety of any adjacent roads, streets, pavements, walls houses, building and other erections matters or things. The bidder shall take down and remove any or all such centering, scaffolding, staging, planking, timbering, strutting, shoring etc. as occasion shall require or when ordered so to do so and shall fully reinstate and make good all matters and things disturbed during the execution of the works, to the satisfaction of the Owner.

9.4 Throughout the execution of the work, the Bidder or his representative duly authorized and fully responsible and technically conversant with the work under this agreement, acting on his behalf shall be available at the site for supervising the work. The Bidder shall make

adequate arrangements for watchmen to guard the materials brought by them to the site and shall ensure the safety, breakage and any theft of materials fixed or unfixed by him. Any material, T & P brought to the site for bonafide use of the Project shall not be removed/ shifted from the site without the prior written permission of the Engineer/Owner.

9.5 The bidder must provide at his cost leveling pipe, steel/ metallic tapes etc. required by the supervising staff of the Owner's/Owner' representative during execution of the work.

9.6 Whenever required by the Owner, the Bidder shall provide electrical drawings / details before execution of work and get them approved by the Owner.

9.7 Wherever the specification of any item indicates the usage of approved equivalent of any material, the Bidder shall get the sample of the equivalent material approved from the Owner before execution. The approval of the equivalent material is entirely at the discretion of the Owner.

10.0 Infrastructure: For storage of materials, the bidder must provide at his own cost sufficient fenced and covered appropriate area on site for storage of the above materials with lock and key arrangement. For arranging meetings, a suitable sized table and chairs shall be provided by Bidder. Temporary space shall be provided to the Bidder for construction of stores for storage of materials /site office/ labour hutments for the project period.

11.0 Site Establishment: The bidder shall provide all stores, workmen and materials. All materials likely to deteriorate in the open shall be stored under suitable cover. The security of the bidder's equipment and materials is his own responsibility. The Owner accepts no liability for loss or damage to the bidder's plant tools or materials. The materials issued to the bidder by the Owner will remain under the custody of bidder as a trustee. However, title on the same will remain with the Owner. The bidder will be responsible for loss or damage to such materials and shall preserve them in good working conditions as required for the contract and good construction practices till such time that they are incorporated in the works and erected, aligned and fully installed in position and handed over to the Owner. In case the Owner feels that arrangements made by the bidder are not adequate he shall so advice the bidder and the bidder shall promptly take corrective action. In case the bidder fails to take corrective action, Owner shall take such corrective actions and recover the cost thereof from the bidder's bills. Accounts of such material on completion of work shall be rendered and surplus material returned to the Owner as per instructions of Owner. The bidder shall clear away periodically or as instructed by Owner any rubbish, scrap materials, etc. and dump the same in the authorized dump sites notified by local authority/area indicated by the Owner. All construction materials shall be neatly stacked in an orderly manner as directed by the Owner and care shall be taken to allow proper access to workmen and easy movement of men, vehicles, cranes and materials. The bidder shall maintain all the drawings carefully mounted on the board of appropriate size and well protected from the ravages of weather, termites and other insects. The bidder shall not permit the entry to the site of any person not directly connected/concerned with the work without first having obtained the written permission of Owner. The bidder shall submit a list of plants, equipments, tools, tackles, etc. which he will use, to perform the work. These tools, etc. shall not be removed from the site till the completion of job. A gate pass must be obtained from the Indian Institute of Technology Roorkee, chief proctor office, in order to remove from site any plant equipment, tools and materials. All items such as instructions and other pertinent data regarding erection/commissioning and maintenance should be typed and classified for transmittal in a manner approved by the Owner. For all employees of Owner, the bidder shall conform for no misconduct from any of his workforce; failure of this will be sufficient cause for removal of such person from the site.

12.0 Messing & Accommodation: The bidder will make his own arrangements for messing and accommodation. No accommodation and messing shall be provided by the Owner.

13.0 Procurement, Consumption and Storage of Materials

13.1 The bidder shall at his own expenses, provide all materials including cement & steel required for the works. Adequate stocks of all materials required for the work are to be maintained at site. No material (unless as provided elsewhere in this document) shall be supplied by the Owner.

13.2 All materials to be provided by the bidder shall be in conformity with the detailed specifications laid down in the contract and the bidder have to prove that the materials conform to the laid down specifications, if requested by the Indian Institute of Technology Roorkee.

13.3 All materials required for execution of work must be got approved by the site representative of the Owner before they are actually put to use. All facilities for prior inspection of materials and subsequent inspection of work by the Site Engineer must be made available.

13.4 The bidder shall, at his own expenses and without delay, supply to the Owner samples of materials proposed to be used in the work. The Owner shall within seven days of supply of samples, or within such further period as Owner may require and intimate the bidder in writing, whether samples are approved by Owner, or not. If samples are not approved, the bidder shall forthwith arrange to supply, for their approval, fresh samples complying with the specification laid down in the contract.

13.5 The Owner shall have full powers to require removal of any or all the materials brought to site by the bidder which are not in accordance with the contract specifications or do not conform in character or quality to the samples approved Owner. In case of default on the part of the bidder in removing rejected materials, the Owner shall be at liberty to have them removed by other means. The Owner shall have full powers to direct other proper materials to be substituted for rejected materials and in the event of the bidder refusing to comply. Owner may cause the same to be supplied by other means. All risks and costs which may attend upon such removal and/or substitution shall be borne by the bidder.

13.6 Bidder shall be responsible for procurement of all materials/ equipments etc. No delay due to non-availability of any material equipment will be entertained by Owner.

14.0 Method of storing the materials

14.1 The bidder shall at his own cost, provide for all necessary storage on the site in specified areas for all materials such as steel, cement and such other materials which are likely to deteriorate by the action of sun, wind, rain, dampness or other natural causes due to exposure in the compounds or in stores in such a manner that all materials, tool etc. shall be duly protected from damage by weather or any other cause.

14.2 Materials required for the works, by the bidder be stored by the bidder only at places approved by the Owner. Storage and safe custody of materials shall be the responsibility of the bidder. All the materials including bidder's Tools & Plants brought by the bidder to the site shall become and remain the property of the Owner and shall not be removed off the site without prior written approval of the Owner/Owner. But whenever the works are finally completed and advances, if any, in respect of such materials are fully recovered, the bidder shall at own expenses forthwith remove from the site all surplus materials supplied by him and upon such removal, the same shall revert in and become the property of the bidder.

15.0 Shuttering and Scaffolding Materials: It shall be desirable to have adequate amount of shuttering and scaffolding materials to complete the work speedily and Owner decision so as to the quantum of these desirable/ resources of the site shall be final and binding.

16.0 Completion of Work: Before finally leaving site, all the Bidders stores, plant, tools and rubbish shall be removed and the site left clean and tidy. The space allocated by Owner shall be vacated and handed over to the Owner.

17.0 Water and Electricity for Construction work: Water & Electricity as per relevant section's mentioned above

18.0 Employment of Labour

18.1 The bidder shall comply with the requirement of statutory provisions and shall be solely responsible for fulfillment of all legal obligations under Contract Labour (R&A) Act, Inter State Migrant Workmen (Registration of Employment and condition of Service Act, Payment of Wages Act., Minimum Wages Act, Workmen's Compensation Act, Factories Act, Employee's Provident Fund & Miscellaneous Provisions Act, Payment of Bonus Act, Payment of Gratuity Act, Industrial Disputes Act and all other Industrial/Labour enactments and Rules made there under as applicable from time to time. In case Owner incurs any liability towards payment of any dues, compensation, cost of any other liability of any kind whatsoever, due to non- fulfillment of statutory provisions under any industrial/labour laws by the bidder, the same shall be made good by the bidder and Owner shall have full right to recover and claim the same against the bidder from his outstanding bills or otherwise. No labour to stay at site.

18.2 The bidder will be expected to employ on the work only his regular skilled employees with experience of this particular work. The permission of the Owner must be obtained before tradesman are recruited locally for the work. This rule does not apply to unskilled labour. No female labour shall be employed in dark hours/ i.e. hours prohibited under the applicable law. No person below the age of eighteen years shall be employed at anypoint of time. The bidder shall pay, to each person, the wages as per minimum Wages Act of the State Government.

18.3 All traveling expenses including provision of all necessary transport to and from site, lodging allowances and other payments to the bidder's employees are his own responsibility. The hours of work on the site shall be decided by the Owner and bidder shall adhere to the same. All bidders' employees shall wear safety helmet and such identifications marks as may be provided by bidder on work site and duly approved by Owner. All notices displayed on the site and any instructions issued by the Owner shall be strictly adhered to by the Bidder's and/or his sub-bidders' employees. The bidder shall be required to maintain employment records as covered in relevant Acts and produce documentary evidence to the effect that he has discharged his obligations under the Employees Provident Fund Act 1952, and ESI Act, 1948 Group Insurance and other Acts for the workmen working at site.

18.4 The bidder shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and the Dean Infrastructure/Executive Engineer may in his discretion, without prejudice to any other right or remedy

available in law, cancel the contract. The bidder shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

19.0 Working and Safety Regulations: The bidder shall observe all statutory safety and legal requirements regulations issued by Central and State Governments applicable to the work as well as any local regulations applicable to the site issued by the Owner or any other authority.

20.0 Particular attention is drawn to the following: In case of accident, the Owner shall be informed in writing forthwith and First-Aid, Hospitalization shall be provided by the Bidder. The bidder shall strictly follow regulations laid down by Govt. and State authorities in this regard and all cases are to be defended by the bidder. The Owner shall not refund any insurance claims. Bidder shall fence his plant, platforms, excavations etc. Compliance with all electricity regulations. Compliance with statutory requirements for inspection and test of all lifting appliances and auxiliary lifting gear. Staircase, doors or gangways shall not be obstructed in any way that will interfere with means of access of escape. Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosive, the bidder shall be responsible for carrying out such provision and/or storage in accordance with the rules and regulation laid down in Petroleum Act 1934. Explosive Act 1948 and Petroleum and Carbide of Calcium Manual Published by the Chief Inspector of Explosive of India. All such storage shall have prior approvals of the Owner. In case any approval or clearance from Chief Inspector of Explosive or any statutory authorities is required, the bidder shall be responsible for obtaining the same.

The bidder shall have his own Fire Fighting Extinguishers and Equipment. The bidder shall be responsible for the provision of all safety notices safety equipments including the safety gadgets for his workmen required by both the relevant legislation and such as the Owner may deem necessary. While working at heights, safety belts and safety helmets shall necessarily be used.

21.0 Owner's and Bidder's Risks: The Owner carries the risks, which this Contract states are The Owner risks, and the Bidder carries the risk, which this Contract states are The Bidder's risks.

21.1 Owner's Risks: The Owner is responsible for the accepted risks which are:

a. In so far as they directly affect the execution of the Works. These include war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection of military or usurped power, civil war, riot commotion or disorder (unless restricted to the Bidder's Employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or
b. A cause due solely to the design of the Works, other than the Bidder's design.

21.2 Bidder's Risks: All risks of loss or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the accepted risks of the owner.

21.3 The Bidder shall be responsible for all injury to persons, animals or things, and for all damages to the structural and/or decorative part of property which may arise from the operations or neglect of himself or of any sub- bidder or of any of his or sub-bidder's employees whether such injury or damage arises from carelessness accident or any other

causes whatsoever in any way connected with the carrying out to the Contract. This clause shall be held to include interalia any damage to buildings, whether immediately adjacent or otherwise and any damage to roads, footpaths, or ways as well as all damage caused to the buildings and the work forming the subject to this Contract by frost, rain or other inclemency of the weather. The Bidder shall indemnify the Owner and hold him harmless in respect of all and any expenses arising from any such injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of Government or otherwise and also in respect of an award of compensation or damages consequent upon such claim. The bidder shall make good all damages of every sort mentioned in the Clause, as to deliver up the whole of the Contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

22.0 Insurance

22.1 The Bidder shall provide, in the joint names of the Owner and the Bidder, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contracted Data for the following events which are due to the Bidder's risks and shall be covered under respective policies as under:

a. Workmen Compensation Policy;
b. Bidder's All Risk Policy;
c. Third Party Insurance.

22.2 Policies and certificates for insurance shall be delivered by the Bidder to the Owner for the approval before the Date of Start of work i.e. dates of execution of the contract. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

22.3 If the Bidder does not provide any of the policies and certificates required, the Owner may affect the insurance which the Bidder should have provided and recover the premiums the Owner has paid from payments otherwise due to the Bidder or if no payment is due, the payment of the premiums shall be a debt due.

22.4 Alterations to the terms of the insurance shall not be made without the approval of the Owner.

22.5 Both parties shall comply with the conditions in the insurance policy.

23.0 Setting out Works: The bidder shall set out the works and responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof, if at any time any error shall appear during the progress of any part of works the bidder shall at his own expenses rectify such error, if called upon to the satisfaction of the Owner.

24.0 Bidder to remove all offensive matter, non-suitable material etc immediately.

24.1 All debris, excavated soil, filth or other matter or an offensive nature taken out of any trench, sewer, drain cesspool or other place shall not be deposited on the surface but shall be at once carted away by the bidder out of the premises/ site under intimation to concerned authorities.

24.2 Any material brought on site if found unsuitable shall be removed from site at once by the Bidder under intimation to the concerned authorities.

25.0 Inspections by Owner

25.1 The representative of the Owner at all times have free access to the works and /or to the workshops, factories or other places where materials are being prepared or constructed for the Contract and also to any place where materials are lying or from which they are being obtained. No person except the representatives of Public authorities shall be allowed on the work at any time without the written permission of the Owner. If any work is to be done at a place other than the site of the works, the Bidder shall obtain written permission of the Owner for doing so.

25.2 The Owner and their representatives shall have the right to test and/ or inspect the works to confirm their conformity to the contract, at all times, whenever in progress either on the site on the Bidder's premises wherever situated or any firm or company where work in connection with this contract may be in hand. All records, registers or documents relating to the works including materials used on works shall be kept open to the inspection of the Owner or his Authorized representative when so called for in writing.

25.3 The Bidder shall get the quality of work done inspected for material and workmanship at different stages of execution as per instructions given by the Owner or their representative from time to time. Any item of work done which is found not conforming to the Contract shall be rejected by the Owner. The decision of the Owner in such cases shall be final.

25.4 The inspections and tests may be conducted on the premises of the Bidder or at the Project site. When carried out on the premises of the Bidder or its sub-Bidder(s), all reasonable facilities and assistance including access to drawings and production data shall be furnished to the inspectors at no charge to the Owner.

25.5 Should any inspected items of work fail to conform to the specifications, the Owner shall communicate them and the Bidder shall either replace them or make all alterations necessary to meet specification requirements free of cost to the Owner.

25.6 The Bidder shall permit the Owner/Architect to inspect the Bidder's accounts and records relating to the performance of the Bidder and to have them audited by auditors appointed by the Owner, if so required.

26.0 Covering Up/Uncovering of Works

26.1 No part of the works shall be covered up without the approval of Owner and the Bidder shall afford full opportunity for examination and inspection by the Owner. The bidder shall give due notice to the EIC about the work to be covered up for its measurements and examination. The EIC shall within a reasonable time attend for the purpose of examining such work, unless the EIC specifically advises the Bidder in writing of his unwillingness not to attend for such examination in which case the Bidder may proceed further with the Contract work.

26.2 Should the Owner consider it necessary in order to satisfy himself as to the quality of the work, the Bidder shall at any time during the continuance of the contract pull down or cut into any part of the work and make such opening into and to such an extent through the same, as the Engineer may direct and the Bidder shall make good the whole to the satisfaction of the Engineer, should the work prove to be faulty or in any respect not in accordance with the terms of the contract documents, the Engineer shall be at liberty to order such further removal as he may consider necessary and the whole of the expenses incurred shall be borne by the bidder. If however, the work proves to be sound and in accordance with the contract document, the actual expenses incurred in such examination will be borne by the Owner.

26.3 Rates charged by the Bidder for works performed under the contract shall not vary from the rates quoted by the Bidder in its bid, with the exception of any price adjustments authorized

in SCC or in the Owner's request for bid validity extension, as the case may be.

26.4 If requested by the Owner, the Bidder shall provide the Owner with a detailed cost breakdown of any rate in the Schedule of Quantities.

26.5 The Owner may at any time / stage of execution demand for the Analysis of Rates for any item / items of work which in their opinion is / are abnormally high / low rates or required for the Analysis of Rates of other Publish
/ extra item / items. The Bidder is bound to present the same and if the Bidder is unable to present a justified Analysis of Rates for any item / items, the rate / rates for such item may be adjusted accordingly and the decision of the Owner in such cases shall be final.

27.0 Change in the order/ Extra items of work

27.1 The Owner may at any time, by written order given to the Bidder, make alterations in, omissions from, additions to, or substitutions for, in drawings, designs or specifications or quantities of the items of work.

27.2 Owner reserves to itself the right of omission of any item of work from the awarded Publish at any time / stage during the execution of work and award the same to another agency / bidder.

27.3 The Owner may at any time by written order given to the Bidder, increase the scope of work or include any new item of work. The Bidder shall be bound to carry out such works, the rates for which shall be arrived as below:

a. In the case of Extra Item(s) being the schedule item(s) (Delhi Schedule of Rates item), these shall be paid as per the schedule rate (at the time of tender) plus/minus percentage above/below quoted contract amount. Payment of Extra Item(s) in case of non-schedule item (Non-DSR item) shall be made as per the prevailing market rate.

b. In the case of Substituted item(s) being the schedule item(s) (Delhi Schedule of Rates item), these shall be paid as per the schedule rate (at the time of tender) plus/minus percentage above/below quoted contract amount. Payment of substitute in case of non-schedule item (Non-DSR item) shall be made as per the prevailing market rate.

28.0 Payment

28.1 The method and conditions of payment to be made to the Bidder under the contract shall be specified in SCC.

28.2 Payment shall be made promptly by the Owner within thirty (30) days of certification of the bill by the Owner.

28.3 All intermediate running payments to the bidder shall be regarded as payments by way of advance against the final payment and shall not preclude the requiring of bad, unsound and imperfect or unskillful work to be removed, taken away and reconstructed or re-erected.

29.0 Variations and Provisional Cost (If applicable):

29.1 Where work cannot be measured and valued properly, the Bidder shall be allowed day work rates on the prices prevailing when such work is carried out (unless otherwise provided in the contract): a. At the rates if any inserted by the Bidder in the priced Schedule of Quantities or b. If no such rates have been inserted then at the rates prevailing in the market for material and labour and at the control rates for the controlled materials including in all cases the rate for delivery of the material at the work.

29.2 Provided that in any case voucher specifying the time daily spent upon the work (and if required by the Owner the workman's names) and the materials used shall be delivered for verification to the Owner, or his authorized representative not later than the end of the week following that in which the work has been executed. Effect shall be given to the measurement and valuation of variations in interim Certificates and by adjustment of the

total Contract Value.

30.0 Claims for Extra or for Deductions

30.1 The Owner shall not be responsible for the payment of any claim for extra work not included in the contract nor the Bidder shall be entitled to claim any addition to the contract sum in respect of any changes or alterations in the materials used unless the same shall have been ordered or sanctioned, as the case may be, in writing by the Owner.

30.2 The Bidder has to submit a monthly return by 10th of the ensuing month for any extra work which in his opinion is not covered by the contract agreement through the Owner's/ Owner's representatives and obtain a receipt from the authorized signatory of the Owner. Failing this, he shall have no right to any such claim, whatsoever may be the circumstances, later on.

30.3 In the event of any dispute arising either as to validity of the claim or as to the account to be paid or allowed in respect thereof, the decision of the Owner shall be final and binding on the bidder. In the meantime, the Bidder may either proceed with the work in question or suspend the same as may be determined by the Owner.

30.4 All extra works (those permitted by Owner) of every description shall be executed by bidder on site of work in pursuance of any of the provision of the contract, shall be measured up, and shall be paid according to actual quantities ascertained by such measurements and the prices as finalized by the Owner based on the priced schedule of quantities so that such priced schedule of quantities shall include all such operations and accessories as appear in the said schedule of prices or specification to be or shall in the opinion of the Owner the contingencies upon the works mentioned in such schedule of prices or required to make such works perfect and fit for use.

30.5 Provided also that if any work shall be ordered by the Owner and executed by the Bidder for the payment of which no provision in the opinion of the Owner have been made in the priced schedule of quantities or the specifications, the Owner shall fix and determine such prices for the same based on the prices appearing in the priced schedule of quantities, such allowance being made as may seem to the Owner sufficient for any difference in the character of conditions of the work. However, rates for extra items shall be fixed on the basis of actual rate analysis.

30.6 If, it shall appear that the work has been executed with unsound, imperfect or unskilled workmanship, or with material of any imperfect or any inferior quantity or otherwise not in accordance with the contract documents the Bidder shall at his own cost rectify, reform, remove, or reconstruct the same, wither in the whole or in part, as may be directed by the EIC, whether or not the value of any such work or materials shall have been included in any payment made to the Bidder.

30.7 The Bidder shall remove all malba etc., wash and clean the floors and hand over the site quite clean on the completion of the work.

31.0 Delay in the Bidder's performance

31.1 Execution of the work and performance of the services shall be done by the Bidder in accordance with the time schedule specified by the Owner in the Notice inviting tender.

32.0 If, at any time during performance of the contract, the Bidder should encounter conditions impending timely execution of the works and performance of services, the Bidder shall promptly notify the Owner in writing of the fact of the delay, its likely duration and its cause(s). As soon as possible, after receipt of the Bidder's notice, the Owner shall evaluate the situation and may, entirely at its discretion, extend the Bidder's time for performance with or without

liquidated damages.

33.0 Liquidated Damages: If the Bidder fails to execute any or all of the works or to perform the services within the period(s) specified in the contract, the Owner shall deduct from the contract value, as liquidated damages, a sum specified in the SCC for each week or part thereof delay until actual completion or performance, up to a maximum deduction of the percentage specified in SCC. Once the maximum is reached, the Owner may consider termination of the contract.

34.0 Termination by Default

The Owner may without prejudice to any other right or remedy, by written notice (of fifteen days) of default sent to the Bidder, terminate the contract in whole or part: a) if the Bidder fails to complete any or all of the works within the period(s) specified in the NIT or any amendment thereof, or within any extension thereof granted by the Owner, or for any cause including unsatisfactory performance or violation of the terms and conditions of the contract whatsoever or b) if the Bidder fails to perform any other obligation(s) under the contract.

In the event, the Owner terminates the contract in whole or in part, the Owner may procure, upon such terms and in such manner as it deems appropriate, works or services similar to those unexecuted and the Bidder shall be liable to the Owner for any excess costs for such similar work or services. However, the Bidder shall continue the performance of the contract to the extent not terminated.

The owner may terminate the contract bond without prejudice due to financial malpractice/ misbehavior/ verbal or physical assault/ poor quality of work etc. Further to this the bidder shall be debarred for two years for participating in any tender of IIT Roorkee.

Termination of the contract shall not relieve the agency/bidder from any of his obligation imposed by the contract with respect to the work performed by them prior to such termination. In case of termination of the contract, IIT Roorkee reserves the right to get the work done by deploying other agencies. Cost incurred for the same will be recovered from agency's bill /PBG/pledged FDR.

For any above-mentioned cause including unsatisfactory performance or violation of the terms and conditions of the contract whatsoever, the contract is liable to be terminated and the agency is liable to be blacklisted and security deposit/ Performance Bank Guarantee submitted by the agency shall be forfeited and bank guarantee will be encashed.

35.0 Force Majeure

35.1 The Bidder shall not be liable for forfeiture of its performance guarantee, liquidated damages or termination by default, if and to the extent that, its delay in performance or other failure to perform its obligations under the contract is the result of an event of Force Majeure.

35.2 For purposes of this clause, "Force Majeure" means an unforeseeable event beyond the control of the Bidder and is not because of the Bidder's fault or negligence. Such events may include acts of the Owner either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics.

35.3 If a Force Majeure situation arises, the Bidder shall promptly notify the Owner in writing of such conditions and the cause thereof. Unless otherwise directed by the Owner in writing, the Bidder shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

36.0 Termination for Insolvency: The Owner may at any time terminate the contract by giving written notice to the Bidder, if the Bidder becomes bankrupt or otherwise insolvent. In this

event, termination will be without compensation to the Bidder, provided such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Owner.

37.0 Termination for Convenience: The Owner, by written 30 days prior notice sent to the Bidder may terminate the contract, in whole or in part, at any time for its convenience. The notice shall specify that the termination is for Owner's convenience, the extent to which performance of the Bidder under the contract is terminated, and the date upon which such termination becomes effective. The items of work that are complete and ready within (1) month after the Bidder's receipt of notice of termination shall be accepted by the Owner at the contract terms and values. For the remaining works, the Owner may elect;

a) to have any portion completed at the contract terms and value and/or

b) to cancel the remainder and pay to the Bidder an amount, finalized by the Owner, for partially completed works and for materials and parts previously procured by the Bidder.

37.0 Resolution of Disputes

37.1 The Owner and the Bidder shall make every effort to resolve amicably by direct informal negotiations any disagreement or dispute arising between them under or in connection with the contract. If, after thirty (30) days from the commencement of such informal negotiations, the Owner and the Bidder have been unable to resolve amicably a contract dispute, either party may require that the dispute be referred for resolutions to the formal mechanisms specified in the SCC. These mechanisms may include but are not limited to, Arbitration in accordance with rules of Arbitration Act and award made in pursuance thereof shall be binding on both the parties.

37.2 All disputes should be under the Jurisdiction of civil court Roorkee.

38.0 Governing language: The contract shall be written in Hindi or English language. All correspondence and other documents pertaining to the contract that are exchanged by the parties shall be written in the same language.

39.0 Governing law: The contract shall be governed by the laws of The Union of India for the time being in force. All disputes are subject to jurisdiction of courts at Roorkee or Honorable High Court Uttarakhand at Nainital.

40.0 Notices: Any notice given by one party to the other pursuant to this contract shall be sent to other party in writing by e-mail or letter and confirmed in writing to the other party's address specified in SCC. A notice shall be effective on the date on which it is delivered, or on the notice's effective date, whichever is later.

41.0 Discoveries: Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Owner. The Bidder is to notify the Owner of such discoveries and carry out the Owner' instructions for dealing with them.

42.0 Dismissals of workmen: The bidder on request from the Owner, immediately dismiss from the works any person employed by him who may be found in the opinion of the client to be unsuitable or incompetent or who has shown misconduct.

43.0 Working Hours: Normal working hours shall be from 08:45 a.m. to 05:30 p.m. No construction work of important structural nature shall be carried out on Sundays, Holidays and during

nights. However, working hours can be extended in case of urgency with prior approval of IIT Roorkee.

B. TIME CONTROL

44.0 Program

44.1 Within the time stated in the Contract Data the Bidder shall submit to the Owner for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the works, along with weekly cash flow forecast.

An update of the Program shall be a programmed showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

44.2 The Bidder shall submit to the Owner, for approval, an updated Program at intervals no longer than the period as stated in the clause no. 7.1. If the Bidder does not submit an updated Program within this period, the Owner may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue program has been submitted.

44.3 The Owner's/Owner's approval of the Program shall not alter the Bidder's obligations. The Bidder may revise the Program and submit it to the Owner again at any time. A revised Program is to show the effect of Variations at any stage of work, Owner award any item/part of item of work to bidder's workman/ external agency, if in their opinion, the progress of work is suffering because of that. The work done will be added to the Bidder's bill and the amount paid for the job will be deducted from the Bidder's account.

45.0 Delay and Extension of time

If in the opinion of the Owner the work be delayed

a) by force majeure or
b) by reason of any exceptionally inclement weather or
c) by reason of proceedings taken or threatened by or disputes with adjoining or neighboring owners or public authorities or
d) by delays of other bidder or Tradesmen engaged by the Owner or the Owner and the works not referred to in the Schedule of Quantities and/or specification or
e) by reasons of Owner's instruction or
f) by reason of civil commotion, local combination of workmen or strike or lockout affecting any of the building trades or
g) in consequence of the bidder not having received in due time necessary instructions from the Owner for which he shall have specially applied in writing or
h) from other cause which the Owner may certify as beyond the control of the bidder or
i) by reason of nonpayment of interim certificate at specified time, the Owner shall grant for approval by the Owner a fair and reasonable extension of time for completion of the Contract. In case of strike or lockout the bidder shall as soon as may be given written notice thereof to the Owner, but the bidder shall nevertheless constantly use his endeavours to prevent delay and shall do all that may reasonably be required to the satisfaction of Owner to proceed with the work.

C. QUALITY CONTROL

46.0 Identifying Defects: The Owner shall check the Bidder's work and notify the Bidder of any Defects that are found. Such checking shall not affect the Bidder's responsibilities. The Owner may instruct the Bidder to search for a Defect and to uncover and test any work that the Owner considers may have a Defect.

47.0 Correction of Defects

47.1 The Owner shall give notice to the Bidder of any Defects before the end of Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability period shall be extended for as long as Defects remain to be corrected.

47.2 Every time notice of Defect is given, the Bidder shall correct the notified Defect within the length of time specified by the Owner' notice.

48.0 Uncorrected Defects: If the Bidder has not corrected a Defect within the time specified in the Owner' notice. In case, it is felt by the Owner that undue delay is being done by the bidder, the same will be got done by the Owner at the risk and cost of the contractor.

D. COST CONTROL

49.0 Schedule of Quantities

49.1 The Schedule of Quantities shall contain items for the construction work, installation, testing, and commissioning work to be done by the Bidder.

49.2 The Schedule of Quantities is used to calculate the Contract Price. The Bidder is paid for the quantity of the work done at the rate in the priced Schedule of Quantities for each item.

50.0 Variations: All variations in the program pursuant to clause no. 7.0 of GCC shall be included in the updated program produced by the Bidder.

51.0 Payments for Variations

51.1 The Bidder shall provide the Owner with a quotation (with breakdown of unit rates) for carrying out the Variation when requested to do so by the Owner. The Owner shall assess and finalize the quotation, which shall be given within seven days of the request or within any longer period stated by the Owner and before the Variation is ordered.

51.2 If the Bidder's quotation is unreasonable, the Owner may order the Variation and make a change to the Contract Price which shall be based on Owner' own forecast of the effects of the Variation on the Bidder's costs.

51.3 If the Owner decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and shall be treated as a Variation.

51.4 The Bidder shall not be entitled to additional payment for costs, which could have been avoided by giving early warning.

E: FINISHING THE CONTRACT

52.0 Completion Certificate: The Bidder shall request the Owner to issue a Certificate of Completion of the Works will do so upon deciding that the Work is completed.

53.0 Taking Over: The Owner shall take over the Site and the Works within seven days of the Owner issuing a certificate of Completion. Before handing over the site, the bidder must obtain a site clearance certificate from the Owner.

54.0 Final Account: The Bidder shall supply to the Owner a detailed account of the total amount that the Bidder considers payable under the Contract before the end of the Defects Liability

Period. The owner shall issue a Defect Liability Certificate and certify any final payment that is due to the Bidder within 5-6 days of receiving the Bidder's account if it is correct and complete. If it is not, the Owner shall issue within 5-6 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Owner shall decide on the amount payable to the Bidder and issue a payment certificate within 5- 6 days of receiving the Bidder's revised account.

SPECIAL CONDITIONS OF CONTRACT (SCC)

The following Special Conditions of Contract are supplementary to the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The corresponding clause number of the General Conditions of Contract is indicated in parentheses.

1. Definition (SCC clause 1.0)

   a) Owner means: IIT Roorkee.
   b) Site means the project site situated in IIT Roorkee Main Campus.

2. (i) **Security Deposit**: As per Critical Data Sheet.

   (ii) **Release of Security Deposit: Security Deposit will be refunded by the Owner after completion of DLP.**

3. Warranty (Defective Liability Period):

3.1 The minimum warranty period for the complete system will be **one years**. Equipment warranty certificates as per respective OEM will be submitted to the department.

3.2 During the warranty period, all elements of the system which fail due to manufacturing defects or operational wear& tear shall be replaced / repaired by the bidder without any charges. In case it is felt by the department that undue delay is being caused by the bidder in doing this, the same will be got done by the department at the risk and cost of the bidder. The decision of Dean Infrastructure in this regard shall be final.

3.3 The bidder shall warranty the performance of the system. If it is not achieved, the necessary additions/modifications shall be done by the bidder without charging any extra price. However, the owner reserves the right to have this job done by other manufacturers if the bidder does not get the work done within 15 days of issuing the notice to the bidder. The cost for the same shall be borne by the bidder.

4. Payment:

4.1 Payment shall be made as

   a) No advance payment shall be made.
   b) 70% payment may be released on successful delivery of approved material at site in good condition.
   c) 20% payment may be released on successful installation, testing & commissioning of the complete system and make it in operation.
   d) The rest of the amount will be released after arranging the NOC / electrical safety clearance from the respective local / statutory authority.

4.2 Payment shall not be released against 1st R/A bill until submission of following documents by bidder to the Owner:

- Measurement Book (MB).
- GST Invoice with revenue stamp.
- EPF & ESI deposit proof (of one month prior to the month of invoice).

4.3 Basis of Payment in RA bills

Payment in RA bills shall be based on quantity of work executed at site (as per the item of work) & verified by Owner as per the item rate in work orders. The owner is authorized to allow payment for part

rate/reduced rate/full rate for any item(s) in the Schedule of Quantity. Further owner is authorized to allow different part rates/ reduced rate for different item(s).

4.4 Disallowance of payment:
If payment has been made in RA bill for any item of work but later some defect is noticed, Owner/Architect is authorized to disallow the payment in the subsequent bills till rectification of the work.

4.5 Final bill

4.6 The final bill complete in all respect shall be submitted by the bidder within 60 days from the date of completion of work. The total quantity may vary as per actual work execution/site requirement/and user suggested changes during execution.

4.7 The bill should be accompanied with the following documents.

a) Work completion certificate.
b) Site clearance status.
c) Indemnity certificate towards labour payment and all statutory payments.
d) Certificate of test on materials etc. (if applicable/ if conducted).
e) Certificate of measurement sheets.
f) Original quality control record (if applicable), measurement records and any other joint site records maintain at site (if applicable). No claim shall be entertained after receipt of final bill.
g) Warranty certificate (if applicable).

Settlement of final bill shall be made subject to deduction of all dues payable by bidder, settlement of all disputes and furnishing of all required documents/clarifications and grant of extension of time, if any, by Owner's competent authority.

5. Liquidated Damages
The quantum of work with stipulated time (as per discretion of EIC) will be communicated to the firm via email, hard copy or telephonically. In case of delay/partial completion, 0.5% per week of balance / unattended work subject to a maximum of 5% (Five percent) of the Contract value from the stipulated date of completion.

6. Resolution of Disputes
In case the parties don't agree to the advice of owner, then the Director, IIT Roorkee shall appoint a sole arbitrator within 30 days of receipt of request forthwith. The arbitration shall be governed by Arbitration and Reconciliation Act 1996.

7. Notices
For the purpose of all notices, the following shall be the address of the Owner and the Bidder.

Owner: Dean Infrastructure, Institute Works Department,
Indian Institute of Technology Roorkee
Bidder:

(To be filled in at the time of Signing of the Contract)

8. Resolution of Disputes & Arbitration
Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning

the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, terminations, completion or abandonment thereof shall be dealt with as mentioned hereinafter.

If the bidder considers any work demanded of him to be outside the requirements of the contract or disputes any drawings, record or decision given in writing in connection with or arising out of the contract or carrying out of the work, he shall promptly within 15 days request the Owner in writing for written instruction or decision.

If the Bidder is dissatisfied with this decision, the Bidder shall within a period of 30 days from receipt of the decision, give written notice to the IIT Roorkee for appointment of Arbitrator failing which the said decision shall be final binding and conclusive and not referable to adjudication by the Arbitrator.

Except where the decision has become final, binding and conclusive in terms of Sub Para (i) above disputes or difference shall be referred for adjudication through arbitration by a sole arbitrator appointed by The Director, IIT Roorkee. If reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator. It is also a term of this contract that no person other than a person appointed by such IIT Roorkee as aforesaid should act as arbitrator and if for any reason that is not possible, the matter shall not be referred to arbitration at all.

It is also a term of this contract that if the contractor does not make any demand for appointment of arbitrator in respect of any claims in writing as aforesaid within 30 days of receiving the intimation from the Owner that the final bill is ready for payment, the claim of the bidder shall be deemed to have been waived and absolutely barred and IIT Roorkee shall be discharged and released of all liabilities under the contract in respect of these claims. The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act, 1996 (26 of 1996) or any statutory modifications or reenactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause.

9. Protection of environment

9.1 The Bidder shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

9.2 During continuance of the contract, the Bidder and his sub-bidders shall at all times abide by all existing enactment on environmental protection and rules made there under, regulations, notifications and bye-law of the State or Central Government, or local authorities and any other law, by-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

9.3 Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974 This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. ‘Pollution’ means such contamination of water or alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to create a nuisance or render such water harmful or injurious to public health or safety, or to domestic,

commercial, industrial agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981, This provides for prevention, control and abatement of air pollution, 'Air Pollution' means the presence in the atmosphere of any air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Prevention and Control of Pollution) Act, 1986 This provides for the protection and improvement of environment and for matters connected to herewith, and the prevention of hazards to human beings. Other living creatures, plants and property, 'Environment' includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act 1991. This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

10. Specifications to be followed for execution for execution of works are:

For Civil Works: CPWD Specifications 2009 Vol. 1 and Vol. 2 with up to date correction slips. (Hereinafter called CPWD specifications also) and Specification mentioned in This Publish document for each project.

For Electrical Works: CPWD General Specifications for Electrical Works, Part-I (Internal) 2023 and CPWD General Specifications for Electrical Works, Part-I (External) 2023 and Specification mentioned in this bid document for each project.

11. If the bidder wants to offer any unconditional rebates on their offer that should be clearly mentioned.

12. In case any information furnished by the bidder is found to be false / forged / incorrect at any stage, their bid shall be rejected, and the bidder shall not be allowed to participate in the re-bidding process of the work.

13. **Clarification of Bids/ Shortfall Documents**: IIT Roorkee may, at its discretion, ask the bidder for clarifications / shortfall documents related to his bid. The request for clarification shall be given in writing. Depending on the reply of the bidder, his bid shall be ignored or considered further.

14. Tender will be awarded on overall L1 basis (including BoQ1, BoQ2, BoQ3 etc.).

15. Abnormally High and Low Bids:

a) Tender evaluation committee (TEC) will observe the rates and seek justifications if that are abnormally high/low. Threshold value over which the rates would be judged high/low shall be decided by the TEC looking into the nature of work and their specification on case to case basis

b) If required necessary for high bids negotiation will be done with the approval of the Competent Authority. However, if the rates will be found abnormally low additional security shall be got deposited as per the following formula:

i) Up to 30% less than the estimated cost: nill

ii) Above 30% and less than up to 50%: 20%

iii) Above 50% and less than up to 70%: 40%

16. The bidder who has two ongoing General Repair & Maintenance/Routine works in-hand for electrical works and three ongoing General Repair & Maintenance/Routine works for civil works shall not be allowed to participate in another fresh tender of General Repair & Maintenance/Routine works.

17. Working/Running Contractor who have completed their work upto/ above the awarded value of contract bond duly verified by the Engineer-in-charge shall be considered as work completed and such contractors shall be allowed to participate in tenders.

18. Only 'Class-I local supplier' and 'Class-II local supplier', as defined in the Public Procurement (Preference to Make in India), Order 2017 shall be eligible to bid in the tender. For more details, please refer: Order No.: P- 45021/2/2017-PP (BE-II), DPIIT, Ministry of Commerce and Industry issued Dated: 16th Sept. 2020. Self- certificate has to be provided in this regard that the item offered meets the local content requirement for 'Class-I local supplier' & 'Class-II local supplier' (as per Annexure-C).

19. Estimate is based on DSR-2022 (E&M) + DSR 2021(Civil) + Nonscheduled rates with 18% GST and 1% BOCWW Cess.

20. In case the GST rate is changed by the GOI then the item rate in the estimate shall be changed on pro-rata basis.

Institute Engineer,
IWD, IIT Roorkee

Annexure-B

Undertaking

(On Non-Judicial stamp paper of Rs. 100/-)

Name of the address of the bidder:……..

NIT No.……

Name of the work: …….

Due Date: ……

I/We have read and examined the Tender document for the work. I/We hereby submit bid for the execution of the work specified for the Institute within the time specified in NIT of quantities and in accordance with the specifications, designs, drawing and instructions in writing referred to the conditions of contract and with such materials as are provided for, by, and in respect of accordance with such conditions so far as applicable.

I/We agree to keep the Bid open for ninety (90) days from the due date of its opening and not to make any modification in its terms and conditions.

Earnest Money as mentioned in the critical data sheet is hereby forwarded in Bankers' Cheque / Demand Draft / Fixed Deposit Receipt issued by scheduled bank. If I/We, fail to furnish the prescribed performance guarantee within prescribed period. I/We agree that the Institute has to right to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that the Institute has to right to forfeit the said performance guarantee absolutely. The said performance guarantee shall be a guarantee to execute all the works referred to in the Tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in NIT. Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-Tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another bidder on back to back basis. Further that, if such a violation comes to the notice of owner, then I/we shall be debarred for tendering in IWD, IIT Roorkee in future forever. Also, if such a violation comes to the notice of owner before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

I/We hereby declare that I/We have no near relative connection by marriage to any staff of the Institute. The

information given in the tender form is correct and best of my knowledge.

Dated: Signature of Bidder

Witness: Postal Address

Occupation:

PERFORMANCE GUARANTEE BOND

In consideration of the Indian Institute of Technology Roorkee having agreed under the terms and conditions of agreement No…… dated……. made between ……. And…… (hereinafter ..... called "the contractor(s)") ……. .....for the work (hereinafter called "the said agreement") having agreed to production of an i r r e v o c a b l e B a n k Guarantee for……. (Rupees ..... only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement,

1. We.....(. hereinafter referred to as "the Bank") hereby undertake to pay to IIT Roorkee (Indicate the name of the bank) an amount not exceeding Rs……. (..... only) on demand by the Indian Institute of Technology Roorkee.

2. We ……...do hereby undertake to pay the amounts due..... and payable (Indicate the name of the Bank) under this Guarantee without any demur, merely on a demand from the Indian Institute of Technology Roorkee stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). 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 (Rupees only).

We, the said bank further undertake to pay to the Institute any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) shall have no claim against us for making such payment.

We ……further agree that the guarantee herein contained shall (Indicate the name of the Bank) remain in full force and effect during the period that would be taken for performance of the said agreement, and it shall continue to be enforceable till all the dues of the Indian Institute of Technology Roorkee under or by virtue ofthe said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the Institute certified that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee.

3. We.....(indicate the name of bank) further agree with the Indian Institute of Technology Roorkee that Indian Institute of Technology Roorkee shall have the fullest liberty without our consent and without effecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement 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 Indian Institute of Technology Roorkee against the said contractor(s) and to forebear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor(s) or for any forbearance, act of omission on the part of the Institute or any indulgence by the Indian Institute of Technology Roorkee to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

This guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).

4. We.....(Indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Indian Institute of Technology Roorkee in writing.

This guarantee shall be valid up to unless extended on demand by Indian Institute of Technology Roorkee. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to

5. ……(Rupees.....only)and unless a claim in writing is lodged with uswithin six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged. Dated the.....day of…… for..... (Indicate the name of the Bank).

List of Approved Makes of Electrical & Mechanical (E&M) Materials		
S.No.	**Materials/ Equipments**	**Manufacturer/ Make**
A	**I.E.I., MCBDB & MCB, Cables & Wires**	
1	MCB, Isolator, Industrial Plug Socket, RCCB, RCBO'S	Schneider Electric / Legrand / / ABB / L&T Siemens
2	MCBDB & Loose Wire Box	Legrand/ L&T/ Schneider / ABB / Siemens
3	Change Over Switches	Asco/ Russel/ Socomac/ ABB/ L&T/ Schneider / Havells
4	Automatic Transfer Switch (ATS)	Asco/ Russel/ Socomac/ ABB/ L&T/ Schneider / Havells
5	FRLS PVC insulated copper conductor single core cale for wiring. (ISI marked)	Finolex/ RR Kabel/ KEI/ Havells/ Polycab
6	MS Conduit (ISI marked) with heavy duty MS Conduit pipe accessories	BEC/ NIC/ AKG/ RMCON / MK(Honeywell)(**Note:** The make of accessories will be same that of conduit pipe & will comply to IS:4768 part 2 2003)
7	PVC Conduit/ Batten (ISI marked) with havy duty PVC conduit pipe accessories	AKG/ BEC/ Precision/ MK(Honeywell)
8	Modular Switch, Socket/ Telephone Socket/ Cable TV Socket/ Data Outlet Socket/ Fan Regulator/ G.I. Boxes Etc. (Wiring accessories)/ Regulator etc.	Havells (Murano)/ Legrand (Arteor)/ Schindler Electric (Zencelo)/ Honeywell-MK (Blenzeplus)/ ABB (Tvisha)
9	Selector Switch & Toggle Switch	Salzer (Larsen & Toubro)/ Siemens/ Kaycee
10	PVC Trunking	Legrand/ schneider/ MK(Honeywell)/ AKG/ Precision
11	G.I. Pipe	Tata/ Jindal (Hissar)/ Prakash Surya
12	Paints	Asian/ Berger/ Dulux/ Narolac
13	Terminals Blocks and Connectors	Elmax/ Wago/ Hensel/ Connectwell
14	Phenolic Laminated Sheet/ Bakelite Sheet	Hylam/ Formica/ (P-I Grade)/ Mylam/ Greenlam
15	Piano Type Switch/ Socket	Anchor/ Kinjal/ Cona
16	Ceiling Rose/ Holder/ Call Bell/ Buzzer etc.	Anchor/ Kinjal/ Cona
B	**Fans & Fitting**	
1	LED Fittings	Wipro/ Phillips/ Crompton Greaves/ Havells
2	Exhaust Fan	Havells/ Crompton Greaves/ Usha/ Almonard/ Orient / Atomberg
3	Ceiling Fan	Havells/ Crompton Greaves/ Usha/ Almonard/ Orient / Atomberg
4	Geysers	Racold/ CG/ Havells/ Usha/ Jaquar
5	Sensor based LED Light Fittings	OCTIOT/Wipro/ Phillips/ Crompton Greaves/ Havells
C	**Street Lighting**	
1	Ornamental C.I. pole (Factory Finish)	Phillips/ Crompton Greaves/ Wipro/ Bajaj
2	Hot Dipped Finish) Galvanized Octagonal Pole(Factory made)	Crompton Greaves/ Phillips/ Bajaj/ Wipro

3	Polycarbonate Juction Box/ Enclosure	Hensel/ Spelsberg/ Neptune- Bals/ Cape Electric

4	XLPE insulated PVC SheatedAlum./ Copper conductor Armoured cable of 1.1KV Grade	Finolex/ Universal/ Polycab/ Havells/ Grandley/ Gemscap/ RPG Cable/ KEI/
D	**Sub Station Equipments**	
1	LT Panel/ Meter Panel Board/ Outdoor Feeder Pillar/ APFC Panel (less than 200 kVAR)/ Bus Ducts	TricoliteElecrical Industries/ Control & Switchgears Pvt. Ltd./ Sterling &Wilson/ Milestone/ Adlec Control System Pvt. Ltd./ Advance Panels & Switchgears Pvt. Ltd./ S.S. Enterprises/ A.R. Engineers
2	Air Insulated Rising Main	C&S/ L&T/ Schneider/ Legrand
3	Sandwich type Bus Trunking	C&S/ L&T/ Schneider/ Legrand
4	Moulded Case Circuit Breaker (MCCB) Thermal Release/ Microprocessor Based (Ics=Icu=100%)	Schneider Electric (NSx Series)/ Siemens (VL Series)/ L&T (D-Shine)/ Legrand (DPX3)/ ABB (Tmax)/ C & S (Winbreak-1/2)
5	Power/ Aux. Contactor 3/4 pole	Schneider Electric/ L&T/ Siemens/ Legrand/ ABB/ C&S
6		
7	LED type indicating lamps/ Push Button	Schneider Electric/ L&T/ Siemens/ C&S/ GE
8	Overload relays with built in Single Phase Preventer	Schneider Electric/ L&T/ Siemens/ C&S/ ABB
9	Conventional/ Electronic (A/V/PF/Hz/KW/KWH) Digital Meters	Conzerv/ Larsen & Toubro/ Secure/ AE/ C&S/ Siemens/ Schneider/ ABB/ Rishabh
10	Timer	Siemens/ L&T/ Legrand/ ABB/ Schneider Electric/ C&S
11	Fasteners/ G.I. Clamps	Hilti/ Fischer/ Chilli/ GMGR
12	D.W Corrugated HDPE Pipe (ISI marked)	REX/ Dura plast/ Zenduct/ Triputi/ Duraline
13	Transformer (Oil/ Dry type)	Crompton/ ABB/ Schneider/ Voltamp/ Kirloskar (only oil type) / Tesla
14	HT Panel/ Ring Main Unit	Siemens/ ABB/ L&T/ Schneider
15	H.T Cable (ISI marked)	CCI/ Polycab/ Universal/ KEI/ Havells/ RPG Cables
16	HT End Termination Cable Joint Kit	Reychem/ Cab Seal/ 3M
17	ACBs (with display)	Siemens/ L&T/ ABB (Emax)/ C&S / Legrand/ Schnieder
18	Rubber Mat	Jyoti/ Deep Joyti/ Premier (duly ISI marked)
19	Fire Extinguishers	Minimax/ New Age/ Safex/ Ansul/ Ceasefire/ Amerex
20	Capacitors & Reactors/ APFC Relay	EPCOS/ L&T/ ABB/ Siemens/ Schneider
21	APFC Panel(200 KVAR & Above) (Accessories make will be as per manufacture's standards)	L&T/ Schneider/ ABB/ Siemens/ Legrand/ C&S
22	Cable Glands Double Compression with earthing links	Comet/ Cosmos/ Dowells/ Gripwell/ Jainson / Hax Brass (Copper Alloy India)
23	Bimetallic Cable Lugs	Comet/ Dowells (Biller India)/ Hax Brass (Copper Alloy India)/ Jainson/ Action
24	MS / GI Cable Tray	Pilco/ Slotco/ Pasco/ MEM/ BEC/ Steelways/ Legrand

25	Programmable Logic Controller (PLC)	Siemens / Woodward/ Allen Bradley / Delta / Mitsubishi
E	**DG Sets**	
1	Diesel oprated power Generating Engine	Cummins India/ Caterpillar/ Ashok Leyland/ Kirloskar/ Mahindra/ Perkins
2	Alternator	Stamford/ Lerroy Sommer/ Kirloskar Electric Caterpillar/ Crompton Greaves/ Toyo Denki
3	DG Set Canopy/ Enclosure & AMF Panel	As per OEM/ OEA of respective DG Set Manufacturer
4	Alarm Annunciator	As per OEM/ OEA of respective DG Set Manufacturer

Note - Due to compatibility of items, for replacement purpose existing brand shall be considered subject to availability.

Annexure-C

(to be submitted by the vendor/firm on its official letter head)

Self-Certificate for Local Content

Tender No:

Dated:

We hereby certify that the items quoted by us against above mentioned tender no. has the local content as per below:

Local Content (in %): …….

Local Supplier Class: .....

The details of the Make in India items/parts used in the quoted products is/areas under:

1.

2.

3.

The details of the location(s) at which the local value addition made/manufactured is/areas under:

1.

2.

3.

We also understand, false declarations will be in breach of the code of integrity under rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

Signature:

Name:

Designation:

Seal of the Firm/Organization:

Annexure-D

PERFORMA FOR DIRECT PAYMENT/ TRANSFER TO BANK ACCOUNT BY IIT ROORKEE

S. No.	Particulars	Information
1	Firm (Beneficiary) Name	
2	Address	
3	Complete Bank Account No. of the Firm (Beneficiary) (In case of change in Bank Account vendor write to Account Office)	
4	Bank Name	
5	Branch Address	
6	IFSC Code No.	
7	Permanent Account No.	
8	Mobile No. (for SMS)	
9	Email ID (For Information)	
10	Enrolment No. (for student)	

We undertake that all the information provided above is correct and IIT Roorkee will not be responsible in case of any error on the part of firm.

Verification by Bank (one time only) Information given at 1,4,5,6&7 verified by Bank Seal and Signature of the Bank	 Seal and Signature of the Firm

TECHNICAL SPECIFICATIONS

A. General

1. SCOPE:

i. This specification covers design, engineering, manufacture, assembly, testing at manufacturer's works, supply, delivery at site, unloading (But, in case Plinth is not ready, supplier shall unload the transformer within Sub-station premises at suitable location as per direction of site-in-charge of customer), handling, storage, installing, testing and commissioning at site of Power Transformer, motorized isolators, 33 kV & 11 kV VCBs, CTs, PTs, Control & Relay panel, LAs and required accessories complete with all fittings and accessories required for efficient and trouble-free operations.

ii. Unless otherwise specified, all components / items to be supplied against this contract shall be suitable for satisfactory continuous operation for the climatic conditions of Roorkee, Uttarakhand. However, the design ambient temperature should not be less than 50 Degree C.

iii. All components / items to be supplied against this contract shall confirm in all respects to the relevant Indian Standard Specifications / IEC Standards, with latest amendments. Equipment meeting any other authoritative standard, which ensures an equal or better quality than the standards mentioned above, will also be acceptable. In such a case, a copy of standard followed should be enclosed with the tender. Acceptability of any alternative standard is at the discretion of the Institute.

iv. Equipment should be provided with a name plate giving full details of manufacturers, capacities and other details as specified in the relevant ISs. The purchase order No. date and words "IIT Roorkee" must be etched on the name plate.

v. This work also includes construction of required panel room, suitable foundations of transformers and other items as per direction of EIC for efficient and trouble-free operations. Further other required erection and civil works like foundation of equipment's, making suitable structure, cutting holes, demolishing the existing structurer etc. (as per requirement and as per direction of EIC) shall be in the scope of bidder.

vi. **02 nos. 10 MVA, 33/11 kV Power Transformers (of Tesla Make) are already installed and working at site**. The contractor has to install and commission one additional 10 MVA, 33/11 kV Power Transformer along with required infrastructure in all respect. The bidder shall be responsible for the integration of new system with existing one including SCADA system (of Hitachi/ ABB make) without any additional cost implication to Institute.

vii. The equipment to be supplied against this specification is required for vital installations where continuity of service is very important. All the work has to be carried out without hampering the utilities of premises.

viii. The bidder shall ensure all the safety protocols as per standards / industry norms.

ix. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure satisfactory, reliable, continuous and trouble-free service throughout the life of the equipment (s).

x. Rating, Diagram, Property Plates and labeling shall be provided for each equipment.

xi. Any other requirement which are not specifically covered here but which are necessary for successful commissioning of the Sub stations are also within the scope of the Contract. The equipment manufactured should conform to the relevant standards and of highest quality of engineering design and workmanship.

xii. The tendered shall state in his tender the place(s) of manufacture, testing and inspection of the various portions of the work included in the tender, the purchaser or his duly authorized agency shall have access to the supplier's works at any time during working hours for the purpose of inspecting the manufacture of material, equipment etc., and the supplier shall provide the necessary facilities for inspection.

xiii. Within 15 days after the date of issue of contract bond, the supplier shall furnish two (02) copies each of the dimensional drawings, technical specifications sheets, schematic drawings and wiring drawings and other required documents for purchaser's approval.

xiv. Institute shall have the right to require the supplier to make any other change in the design, which may be necessary in his opinion to make the equipment conform to the stated provisions of the specification without additional Cost of the purchaser.

xv. Approval of drawings/work by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the contract, latest revision of application standards, rules and codes of practices.

xvi. It needs to note that all equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have to power to reject any work or materials which, in his judgment is not in full accordance therewith.

xvii. NOC for electrical safety for the whole substation (system) will be obtained by the contractor from competent authority as per applicable rules on behalf of the Institute.

xviii. The complete system including Power Transformer and associated switchgear / accessories shall be guaranteed for satisfactory operation for a period of **01 year** from the date of commissioning.

xix. After the work completion, the bidder shall provide the soft copies and 03 nos. hard copies of as-built documents / drawing along with Warrantee certificate to EIC.

xx. Instruction Booklets - Operating, testing, commissioning, and maintenance instructions in English language covering all the protective and auxiliary relays and instruments shall be put under a common cover, and four such sets shall be supplied free of cost to Institute.

xxi. The supplier shall be responsible for suitable packing of all the material and marking on the consignment so as to avoid any damage during the transport and storage and to ensure correct dispatch to the destination.

xxii. All the plant / apparatus / equipment supplied shall comply in all respect with the requirement of Indian Electricity Act 2003 and Indian Electricity Rule 2003/IS and latest amendment thereof during the execution of contract where-ever applicable.

xxiii. Tests during manufacture / Test Reports / Test Certificates:

- The Bidder shall furnish details of tests carried out during the process of manufacture and end inspection by the bidder to ensure the desired quality of the equipment to be supplied.
- Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the purchaser's representative.
- Test certificates of tests conducted during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the purchaser.

xxiv. The following documents to be submitted by the vendors to the consignee, Stores at the time of dispatch to stores by the vendors: -

- Copy of Purchase order.
- Copy of Dispatch Instruction.
- Inspection Test Certificate.
- Seal list and packing list.
- Challan in triplicate.
- Waybill, if applicable.

10 MVA, 33/11 KV, 3 PH POWER TRANSFORMER

1. SCOPE:

i. This specification covers design, engineering, manufacture, assembly, testing at manufacturer's works, supply, delivery at site, unloading (But, in case Plinth is not ready, supplier shall unload the transformer within Sub-station premises at suitable location as per direction of site-in-charge of customer), handling, storage, installing, testing and commissioning at site of 10MVA 33/11KV, 3 Phase Power Transformer as detailed in the specification given hereunder , complete with all fittings and accessories required for efficient and trouble-free operations.

ii. The Transformer offered shall be multi-winding, oil immersed complying as per Specific Technical parameters and suitable for outdoor installation.

iii. Rated capacity and voltage of the transformer shall be 10MVA, 33/11 kV outdoor power transformer.

iv. **The transformers should be Type Tested (any Govt. recognized test house or laboratory / NABL accredited Laboratory) as per IS 2026 or IEC 60076 in conjunction with their relevant Part. Necessary test documents of previously tested similar capacity of transformer within last 5 years from date of NIT shall have to be submitted by the contractor before execution of work.**

2. STANDARD:

The finished Power Transformer, oil, bushings, tap changer etc., that are used in manufacturing of transformer shall confirm in all respects to the relevant Indian Standard Specifications / IEC Standards, with latest amendments as indicated below.

i)	IS:2026	- Specification for Power Transformer
ii)	IS/IEC 60137 (Superseding IS:2099) and 3347	- Bushing for alternating voltage above 1000 volt
iii)	IS : 6600	- Guide for loading of oil immersed transformer
iv)	IS : 335	- Specification for transformer oil
v)	CBIP	- Manual on Transformer
vi)	IEC 60076	- Power Transformer
vii)	IEC 354	- Loading guide for Oil immersed Transformer
viii)	IEC 551	-Tr. Sound Level
ix)	IS 8468	-Specification for on load tap changer
x)	IS 3639	-Specifications for fittings and accessories for Power Transformer

Equipment meeting any other authoritative standard, which ensures an equal or better quality than the standards mentioned above, will also be acceptable. In such a case, a copy of standard followed should be enclosed with the tender. Acceptability of any alternative standard is at the discretion of the Institute.

3. Climatic Conditions

The Power Transformer to be supplied against this Specification shall be suitable for satisfactory continuous operation for the climatic conditions of Roorkee, Uttarakhand.

4. General Design / Principal Parameters

4.1 Design and Standardization:

i) The transformer and accessories shall be designed to facilitate operation, inspection, maintenance and repairs. All apparatus shall also be designed to ensure satisfactory operation under such sudden variations of the load and voltage as may be met with under working conditions on the system, including those due to short circuit.

ii) The design shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the equipment keeping in view the requirements of Indian Electricity Rules.

iii) All materials used shall be of the best quality and of the class most suitable for working under the conditions specified. They shall withstand the variations of temperature, and atmospheric conditions arising under working conditions without undue distortion or deterioration or the setting up of undue stresses in any part, and without affecting the strength and suitability of various parts.

iv) Cast iron shall not be used for chambers of oil-filled apparatus or for any part of the equipment which is in tension or subject to impact stresses. This clause is not intended to prohibit the use of suitable grades of cast iron for parts where service experience has shown it to be satisfactory, such as large valve bodies, unless otherwise specified.

v) All out-door apparatus, including bushing insulators with their mountings, shall be designed to avoid pockets in which water can collect.

vi) Means shall be provided for easy lubrication of all bearings, and where necessary of any mechanism or moving parts that are not oil immersed.

vii) All mechanisms where necessary shall be constructed of stainless steel, brass, gunmetal to prevent sticking due to rust or corrosion.

viii) All taper pins used in any mechanism shall be of the split type complying with IS: No.2393 (latest version) for these items.

ix) All connections and contacts shall be of sample section and surface for carrying continuously the specified currents without undue heating and fixed connections shall be secured with bolts or set screws of ample size, adequately locked. Lock nuts shall be used on stud connections carrying current.

x) All apparatus shall be designed to minimize the risk or accidental short circuit caused by animals, birds or vermin.

xi) The Transformer and accessories shall be designed to facilitate easy inspection, cleaning and repairs.

xii) All fittings and accessories shall be designed to ensure satisfactory operation under the worst conditions of load and voltage as may be met under working conditions in the system.

xiii) All electrical connections shall be of ample cross sections for carrying the specified currents continuously without undue heating. All fixed bolts and screws shall be reliable under the worst conditions of operations.

xiv) Transformers shall be capable of withstanding thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any winding.

4.2 CENTER OF GRAVITY:

The center of gravity of the assembled transformer shall be low and as near the vertical center line as possible. The transformer shall be stable with or without oil. The location of Centre of Gravity shall be shown on the outline general arrangement drawing.

4.3 Bolts, Nuts and Galvanizing requirement:

i) Steel bolts and nuts exposed to atmosphere with suitable finishes like cadmium plated or zinc plated passivity shall be used for diameters above 6 mm

ii) All nuts and pins shall be locked in position with the exception of those external to the transformer. Bolts and nuts external to the transformers shall be provided with a double flat washer and one spring washer.

iii) On outdoor equipment, all bolts, nuts and washers in contact with non-ferrous parts which carry current shall be of phosphor bronze where the transfer of current is through the bolt.

iv) If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, suitable special spanners shall be provided by the supplier.

v) Galvanizing shall be applied by hot-dip process or by electro galvanizing process for all parts other than steel wires and shall consist of a thickness of zinc coating equivalent to not less than 610 gm zinc per square meter of surface. The zinc coating shall be smooth, clean and of uniform thickness and free from defects. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the coated material. The quality will be determined by tests as per IS: 2630 (latest version). (Alternatively, galvanizing Aluminizing may also be considered).

vi) All drilling, punching, cutting, bending and welding of parts shall be completed and all burrs shall be removed before the galvanizing process is applied.

vii) Galvanizing of wires shall be applied by the hot-dip process and shall meet the requirements of the relevant IS. The zinc coating shall be smooth, clean and of uniform thickness and free from defects. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of wire.

viii) Surfaces, which are in contact with oil, shall not be galvanized or cadmium plated.

4.4 Labels:

i) Labels shall be provided for all apparatus such as relays, switches, fuses contained in any cubicle or marshaling kiosk.

ii) Descriptive labels for mounting indoors or inside cubicles and kiosks shall be of material that will ensure permanence of lettering. A matt or satin finish shall be provided to avoid dazzle from reflected light. Labels mounted on dark surface shall have white lettering on a black background. Danger notices shall have red lettering on a white background.

iii) All plates shall be of incorrigible material.

iv) Labels shall be attached to panels with brass screws or with stool screws which have received rust preventive treatment or those can be stuck with araldite also.

v) Labels should have sufficient lettering size for normal reading.

4.5 Temperature Rise:

Transformer shall be capable of operating continuously at its normal rating without exceeding temperature rise and hot spot limits as specified in SCHEDULE of Technical Particulars for 10 MVA, 33/11 KV Transformer.

4.6 Dynamic Ability to Withstand Short Circuit:

i) Thermal ability to withstand short circuits shall be proved by calculation and shall be furnished along with the drawing after placement of L.O.A.

ii) The designed time period for short circuit will be taken as 3 (three) seconds and fault current will be taken as per technical particulars. The maximum permissible value of the highest average temp. of winding after withstanding the above stipulated Short Circuit shall not exceed 250 Degree C and the submitted calculations shall be as per Cl. No. 9.1 of IS: 2026 (Part-I).

4.7 Electrical Characteristics and Performance: Transformers shall be oil immersed and naturally cooled core type and shall be suitable for out-door installation and shall be provided with conservator vessels. The type of cooling shall be as stated in the relevant specifications.

4.8 Continuous Maximum Rating and Overloads:

i) Transformers shall comply as regards rating temperature rise and overload with the appropriate requirements of IS 2026 when operating with ONAN cooling. Transformers shall be capable of operation continuously in accordance with IS loading guide at their C.M.R., and at any ratio irrespective of the direction of flow of power and with voltage of the untapped winding maintained at the voltage stated in the ordering schedule.

ii) For transformer tapping ranges extending more than 5 percent below the nominal voltage, shall meet the temperature rise limits specified in IS 2026 on all tapings on which the rated current is not more than 95 percent of the maximum rated current on the lowest voltage tapping. On other tapings, they shall operate continuously without injurious heating. The loading of the transformers is to be in accordance with IS 6600. Guide for loading of oil immersed transformers.

iii) The transformers may be operated without danger on any particular tapping at the rated KVA provided that the voltage does not vary by more than ± 10% of the voltage corresponding to the tapping.

4.9 Voltage Ratio: The voltage between phases on the higher and lower voltage winding of each transformer measured at no load and corresponding to the normal ratio of transformation shall be those stated in the ordering schedule. Means shall be provided for varying the normal ratio of transformation in accordance with the respective clause on load type.

4.10 Electrical Connections: Transformers shall be connected in accordance with the IS group symbol Dyn 11.

4.11 Frequency: The transformers shall be suitable for continuous operation with frequency variation of ±3% from normal 50 C/S without exceeding specified temperature rise.

4.12 Duty Under Fault Conditions:

i) Except where modified below, it is to be assumed that the amount of generating plant simultaneously connected is such that normal voltage will be maintained on one side of any transformer when there is a short circuit between phases or phase to earth on the other side. Any transformer may be directly connected to an underground cable or overhead transmission line and switched into and out of service together with its associated transmission line.

ii) All Transformers shall be capable of withstanding without any damage to external short circuits between phases and phase to ground according to IS: 2026 or its latest version.

4.13 Losses:

i) The maximum loss of each transformer shall be as indicated below: The fixed losses should be as low as is consistent with normal design, reliability, and economical use of material. The offers for transformers with higher losses will be liable for rejection.

Rating	**10 MVA, 33/11 kV (**Standard Max losses at 75^0C)
No load losses	7500 W (max.)
Full Load losses at 75°C	55000 W (max.)

i) The purchaser reserves the right to reject any transformer if, during tests at the supplier's works, the test shows no load losses and total losses exceed the corresponding maximum guaranteed values.

ii) The supplier shall provide, along with the tender, design, details of core assembly showing the constructional details, core diameter, net/gross sectional area of the core assembly etc. The information must also be given in respect of voltages per turn at principal tap for normal voltages. The loss curves for type /grade of steel laminations being used for core shall also be provided along with the tender documents.

iii) The bidder shall state no load loss, load loss at rated voltage and frequency and loss figures shall be guaranteed.

4.14 Tolerance:

Sr. No.	**Item**	**Tolerance**
i)	Voltage ratio at principal tapping	The lower of the following a) + 0.5% of the declared ratio b) A percentage of the declared ratio Equal to 1/10th of the actual % impedance voltage at rated current.
ii)	Impedance voltage at rated current (Principal tapping)	The tolerance on percentage impedance at principal tapping and all other taps, tolerance will be applicable as per IS – 2026.

iii)	No load current	+30% of the declared no-load current.

4.15 Regulation and Impedance: The impedance voltage at a normal ratio of transformation and normal rating shall be 8.35% for 10.0 MVA transformers. Tolerance is as per IS. The impedance value measured on any other tapping shall not exceed the value measured on the principal tapping by more than 10% impedance.

4.16 Flux Density:

i) The maximum flux density in any part of the core and yoke, at normal ratio and at normal voltage and frequency, of each transformer shall be stated. The normal flux density for cold-rolled grain-oriented steel laminations shall not exceed 1.7 Tesla's at a normal tap position. Over-fluxing should be limited as per IS.

ii) However, in the case of transformers with variable flux, the voltage variation, which would affect flux density at every tap, shall be kept in view while designing transformers.

4.17 Vibration and Noise: Every care shall be taken to ensure that the design and manufacture of all transformers and auxiliary plants shall be such as to reduce noise and vibration to the level obtained in good modern practice. The maximum noise level should be as per NEMA standard.

4.18 Suppression of Harmonics: The transformers shall be designed with particular attention to the suppression of harmonic voltages, especially the third and fifth, so as to eliminate waveform distortion and from any possibility of high-frequency disturbances, inductive effect loop circulating currents between the neutral points at different transforming stations reaching such a magnitude as to cause interference with communication circuits.

4.19 Insulating Oil: Fresh insulating oil for first filling together with 5% extra oil shall be supplied with each transformer. The oil shall comply in all respects with the provisions of the latest edition IS:335 (as amended up to date) of specification for New Insulation oils for transformers and switchgear. Attention shall be paid to delivering the oil free from moisture and having uniform quality throughout in non-returnable steel drums. To ascertain the quality of the Transformer oil, the original manufacturer's test report shall be submitted at the time of inspection. After site processing through filtration and before commissioning, the moisture content shall be less than 25 ppm.

4.20 Magnetic Circuit / Core:

i) The core shall be constructed from high-grade, non-aging cold-rolled grain-oriented silicon steel laminations, M4 or Superior Grade. Only prime quality CRGO sheets should be used in the transformers, and Second/Defective/Scrap CRGO should not find its way into transformers.

ii) The magnetic circuit shall be core type. Each limb shall be joined with top and bottom yokes. The laminations shall be made from high-grade, non-aging, cold-rolled grain-oriented silicon CRGO alloy of HI-B or equivalent grade steel. The insulation of lamination shall be coated with oxide/silicate coating or any coating inert to the action of hot transformer oil. The core should be bottom-mounted.

iii) The core shall be of stepped cross-section. The yokes shall be clamped by means of end frames and yoke bolts and limbs shall be clamped by means of clamp plates. Enough lifting lugs is to be provided on end frames so that the core with windings can be lifted when required.

iv) The design of magnetic circuits shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure, and production of flux components at right angles to the plane of lamination, which may cause local heating.

v) The insulation for the core to bolts and core to clamps shall be such as to withstand a test voltage of 2 (two) KV rms at 50 Hz for one minute.

vi) Every care shall be exercised in the selection, treatment, and handling of core steel to ensure that, as practicable, the laminations are flat and the finally assembled core is free from distortion.

vii) For consideration of over fluxing, the transformer shall be suitable for continuous operation for values of over fluxing at

a) 110%, b) one minute for 125%, and c) 5 seconds for 140% of rated voltage.

viii) Core materials should be directly procured from either the manufacturer or their accredited marketing organization of repute and not through any agent.

ix) Each lamination shall be insulated with a material that will not deteriorate due to pressure and the action of hot oil.

x) Oil ducts shall be provided where necessary to ensure adequate cooling. The winding structure and major insulation shall not obstruct the free flow of oil through such ducts, where the magnetic circuit is divided into pockets by cooling ducts parallel to the plane of the laminations or by insulation material above 0.25mm thick tinned copper strip brazing pieces shall be inserted to maintain electrical continuity between pockets.

xi) The framework and clamping arrangements shall be earthed.

xii) The prime core materials are only to be used. Bidders should furnish the following document as applicable as proof of use of prime Core material to be submitted before the stage inspection:

- Invoice of supplier
- Factory's test certificate
- Packing List
- Bill of landing
- Bill of entry certificate by Custom.
- Description of material, electrical analysis, physical inspection, certificate for surface defects, thickness and width of the materials.
- Place of cutting of core materials

Mechanical Construction of Core:

i) All parts of the cores shall be of robust design capable of withstanding any shocks to which they may be subjected during lifting, transport, installation and service.

ii) All structural members of the assembled cores shall be of steel. All castings shall be fitted, and structural steel adequately cleaned and painted before being built into the structure. Any non-magnetic or high-resistance alloy used shall be of established quality.

iii) Adequate filaments shall be provided to enable the core and windings to be lifted.

iv) Suitable provision shall be made for the storage of any removable portions of the lifting tackle on the transformer tank.

v) Adequate provision shall be made to prevent movement of the core and winding relative to the tank during transport and installation or while in service.

vi) The supporting framework of the cores shall be so designed as to avoid the presence of pockets, which would prevent complete emptying of the tank through the drain valve or cause trapping or air during filling.

4.21 Windings:

i) All windings shall be made of electrolytic high-conductivity copper of 99.90% purity and free from scales, spills, splits, and other defects.

ii) The windings shall be fully insulated as defined in IS: 2026. All neutral points shall be insulated for the voltage specified in IS 2026. The windings shall be so designed that all coil assemblies of identical voltage and ratings shall be interchangeable. The maximum allowable current density is 2.5 A/mm2.

iii) Insulation Details: The MPC shall be 0.6 mm (min.) maintained for HV winding and 0.5 mm (min.) for LV winding. Negative tolerance shall not be allowed in paper covering.

iv) The Power Transformer shall be designed to withstand the impulse test voltage as per IS 2026.

v) The transformer shall withstand the power frequency voltage test as per IS:2026.

vi) The windings shall be designed to reduce to a minimum the out-of-balance forces in the transformer at all voltage ratios.

vii) The insulation of transformer windings and connection shall be free from insulating composition liable to soften, ooze out, shrink or collapse during service.

viii) The stacks of windings shall receive adequate shrinkage treatment before final assembly.

ix) The coil clamping arrangement, and the finished dimensions of any oil duct shall be such that it will not impede the free circulation of oil through the ducts.

x) No strip conductor wound on the edge shall have a width exceeding six times its thickness.

xi) The conductors shall be transposed at sufficient intervals in order to minimize eddy currents and equalize the distribution of currents and temperature along the windings.

xii) The HV winding shall be arranged so as to be removed without hindrance to and causing any damage to the LV winding.

xiii) The windings shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and field repair is possible.

xiv) The coils shall be supported between adjacent sections by insulating spacers, and the barriers. Bracing and other insulation used in the assembly of the windings shall be arranged to ensure free circulation of the oil and to reduce hot spots in the windings. The stacks of windings shall receive adequate shrinkage treatment before final assembly, and the same shall be assembled in a dust-controlled chamber.

xv) The insulation of the coils shall be such as to withstand the full electrical strength of the windings. All materials used in the insulation and assembly of the windings shall be insoluble, non-catalytic, and chemically inactive in the hot transformer oil and shall not soften or otherwise be adversely affected under the operating conditions. The dielectric strength of winding insulation shall confirm to values given in IS: 2026, as amended up to date, or as per specific Technical Parameters.

xvi) All threaded connections shall be provided with locking facilities. All leads from the windings to the terminal board and bushings shall be rigidity-supported to prevent injury from vibration. Guide tubes shall be used where practicable.

xvii) The windings shall be clamped securely in place so that they will not be displaced or deformed during short circuits. The assembled core and windings shall be vacuum-dried and suitably impregnated with insulating oil. The copper conductors used in the coil assembly shall be best suited to the requirements, and all permanent current-carrying joints in the windings and the leads shall be welded or brazed. Oil ducts shall be such as will not impede the free circulation of oil through windings assembly.

xviii) The conductor shall be transposed at sufficient intervals in order to minimize eddy currents and to equalize the distribution of currents and temperature along the winding.

xix) The windings and connections of all transformers shall be braced to withstand shocks that may occur during transport or due to switching and other transport conditions during service.

4.22 Internal Earthing Arrangements:

i) Internal Earthing General: All metal parts of the transformer, with the exception of the individual core laminations, core bolts, and associated individual clamping plates, shall be maintained at some fixed potential.

ii) Earthing of Core Clamping Structure: The top main core clamping structure shall be connected to the tank body by a copper strip. The bottom clamping structure shall be earthed by one or more of the following methods.
   a) By connection through vertical tie-rods to the top structure
   b) By direct metal-to-metal contact with the tank base, maintained by the weight of the core windings.
   c) By a connection to the top structure on the same side of the core as the main earth connection to the tank.

iii) Earthing of Magnetic Circuit: The magnetic circuit shall be earthed to the clamping structure at one point only through a link placed in an accessible position beneath an inspection opening in the tank cover. The connection to the link shall be on the same side of the core as the main earth connection.

iv) Earthing of Coil Clamping Rings: Where coil clamping rings are of metal at earth potential, each ring shall be connected to the adjacent core clamping structure on the same side of the transformer as the main earth connections.

4.23 CLEANING AND PAINTING:

i) Before painting or filling with oil, all non-galvanized parts shall be completely clean and free from rust, scale, and grease, and all external rough surfaces on castings shall be made smooth. The interior of all transformer tanks and other oil-filled chambers and internal structural steelwork shall be cleaned of all scales and rust by sandblasting or other approved methods. These surfaces shall be painted with an oil-resisting varnish or paint.

ii) Except for nuts, bolts, and washers, which may have to be removed for maintenance purposes, all external surfaces shall receive a minimum of three coats of paint. The primary coat shall be applied immediately after cleaning. The second coat shall be of oil paint of a weather-resisting nature and of a shade or color easily distinguishable from the primary, and the final coats shall be applied after the primary coat has been touched up where necessary. The final coat shall be of a glossy, oil and weather-resisting non-fading paint of battleship grey color.

iii) All interior surfaces of the mechanism chamber and kiosks except those which have received anti-corrosion treatment shall receive three coats of paint applied to the thoroughly cleaned metal surface. The final coat shall be of light-colored anti-condensation paint.

4.24 Tank and Tank Cover:

i) Tank Construction: The tank shall be complete with all accessories and shall be designed so as to allow the complete transformer in the tank and filled with oil to be lifted by crane or jacks, transported by road, rail or water without over straining any joint and without causing subsequent leakage of oil.

ii) The base of each tank shall be so designed that it shall be possible to move the complete transformer unit by skidding in any direction without injury when using rollers, plates or rails.

iii) Tank stiffeners shall be continuously welded to the tank and designed to prevent retention.

iv) Lifting and Haulage Facilities: Tank shall be provided with lifting lugs suitable for lifting the transformer complete with oil.

v) Tank Cover: Tank cover shall be of adequate strength and shall not distort when lifted. Inspection openings shall be provided as necessary to give easy access to bushings, for changing ratio or winding connections, or testing the earth connections at the link board. Each inspection opening shall be of suitable size for the purpose for which it is provided, and at least two openings, one at each end of the tank, shall be provided.

vi) The tank cover shall be fitted with pockets for a thermometer, and for the bulbs of the oil winding temperature indicators, protection shall be provided wherever necessary for each capillary tube. The thermometer pocket shall be fitted with a captive screwed cap to prevent the ingress of water.

vii) The pockets shall be located in the position of maximum oil temperature at CMR, and it be possible to remove the instrument bulbs without lowering the oil in the tank (C.M.R Continuous Maximum Rating)

i) The tank and cover shall be fabricated from a low-carbon, mild steel plate of adequate size for welded construction. The tank so welded shall be reinforced by stiffener of structural steel for general rigidity. Each tank cover shall be of adequate strength and shall not distort when lifted.

ii) The internal and external surfaces, including structural steelwork and oil-filled chambers, are to be painted after removing all rust and scale of foreign adhering matter or grease by sandblasting or other approved method. All steel surfaces in contact with insulating oil shall be painted with two coats of heat-resistant oil-insoluble insulating paint.

iii) All steel surfaces exposed to weather shall be given a primary coat of zinc chromate and shall be applied immediately after cleaning. The second coat shall be of oil and weather-resisting nature and of shade or color easily distinguishable from the primary. The final coat shall be of epoxy paint of a minimum thickness of 80 microns and weather-resisting non-fading paint of shade No. 631 of IS or as per the direction of EIC.

iv) All paints shall be carefully selected to withstand heat and weather. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

v) The tank construction shall be of conventional type. An adequate number of inspection covers shall be provided to give easy access to the bushing or other parts as may be necessary. To make joints oil tight, nitrile rubber gaskets shall be cut to size and shape to avoid joints on gaskets as far as practicable. It should be fitted with pockets for thermometer and for the bulbs of oil and winding temperature indicators. The thermometer pockets shall be fitted sufficiently above on the surface of the top cover of main tank with a captive screwed top to

prevent ingress of water. The pockets shall be in a position of maximum temperature, and it shall be possible to remove the bulb without lowering the oil in the tank.

vi) Bi-directional flanged rollers for moving the transformer on rail gauge (1676 mm) shall be provided. The direction of the roller through 90^{o}(degrees) can be changed by jacking up the assembly. Bidirectional rollers can be locked in the required direction by bolting together the roller mounting pad welded on the base of the tank and bi-directional flanged rollers bracket with bolts. The tank shall have all fittings and accessories.

vii) Lifting lugs shall be provided on all parts of transformer requiring independent handling during assembly or dismantling. In addition, the transformer shall be provided with lifting lugs and bosses properly secured to the side of the tank for lifting complete transformer assembly filled with oil either by crane or by pulley. Pulling lugs shall also be provided to facilitate the movement of the transformer horizontally.

viii) The tank shall be designed to have sufficient strength to withstand mechanical shock during transport.

ix) The tank shall be designed to have sufficient strength to withstand without distortion. The design shall be such that the Tank cover can be lifted independently without lifting the active part of the core, winding, etc.

x) A transformer tank of each size, its radiator, conservator vessel, and other fittings together or separately shall be subjected to pressure and vacuum testing as per relevant IS / IEC.

4.25 CONSERVATOR VESSELS, OIL GAUGES AND BREATHERS:

i) The conservator is a vessel for oil preservation. The oil level in the conservator shall not be below the level of the H.V. bushing caps unless the bushings are of oil sealed type construction.

ii) A conservator completes with a sump and drain valve shall be provided in such a position as not to obstruct the electrical connections to the transformer having the adequate capacity between the highest and lowest visible levels to meet the requirement of expansion of the total cold oil volume in the transformer and the cooling equipment from the minimum ambient temperature to 100 Deg C.

iii) One end of the conservator shall be bolted into position so that it can be removed for cleaning purposes. Normally one oil gauge magnetic/prismatic/plain type shall be provided.

iv) The oil level is 10 degrees C, 30 degrees C, and 100 degrees C (Maximum) shall be marked on the gauge.

v) The conservator shall have the required no. of filter valve in addition to the valve specified in the accessories for the main tank. The conservator with sump shall also have a small drain valve and sampling cock; the latter so arranged so as not to interfere with oil lines. The oil level gauge shall be mounted on the conservator. The oil level at the gauge shall have three indications viz., oil level at 30^{o}C shall be marked on the gauge and indicating range shall be minimum to maximum level.

vi) The oil connection from the transformer tank to the conservator's vessel shall be arranged at a rising angle of 3 to 9 degrees to the horizontal up to the Buchholz relay. The inside diameter shall be 50mm/ 80mm per transformer’s capacity and IS 3639.

vii) Valves shall be provided at the conservator to cut off the oil supply to the transformer after providinga straight run of pipe for at least five times the internal diameter of the pipe on the tank side of the Buchholz relay and at least three times the internal diameter of the pipe on the conservator side of the Buchholz relay. The pipe connecting the transformer tank with the conservator will project above the lowest point in the conservator such that the portion below the pipe acts as a sump where the impurities in the conservator will be collected.

viii) Magnetic oil level gauge with low oil level alarm suitable for 220Volt $^{+}$/-10% DC supply shall be provided. In addition to the magnetic oil level gauge, there shall be one Plain oil level gauge.

ix) OLTC Conservator shall have an oil indicator made of glass.

x) The atmospheric type of conservator shall be filled with oil at a level appropriate to the filling temperature. The oil shall be separated from the atmosphere by a flexible air cell of nitrile rubber reinforced with a nyloncloth air cell. Flexible air cell of nitrile rubber shall be able to withstand max temp of oil considering continuous operation as well as considering overloading of the transformer as per relevant IS/IEC. The connection of the air cell to the top of the conservator is to be made by an

airproof seal to prevent the entry of air into the conservator.

xi) Each conservator vessel shall be fitted with a dehydrating filter breather in which silica gel is a dehydrating agent. The external atmosphere is not continually in contact with the silica gel through provision of an oil seal. It shall be so designed to facilitate thefollowings:

A) Passage of air through silica gel.

B) Silica gel is isolated from the atmosphere by an oil seal.

C) Two breathers (of identical size) shall be connected in parallel for the main conservator tank. A stopvalve shall be provided for each breather and for the common pipeline.

D) Breathers are to be maintained approx. at a height of 1200 mm. above the rail top level.

E) Moisture absorption indicated by a change in the color of the silica gel can be easily observed from a distance at ground level.

4.26 PRESSURE RELIEF DEVICE:

i) The pressure relief device shall be provided of sufficient size for rapid release of pressure that may be generated within the tank, and which might result in damage to the equipment. The device shall operate at a static pressure of less than the hydraulic test pressure for transformer tanks. Sufficient no. of pressure relief device with two sets of electrically insulated NO contacts (each having) shall be provided for Alarm/Tripping. The design shall include preventing the ingress of rainwater. It shall be mounted on the main tank's cover and designed to prevent gas accumulation.

ii) Pressure relief device & Buchholz relay shall be tested for Outdoor environment as per relevant IS / IEC to avoid maloperation due to ingress of moisture.

iii) Gas actuated relay: - Sufficient no. of double float gas detector relay (Buchholz relay) of reputed make with alarm and tripping contacts to detect accumulation of gas and sudden changes of oil pressures, complete with two shut-off valves and flange coupling to permit easy removal without lowering oil level in the conservator tank. A bleed valve for gas venting and a test valve are to be provided. It shall include the following -

- Each transformer shall be fitted with gas and oil-actuated relay (Buchholtz Relay) equipment having contacts that close following oil surge or low oil level conditions.
- Each gas and oil-actuated relay shall be provided with a test cock and a flexible pipe connection for checking the operation of the relay.
- A machined surface shall be provided on the top of each relay to facilitate the setting of the relays and to check the mounting angle in the pipe and the cross-level of the relay.
- The design of the relay mounting arrangements, the associated pipework, and the cooling plant shall be such that mal operation of the relays shall not take place under normal service conditions.
- The pipe work shall be so arranged that oil and gas arising from the transformer shall pass into oil-actuated relays. The oil circuit through the relay shall not form a delivery path in parallel with any circulation oil pipe, nor shall it be tied into or connected through a pressure relief vent; sharp bends in the pipe work shall be avoided.
- Adequate clearances between all pipework and live metal shall be provided.

4.27 EARTHING TERMINAL:

i) Two grounding terminals capable of carrying the full short circuit current of the transformer for min 3 (three) seconds shall be provided at positions close to the bottom at two corners of the tank for bolting the earthing terminals to the tank structure to suit local condition.

ii) Neutral Earthing Arrangement: - The neutral terminal of two winding transformers shall be brought to the ground level by adequately sized brass/tinned copper grounding bar (considering the system fault level as

stated in Technical Specification) supported from the tank by using porcelain insulators. The end of the tinned copper bar shall be brought to the bottom of the tank at the convenient point for making bolted connection to two nos. galvanized steel grounding flat connected to sub-station grounding mat.

4.28 RATING, DIAGRAM AND PROPERTY PLATES:

The following plates shall be fixed to the transformer tank at an average height readable from the transformer base level.

i) A rating plate bearing the data specified in the appropriate clauses of IS: 2026.

ii) A diagram plate showing the internal connections and also the voltage vector relationship of the several windings in accordance with IS: 2026 and in addition a plan view of the transformer giving the correct physical relationship of the terminals. No load voltage shall be indicated in each tap. The winding temperature C.T. and the thermometer pocket shall also be indicated on the said plate.

iii) When links are provided in accordance with voltage ratio for changing the transformer ratio, then approved means shall be provided for clearly indicating ratio for which the transformer is connected, no load voltage shall be indicated for each tap.

iv) A plate showing the location and function of all valves and air release corks or plugs. This plate shall also warn operators to refer to the maintenance instructions before applying the vacuum treatment for drying. The above plates shall be of material capable of withstanding continuous outdoor service.

v) All plate material shall preferably in stainless steel.

vi) A separate rating plate embossing different losses obtained after relevant test for each transformer is to be provided.

vii) A rating plate for each type of bushing shall be provided and to be fixed at the base of the bushing.

4.29 LABELS:

i) Labels shall be provided for all apparatus such as relays, switches, fuses contained in marshalling box.

ii) Descriptive labels for mounting indoor or inside cubicles and kiosks shall be of material that will ensure permanence of the lettering. A mat or stain finish shall be provided to avoid dazzle from reflected light. Labels mounted on dark surfaces shall have white lettering on a black background Danger notice shall have red lettering on a white background. All plates shall be of material which will not be corroded. Labeling shall be clear, concise and adequate.

iii) Labels for mounting outdoors shall be weather and corrosion proof formed by etching to ensure permanence.

iv) Labels shall be attached to panels with brass screws or with steel screws which have received rust preventive treatment.

v) Labels should have lettering sizes as per OEM standards. However, these should be properly visible.

4.30 COOLING SYSTEM:

i) The transformer shall employ ONAN type cooling (100% cooling banksconsisting of radiators)

ii) Radiators and coolers should be so designed as to avoid pockets in which moisture may collect and shall withstand the pressure tests.

iii) Unless the pipe work is shielded by adequate earth metal the clearance between all pipe work and live parts shall be more than the clearance for live parts to earth.

iv) The radiator fins shall be manufactured from a steel sheet with adequate thickness.

v) Radiators should be mounted / connected directly to the tank, shall be detachable type and shall be provided with machined or ground flanged inlet and outlet branches.

vi) The transformer of all capacities shall be fitted with detachable radiator consisting of a series of separate circular/elliptical/rectangular, etc. tubes or fins, welded at their top and bottom into headers which in turn

are connected to the tank by means of bolted, oil tight, flanged joints. There shall be indicating butterfly or similar valves fitted in between the tank and the headers which can be kept in an open or closed position. There shall also be filter valves for circulation of oil, at each of top and bottom header. One air release plug at the top header shall be provided. There shall be an air release plug & drain plug for each radiator.

vii) The radiator tubes/fins shall be seamless and made of mild steel/CRCA and to prevent rusting epoxy paint of 80 micron shall be applied and minimum wall thickness not less than 1.2 mm, with a clean bright internal surface free from rust and scale. They shall be suitably braced to protect them from mechanical shocks normally met in transportation.

viii) A separate blanking plate shall be supplied to permit the blanking of the main oil connection to each cooler unit when the same is detached. Each cooler unit shall have a lifting eye, oil drain valve at the bottom and a vent at the top.

4.31 VOLTAGE CONTROL:

a) On load type:

i) The OLTC shall confirm to IS: 8468 (latest version).

ii) The OLTC shall be housed in a separate tank so that the oil of the OLTC chamber does not come in contact with the oil of the main tank in any way. There should be separate conservator with the arrangement of having the dehydrating breather for OLTC tank. Winding temperature, oil temperature repeaters, tap position indicator shall also be provided for incorporating in the same 33KV panel of the transformer in the control room. Sufficient terminals for the above-said indicators shall have to be provided for sending inputs for SCADA.

iii) 10 MVA transformers voltage control equipment shall be of on-load changing type on the HV side for HV variation of +10% to –10% in 16 equal steps of 1.25% for varying its effective transformation ratio while the transformers are on-load and without producing phase displacement.

iv) In the case of On Load Tap Changer, this shall also be designed suitable for local manual as well as local electrical operation and Remote electrical operation including SCADA. However, It shall not be possible to operate the electric work drive when the manual operating gear is in use.

v) Remote Tap Changing Circuit (RTCC): Suitable control cable between Marshalling box and OLTC & RTCC shall be included in the scope of supply of transformer.

vi) The on-load tap changer shall include the following –

- An oil immersed tap selector and arching switch or arc suppressing tap selector, provided with reactor or resistor for reduction of make and break arcing voltages and short circuits.
- Motor driven mechanism.
- Control and protection devices.
- Local/Remote tap changer position indicator.
- Manual/Electrical operating device.

vii) The on-load tap changer shall be designed so that the contacts do not interrupt arc within the main tank of the transformer.

viii) The tap selector and arcing switch or arc suppressing tap selector switch shall be in one or more oil filled compartments.

ix) The compartment shall be provided with oil surge relay. Those compartments shall be designed so as to prevent the oil in tap selector compartments from mixing with the oil in the transformer tank.

x) A suitable pressure relieving arrangement should be provided to take care of sudden pressure rise in the compartment. But this should, in no way, affect the performance of the Oil Surge relayprovided for this compartment. Oil surge relay (0.49 kg/cm2.) with trip float arrangement shall be provided for OLTC compartment.

xi) The manual operating device shall be so located on the transformer that it can be operated by aman standing at the level of the transformer track. It shall be strong and robust in construction.

xii) The tap changer shall be in independent mode. The control scheme for the tap changer shallbe provided for independent control of the tap changers. In addition, alarm and visual indicationsystem for out of step condition of the tap changer to be provided so that these can be incorporated in the same 33KV transformer panel. Visual indication during the operation of the motor shall also be provided for incorporating it in the same panel. The tap change control must ensurestep by step operation under all operating conditions. An indication lamp showing tap changing in progress is to be provided for incorporating in the same transformer control panel.

xiii) The contactors and associated gear for the tap change driving motors shall be housed in a local kiosk mounted on the transformer. The motors shall be suitable for operation with 3- phase 415 volts, 50 cycle external power supply.

xiv) Winding & Oil temperature (O degree – 150 degree) repeaters, to be connected to winding and oil temperatures meters housed in the main Transformer Marshalling Box at outdoor.

xv) An under-voltage relay shall be incorporated to monitor the 110 Volt AC control circuit voltage circuit supply the audible and visual indication shall be provided in the 33KV (in case of 33/11KV 10MVA transformer where OLTC is to be provided as per BOQ) transformer control panel.

xvi) The OLTC should have been Type Tested.

b) OFF LOAD:

The equipment for local electrical and local manual operation shall be provided and shall comply with the following conditions.

- It shall not be possible for any two electrical controls be in operation at the same time.
- The operation from local/ remote control switch shall cause one tap movement only.
- It shall not be possible to operate the electric drive when the manual operating gear is in use
- All electrical control switches and the local operating gear shall be clearly labeled in a suitable manner to indicate the direction of the tap changing.
- The local control switches shall be mounted in the marshalling box or driving gear housing.
- The equipment shall be so arranged as to ensure that when a tap change has been Initiated, it shall be completed independently of the operation of the control relays or switches. If a failure of the auxiliary supply during tap changing or any other contingency would result in that movement not being completed adequate means shall be provided to safeguard the transformer and its auxiliary equipment.

c) REMOTE TAP CHANGER CONTROL (RTCC) PANEL

The supplier shall furnish, in addition to the equipment above, the following accessories mounted on a separate Remote Tap Changer Control (RTCC) panel to be installed in each of the IITR's Control Room for remote operation. The RTCC panel must be equipped with the followings

- If an RTCC panel is provided it must be equipped with Bay Control Unit (BCU).
- Raise and Lower Push Button Switch
- Remote tap position indicator and other required devices.
- One chart showing the voltage corresponding to tap position indicator shall be engraved on a metal sheet and the same shall be fixed near the tap position indicator on the RTCC (panel).
- In Tap Position Indicator sufficient terminals are to be provided for sending inputs for SCADA.
- An indication lamp showing tap changing in a progress
- Winding & Oil temperature (O degree – 150 degree) repeaters, to be connected to winding and oil

- Temperatures meters housed in the main Transformer Marshalling Box outdoor.
- Provision for SCADA operation.
- An under-voltage relay shall be incorporated to monitor the 110 Volt AC control circuit voltage circuit
- Supply and its audible and visual indication shall be provided in RTCC panel.
- Bay Control Unit (IED should be latest IEC61850 compliant having rear port)–
- BCU shall be provided for data acquisition and control of Power Transformer.
- The Power Transformer BCU must be supplied from a Relay manufacturer conforming to all the requirements of latest IS/IEC and the latest relay specification.
- Communication Port: BCU shall be PRP compliant for SAS with latest 61850 protocol including one front port for direct access with proprietary protocol. Supply of Red Box is also to be considered for integration of the BCU into a non-PRP compliant network.
- All inputs and outputs must be user programmable. The bay control units shall be equipped with enough programmable I/O modules for interfacing with the process inputs and outputs. Extension should be possible with additional I/O s via fiber-optic communication and process bus.
- If it is designed with draw out type modules, it should take care of shorting all CT inputs automatically while drawing out. The CT / VT ratio shall be field programmable, and Relay shall display the actual HV Voltage and current considering suitable multiplying factors. The system shall be self-sufficient and shall not require any additional devices like parallel balancing module etc.
- A graphic user interface (GUI) display shall be provided in each bay control unit. All alarms related to the respective bay shall be displayed in the BCU through its LED's or in its GUI display as an alarmist/scroll.
- The exact number of digital inputs shall be as per detailed engineering requirement. Apart from that, BCU wise 20% spare I/Os shall be kept for IITR use in future.

d) **Others**

i) Suitable apparatus shall be provided for each transformer to give indications as follows:

ii) A mechanical indication of the number of tapping positions shall be provided to the OLTC gear of the transformer.

iii) All relays and operated devices shall operate correctly at a voltage between the limits specified in the relevant Indian standards.

iv) The tap changing switches and mechanism shall be mounted in oil tanks or compartments mounted at an accessible position on the transformer tank.

v) Any enclosed compartment not oil filled shall be adequately ventilated. Metal clad heaters shall be provided in the driving mechanism chamber and in the marshalling box, all contractor relay coils, or other parts shall be suitably protected against corrosion or deterioration due to condensation, fungi etc.

vi) A separate Bucholz relay / oil surge relay shall be provided for the on-load tap changer chamber.

vii) The whole of the apparatus shall be of robust design and capable of giving satisfactory service without undue maintenance under the conditions to be met in service, including frequent operation.

viii) A five-digit counter shall be fitted to the tap changing mechanism to indicate the number of operations completed by the equipment

4.32 BUSHINGS, INSULATORS AND TERMINALS:

i) Transformers shall be fitted with bushing insulators.

ii) Bushings shall conform to IS: 3347, IS/IEC 60137 (Superseding IS:2099). The characteristic of the oil used in the bushing shall be the same as that of the oil in the transformer.

iii) All bushings shall be suitable for heavily polluted atmosphere and minimum creepage distance shall be taken as 25 mm per KV.

iv) The rod gap shall be adjustable type to enable a coordination of insulation level with surge diverters. Any stress shield shall be considered as an integral part of the bushing assembly.

v) Special precautions shall be taken to exclude moisture from paper insulation during manufacture, assembly, transport and erection. The surface of all paper insulations shall be finished with non-hydro scopic varnish which cannot be damaged easily.

vi) Each porcelain bushing or insulator, and paper bushing shall have marked upon it the manufactures identification mark, and such other mark as may be required to assist in the representative allocation of batches for the purposes of the sample tests.

vii) Clamps and fittings made of steel or malleable iron shall be galvanized. All bolts' threads shall be greased before erection.

viii) The bushing flanges shall not be of re-entrant shape which may trap air. The bushing turrets shall be provided with vent pipes which shall be connected to route any gas collection through the Bucholz relay.

ix) Necessary features on transformer tank for mounting LAS on both HV and LV sides shall be provided. They should be detachable type and not welded. A suitable earth strip shall also be provided for each LA, and it should be brought out separately to the ground insulation from the tank.

x) Bushing shall have high factor of safety against leakage to ground and shall be so located as to provide adequate electrical clearances between bushing and grounded parts. Bushings of identical voltage rating shall be interchangeable. All bushings shall be equipped with suitable terminals of approved type and size and shall be suitable for bimetallic connection, if necessary. All main windings and neural leads shall be brought out to outdoor through bushings which shall be so located that the full flashover strength will be utilized and phase to phase and phase to earth clearance shall be more than minimum value specified in the relevant Indian standard / IEC. Location and arrangement of bushing shall follow Indian Standards.

xi) Each bushing shall be so coordinated with the transformer insulation that flashovers will occur outside the tank.

xii) All porcelain used in the bushings shall be made of the wet process, be homogeneous and free from cavities or other flaws. The glazing shall be uniform in colour and free from blisters, burns, and other defects.

xiii) Rating plate of bushing shall be provided near each type of bushing with terminal marking and physical position as per IS:2026. Bushing for 36KV & 12KV shall be Solid porcelain or oil communicating type.

xiv) Main terminals shall be solderless, and "Terminal Connectors" shall be as per relevant clause of Clamps and Connectors. The spacing between the bushings must be adequate to prevent flashover between phases under all conditions of operation.

xv) Terminals: Transformers shall be provided with bushing insulators on both H.V and L.V. sides. H.V and L.V. bushings shall be located on opposite sides.

xvi) The voltage and current rating of the bushings shall be as follows:

	Highest System Voltage (KVrms)	Current Rating (Amps.)
1.	36 KV (for 33 kV Side)	250
2.	12KV (for 11 kV side)	630
3.	12KV (for Neutral)	630

xvii) Bushing Current Transformer:

a) The current transformer shall comply with IS:2705/IEC-185.

b) It shall be possible to remove the turret mounted current transformers from the Tr. Tank without removing the tank cover. Necessary precautions shall be taken to minimize eddy currents and local heat generated in the turret.

c) Current transformer secondary leads shall be brought out to a weatherproof terminal box neareach bushing. These terminals shall be wired out to marshalling box using separate cables for each core.

xviii) HV Bushing CT detail as follows:

a) Ratio: 200/1A, Single Core

b) Accuracy Class : PS

c) Minimum knee point voltage Vk (at highest ratio) : 250 V,

d) Maximum CT Secondary winding resistance RCT : <4 ohm,

e) Maximum excitation current at knee point voltage: 30 mAmps

xix) LV Bushing CT & Neutral Bushing CT for 11 KV side of 10 MVA 33/11KV Transformer:

(a) Ratio: 600/1A, Single Core

(b) Accuracy Class : PS

(c) Minimum knee point voltage Vk (at highest ratio) : > 400 V,

(d) Maximum CT Secondary winding resistance RCT : <6 ohm,

(e) Maximum excitation current at knee point voltage: 30 mAmps

4.33 TEMPERATURE INDICATING DEVICES AND ALARM:

i) The transformer shall be provided with Temperature indications for measuring Transformer oil temperature and Transformer winding temperature. These samples of temperature indicator shall be got approved before supply.

ii) Except where outdoor types of indicators are supplied, the temperature indicators shall be housed in the marshalling box. Winding temperature indicators shall also be provided.

iii) All contacts shall be adjustable on a scale and shall be accessible on removal of the cover.

iv) The temperature indicators shall be so designed that it shall be possible to check the operation of the contacts and associated equipment.

v) The connections shall be brought from the device to terminals placed inside the marshalling box.

vi) Dial type gas thermometer for oil temperature indication: One dial type indicating thermometer (having 270°C scale with accuracy of 1.5% of FSD) of robust design and in weatherproof casing shall be provided and housed in transformer tank mounted marshalling box at a convenient height to read the hot oil temperature and shall have contacts for alarm and trip for ONAN type transformer with capacity 10 MVA 33/11 KV. Maximum oil temperature indicating pointer shall also be provided. Oil temperature indicator shall be mounted in tank mounted marshaling box for transformer of 10MVA capacity and shall be connected to one phase of HV winding.

vii) Indicating type winding temperature indicator: The transformer shall be provided with a device for indicating the combination of top oil temperature and heating by winding current calibrated to follow the hottest spot temperature of the transformer winding. The device shall have a dial type indicator, and in addition an indicating pointer to register the hottest temperature reached. The temperature indicator shall be connected to CT secondary current in one phase of each winding of the transformer.

viii) Separate winding temperature indicators, with potential free mercury contacts for control, indication, alarm and trip shall be provided, with independent facility for setting the contacts at any temperature over the whole working range of 20oC to 150oC. Each mercury contact shall have adjustable 10oC overlapping (between ON & OFF). The winding temperature indicator shall be mounted in tank mounted marshalling box for transformers of 10 MVA capacity and shall be connected to one phase of each HV windings. The accuracy class of WTI shall be ±1.5% or better temperature indicator did shall have linear gradation to clearly read at least every 2°C.

4.34 Marshalling Box:

i) The sheet steel vermin proof, with ventilated and weatherproof marshaling box (as per IP55) of a suitable construction shall be provided for the transformer ancillary apparatus. The box shall have a sloped roof, and the interior and exterior painting shall be in accordance with the relevant clause of cleaning and painting.

ii) Marshalling box of each type shall be tested for IP-55 protection in accordance with IS:13947.

iii) The marshalling box shall be provided on the body of the tank at a suitable height and shall accommodate the following equipments. Alternative weatherproof instruments can be mounted outdoors.

- Temperature indicators
- Control and protection equipment for the local electrical control of tap changer, if the same cannot be accommodated in the motor driving gear housing
- Terminal board and gland plates for incoming and outgoing cables
- A suitable cover with glass window shall be provided for taking reading.

iv) All the above equipments except (c) shall be mounted on panels and back of panel wiring shall be used for interconnection.

v) The marshalling box shall be provided with cubicle lamp with door switch, space heater with differential thermostat and removable cable gland plate etc.

vi) All internal wiring shall be carried out with 1100 Volt grade PVC insulated stranded copper conductor of 2.5 sq. mm or larger size as per scheme requirement.

vii) All incoming cables shall enter the kiosk from the bottom. The gland plate and associated compartment shall be sealed in a suitable manner to prevent the ingress of moisture from the cable trench.

viii) The undrilled gland plate shall be provided for accommodating glands for incoming and outgoing cables.

ix) All terminal blocks for cable connection shall be located in this box. Terminal blocks shall be of 1100 Volt grade and have continuous rating to carry the maximum expected current on the terminals. The terminal block shall be fully enclosed with removable covers of transparent, non-deteriorating type plastic material. An insulating barrier shall be provided between the terminals. The terminal blocks shall have locking arrangement to prevent its escape from the rails.

x) 20% of spare terminals are to be provided. These spare terminal blocks shall be uniformly distributed on all the terminal block columns.

xi) All terminal blocks shall be numbered for easy identification. Terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks.

4.35 TERMINAL CONNECTOR:

i) The bushing shall be equipped with suitable terminals for connector as specified herein.

ii) Each terminal (including the neutral) shall be distinctly marked on both the primary and secondary side in accordance with the diagram of connection supplied with the transformers.

iii) Universal type bi-metallic, rigid connector for bushing stud shall be provided.

iv) The clamp and connector shall be made from Cold forged Aluminum Alloy Plate i.e Extruded Aluminum Clamp and Connector shall be processed through Cold forging.

v) The Nuts & Bolts associated with equipment of connector pieces shall be MS Hot dip galvanized. The quality of Nuts & bolts shall conform to relevant IS of latest edition.

vi) The minimum thickness at any point of current carrying part of any clamp & connector shall not be less than 12mm.

vii) From outermost hole edge to nearest edge of any clamp & connector the distance shall not be less than 10mm.

viii) The current density of Aluminum/Copper shall be considered as 0.75/1.75 A/sq.mm.

ix) The minimum thickness of Bimetal in bimetallic connection shall be 2mm.

4.36 Control Connections and Instrument Wiring, Terminal Boards and Fuses:

i) All control, alarm and indicating devices provided with the transformer shall be wired up to the terminal blocks in the marshalling box.

ii) All wiring connections, terminal boards, fuses and links shall be suitable for a tropical atmosphere. Any wiring liable to be in contact with oil shall have oil resisting insulation and the bared ends of stranded wire shall be sweated together to prevent creepage of oil along the wire.

iii) There shall be no possibility of oil entering connection boxes used for cables or wiring.

iv) Panel connections shall be neatly and securely fixed to the panel. All instruments and panel wiring shall be run in PVC or non-rusting metal cleats of the limits compression type. All wiring to a panel shall be taken from suitable terminal boards.

v) When 415 V connections are taken through junction boxes or marshalling boxes they shall be adequately screened and 415 'VOLTS DANGER' notices must be affixed to the outside of the junction boxes or marshaling boxes.

vi) All box wiring shall be in accordance with relevant IS.

vii) All wires of panels and all multi core cables shall have ferrules, which bear the same number at both ends.

viii) Wires shall not be jointed or tied between terminal points.

ix) Wherever practicable circuits in which the voltage exceeds 125 volts, shall be kept physically separated from the remaining wiring. The function of each circuit shall be marked on the associated terminal boards.

x) Where apparatus is mounted on panels all metal cases shall be separately earthed by means of copper wire or strip having a suitable cross section. Where strip is used, the joints shall be sweated.

xi) All wiring diagrams for control and relay panel shall preferably be drawn as viewed from the back and shall show the terminals boards arranged as in service. All diagrams shall show which view is employed.

xii) Multi core cable tails shall be so bound that each wire may be traced without difficulty to its cables.

xiii) The screens of screen pairs of multi core cables shall be earthed at one end of the cable only. The position of earthing connections shall be shown clearly on the diagrams.

xiv) Terminal boards shall have pairs of terminals for incoming and outgoing wires. Insulating barriers shall be provided between adjacent connections, the height of the barriers and the spacing between terminals such as to give adequate protection, while allowing easy access to terminals. The terminals shall be adequately protected with insulating dustproof covers.

xv) No live metal shall be exposed at the back of the terminal boards.

xvi) All fuses shall be of the cartridge type and shall conform to relevant IS.

xvii) Fuses and links shall be labeled.

xviii) Wiring from transformer to the cubicle shall be done with PVC wires in conduit or by PVC armoured cable of 1100 V grade. Minimum wire size shall be 2.5mm² copper. Not more than two wires shall be connected to a terminal. 20% spare terminals shall be provided.

xix) All devices and terminal blocks within the marshalling box shall be identified by marking corresponding to the circuit in schematic or wiring diagram. All fuses shall be of cartridge type and IS marked.

xx) Phase marking on each terminal bushing (including neutral) shall be distinctly made on both the primary, secondary and tertiary winding side in accordance with the connection diagram of the transformer.

xxi) Interconnection of wires in between transformer and marshalling box will be in the scope of the contractor.

4.37 TESTS & INSPECTION:

- All tests and inspections as per relevant IS shall be carried out at the place in presence of the IIT-Roorkee representative.
- The Bidder shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of the offered equipment in its various stages so that arrangements can be made for inspection.
- The supplier shall give 15 days' advance intimation to enable the purchaser to depute his representative for witnessing acceptance and routine tests.
- The manufacturer shall be responsible to pay a penalty of Rs 20,000/- for each occasion at which the fake inspection call has been made or the material is rejected during testing/inspection by the authorized agency/representative.

4.37.1 TESTS

All Routine and Acceptance tests at manufacturer's works shall be carried out in presence of IIT Roorkee's representative in compliance with IS:2026/ IEC 60076 (as amended up to date) on the transformers. The entire cost of the acceptance test, routine test and special test as follows that are to be carried out as per relevant IS shall be treated as included in the quoted price of transformer. The Contractor shall give at least 21 (twenty-one) days advance notice intimating the actual date when the tests will be carried out. Three (3) copies of the test results of transformer shall be submitted to the Institute Engineer, IITR for approval.

(A) The following tests are to be carried out as a part of routine tests as per IS:2026/ IEC 60076 and as per our standard requirement:

i) Resistance of each winding at all taps (wherever applicable).

ii) Turns ratios for all sets of windings on each tap

iii) Polarity and phase vectorrelationship

iv) Measurement of No-Load Loss and No-Load Current at 90, 100 and 110 percent ratedvoltage.

v) Impedance voltage at normal, maximum and minimum tap for each pair of winding.

vi) Measurement of insulation resistance between windings and between windings and earth. IRvalue is to be measured before and after impulse test. The insulation resistance of each winding in turn to all the other windings, core, frame and tank connected and to earth shall be measured by standard megger and the values shall not be less than the specified values in relevant IS code.

vii) Regulation at rated load and at unity, 0.8 lagging power factors

viii) Efficiencies at u.p.f. and 0.8 p.f. at 50%, 75% and 100% loading.

ix) Measurement of Load Losses.

x) Measurement of impedance voltage

xi) Separate source voltage withstands test.

xii) Induced over voltage withstand test with Partial Discharge measurement.

xiii) Magnetic Balance test.

xiv) Oil leakage test on tanks and all oil filled compartment of transformer shall be tested as perCBIP for 12 hours (minimum) filled with oil for which no oil leak shall occur.

xv) Test on pressure relief device.

xvi) Measurement of Tan Delta Capacitance of Windings.

xvii) Zero Sequence Impedance measurement.

xviii) Test on tank mounted marshaling box.

xix) BDV measurement of transformer oil.

xx) Visual, dimensional checking of transformer.

(B) The following Type tests are to be carried out / already test conducted reports needs to be submitted as per IS/IEC:

1. Temperature rise test (cl.no.16.8 of IS 2026)
2. Checking of acoustics noise level.
3. Full wave Lightning Impulse withstand (Dry & Wet) Tests in all phases (including chopped and reduced choppedwave) (IEC 60076-3/ IS:2026, Part- III,2009).

All acceptance and routine tests stipulated in the relevant standards shall be carried out by the supplier in the presence of purchaser's representative. The purchaser reserves the right to insist on witnessing the acceptance/routine testing of the bought-out items to pass tests.

Tests during manufacture / Test Reports / Test Certificates:

- The Bidder shall furnish details of tests carried out during the process of manufacture and end inspection by the bidder to ensure the desired quality of the equipment to be supplied.
- Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the purchaser's representative.

- Test certificates of tests conducted during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the purchaser.

4.37.2 STAGE INSPECTION (may be carried out as per direction of EIC):

Stage inspection may be carried out by the customer on Core, Coil & Tank during the manufacturing stages of the transformer. The manufacturer will inform for the stage inspection and shall arrange the inspection at the manufacturer's premises or manufacturer's bidder's premises free of cost as per the Institute requirement and the direction of EIC. Stage inspection of core and coil may be carried out accordingly. On the basis of satisfactory Stage Inspection or the approval of the reports provided by bidder/OEM, manufacturer will proceed further. The following stage inspection may be carried out in one inspection. Prior to stage inspection following documents shall have to be submitted by manufacturer for verification:

i) Document related to prime core, procurement establishing traceability vide relevant Cl. of Technical Specification of Power Transformer.

ii) Documents for coil establishing traceability.

The following tests have to be carried out in stage inspection.

i) On Core

- Flux density checking of assembled core (without having any insulating tape etc. rapped around the core) vis-à-vis measurement of step thickness, lamination width etc.
- Window height, leg center dimension, core diameter of assembled core.
- Physical verification of core in respect of lamination thickness, bend, camber and waviness etc.
- Carlite test, Watt loss and ageing test on the sample of prime core. (Core sample shall be selected during stage inspection and sent to any NABL accredited laboratory for tests)
- Loss measurement of Prime core (Loss/Kg).
- 2KV test between core and Yoke clamps.

ii) On Coil

- Physical verification of HV and LV wound coil
- Measurement of resistance of each finished coil (HV& LV).
- Measurement and current density calculation of each winding.
- Copper purity test (after cutting from finished coil offered for inspection).

Calibration Certificates of all measuring instruments to be used during stage and final inspection shall be produced and that will be in conformity with our relevant Clauses of GCC/Technical Specification.

iii) On Tank

- Physical inspection & Dimension Checking of Main Tank
- Vacuum Withstand Test on the Main Tank.
- Pressure Withstand Test on the Main Tank.
- Leakage Test of the main Tank.

4.38 DOCUMENTATION:

a) General

i) One copy of each drawings incorporating the particulars as per following requirement along with one set of complete type test report on similar rating transformer to be carried out / already test conducted reports needs to be submitted as per IS/IEC in Govt. recognized Laboratory/NABL accredited Laboratory.

ii) The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication

work in connection with the equipment prior to the approval of the drawing shall be at the supplier's risk.

b) Test Reports:

i) After all the tests (routine and type) have been completed, 3 (three) certified copies of each test report shall be submitted for approval. Each report shall supply the following information:

a) Complete identification, where applied, duration and transformer.

b) Method of application, where applied, duration and interpretation of results for each test.

c) Test on Associated Equipment:

i) Porcelain Bushings, Windings Temperature Indicating Devices. Dial Thermometers, Buchholz Relays, Auxiliary Meters, Motor Starting Contactors, Control devices, insulating oil and other associated equipment covered by the contract shall be certified by the contractor to have been tested in accordance with the relevant IS specification by the manufacturer. The contractor shall furnish a certificate of compliance of the relevant tests, for all auxiliary apparatus. Six certified copies of the aforesaid test reports shall have to be furnished.

d) Contract Drawings and Manuals:

i) After issue of the Award letter, two sets of following drawings, manuals and literatures shall be submitted to the EIC of the work.

- Outline dimensional drawings of transformer and accessories including LA mounting arrangement the tank with necessary clearances between the tank and HV/LV side LA's as per IS 2026.
- Detailed foundation plan.
- Sectional views showing the general construction features and disposition of various fittings and accessories.
- Bushing drawings showing full details of construction of HV/LV bushing and other technical data, weight of bushing assembly etc.
- Technical literature on general construction features for winding temperature indicators, Buchholz relays, oil temperature indicators, pressure release devices etc.
- Assembly drawings and weights of main component parts
- Tap changing and rating plate diagrams.
- Schematic control and wiring diagrams for all auxiliary equipment.
- Schematic diagram showing the flow of oil in the cooling system as well as each limb and winding, longitudinal and cross-sectional views showing the duct sizes, cooling pipe etc. for transformer/ heat exchanger drawn to scale shall be furnished.
- Large scale drawing of high- and low-tension winding of the transformer showing the nature and arrangement of insulation and terminal connections.
- Test Reports.
- Descriptive literature and data on transformer construction, winding bushing, heat exchanger, tap changing gear etc.,
- Valve Schedule Plate
- Measured Loss Plate
- Clamp & connectors
- Rating Plate diagram
- Oil filling instruction plate
- Roller locking arrangement
- Marked erection prints identifying the components parts of the power transformers as dispatched, with assembly drawings

ii) Drawing for Controls:

- General arrangement of tank mounted Marshalling Box for all types of transformer.

- Wiring diagram of tank mounted Marshalling Box for each type of Transformer.
- Drawings other than there mentioned above if required as per provision of Technical Specification
- for Erection & Maintenance are also to be submitted.

iii) As Built Drawings

- Three (03) copies of as built drawings and literatures for transformer shall be submitted for our record and distribution to site.

iv) Instruction manuals:

- Three (03) copies of operation, maintenance and erection manuals in English language shall be supplied for each transformer. The manuals shall be bound volumes and shall contain the drawings and information required for erection, operation and maintenance of the power transformer. The manuals shall include amongst others, the following particulars.
  1. Marked erection prints identifying the components parts of the power transformers as dispatched, with assembly drawings.
  2. Detailed dimensional drawings, assembly and descriptions of all the components.

Drawings / documents other than those- mentioned above if required as per provision of Technical Specification for Erection & Maintenance are also to be submitted.

4.39 Packing, Transport and Forwarding:

i) The supplier shall be responsible for suitable packing of all the material and marking on the consignment so as to avoid any damage during the transport and storage and to ensure correct dispatch to the destination.

ii) The equipment shall be packed in crates suitable for vertical/horizontal transport, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing.

iii) The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangements for lifting, such as lifting hooks etc., shall be provided. Any material found short inside the packing cases shall be supplied immediately by the supplier without any extra cost.

iv) Each consignment shall be accompanied by a detailed packing list containing the following information.

a) Name of the consignee.
b) Details of consignment.
c) Destination.
d) Total weight of consignment
e) Handling and packing instructions.
f) Bill of Material indicating contents of each package.

v) The supplier shall ensure that the packing list and bill of material are approved by the purchaser before dispatch. The packing shall be done as per the manufacturer's standard practice. However, he should ensure the packing is such that, the material should not get damaged during transit by Rail/Road.

vi) The marking on each package shall be as per the relevant standards and shall also contain "IIT Roorkee".

vii) Power Transformer is to be transported in an atmosphere of nitrogen or dry air at positive pressure.

viii) Necessary arrangement shall be ensured by the manufacturer to take care of pressure drop of nitrogen or dry air during transit and storage till completion of oil filling during erection. The nitrogen or dry air cylinder provided to maintain positive pressure can be taken back by the contractor after oil filling. A gas pressure testing valve with necessary pressure gauge and adaptor valve shall be provided

ix) The transformer Main Tank with Core-coil assembly shall be shipped/ transported filled with inert gas due to transport weight regulation. If the transformer is equipped with an inert gas pressure system, then a low-pressure alarm device is to be provided. The alarm device shall be required forextended storage at site.

x) Special attention shall be paid in packing the accessories & spares to avoid moisture ingress. All parts shall be adequately marked to facilitate field erection. Boxes and crates shall be marked withthe contract number and shall have a packing list enclosed showing the parts contained therein.

xi) The Bushings shall be created & packed and transported as per the standard guideline of the Bushing Manufacturer. All care should be taken to avoid any damage to the porcelain due to vibration duringtransport.

xii) The weights & dimensions of the packages to be transported to site shall be governed by facilities available for the routes by road/rail/ship.

4.40 Mandatory Accessories, Spares and Tools:

The transformer shall be provided with the following accessories shall be supplied. All accessories mounted outdoor shall have contact enclosure tested with IP-55 or higher asper IS:2147 in order to avoid mal operation during rain or condensation. Following necessary Accessories and Fittings to be provided along with the transformer and shall be in the scope of bidder:

i) Main Oil conservator with atmoseal, supporting bracket or structure and filling hole and gap and drain in cock.

ii) Oil level gauge with 100ºC, 300ºC, 600ºC and 900ºC marking.

iii) Silica gel breather with oil seal and connecting pipe as defined in technical specification. The breather shall be accessible for inspection from the ground. Another Silica gel breather with oil seal shall also be provided in the conservator for OLTC tank.

iv) Air release plug.

v) Two numbers of earthing terminals with lugs.

vi) On load tap changing gear with Buchholtz relay / oil surge relay.

vii) Drain valve, filter valves at top and bottom.

viii) Radiators with valves

ix) Lifting lugs with fastening holes

x) Four Nos. Jacking pads with thickness not less than 20 mm

xi) Inspection covers (2 Nos.)

xii) Thermometer pockets (2 Nos.)

xiii) Winding temperature indicators with sufficient contacts - Micro Switch contact type and Dial Type

xiv) Pressure relief device - Spring loaded setting type pressure relief Valve having suitable opening Port. Hole & provision of visual indication for opening of the valve & Alarm/Trip contact arrangement both in the main & OLTC tank

xv) Rating and diagram plate and flow chart

xvi) Oil temperature indicators with sufficient contacts - dial type and micro-Switch contact type

xvii) Marshaling box

xviii) Outdoor type HT & LT bushings. HV-3 Nos. and LV-4 Nos. suitable for heavily polluted atmosphere. These bushings shall be provided with bimetallic clamps suitable for panther ACSR Conductor.

xix) Necessary oil for the first filling.

xx) Bottom mounting channel

xxi) Necessary features on transformer tank for mounting LAs on both HV & LV shall be provided and they shall be detachable type and not to be welded.

xxii) Explosion vent with diaphragm.

xxiii) Valve in equalizing pipe.

xxiv) Pulling eyes.

xxv) Sampling devices (bottom and top)

xxvi) Radiator shut off valve at top and bottom

xxvii) Buchholz relay with a shut-off valve at both ends of the relay. Isolating valve for a conservator in between conservator and Buchholz Relay and in between Buchholz relay and main tank.

xxviii) Oil inlet valve

xxix) One oil drain valve each suitably located at the top and bottom

xxx) Conservator –filter, drain and sample valve, air release valve & release plug.

xxxi) OLTC Conservator – Oil filling valve, Drain valve, Suction valve

xxxii) One drain valve for OLTC

xxxiii) Conservator valves for driving out air between air cell & wall of conservator & connection to breather.

xxxiv) Access/inspection holes with bolted cover for access to inner ends of the bushing.

xxxv) Cover lifting eyes.

xxxvi) Lifting eyes for core frame with windings.

xxxvii) Tap changing arrangement with OLTC Driving mechanism Box and with matching RTCC Panel.

xxxviii) Air release plugs on top of inspection cover of main tank top cover and a pipe shall be provided connecting the top of bushing turrets to the Buchholz relay so that any trapped air in those parts may be accumulated in the Buchholz relay. The connecting pipe shall have suitable sections so that the bolted turret covers can be opened to attend the C.T. provided therein.

xxxix) Jacking pads with handling holes at four corners.

xl) Transport lugs & Ladder with anti-climbing locking arrangement.

xli) Under carriage base channel.

xlii) Tank earthing terminals – 2 Nos.

xliii) An additional pocket for inserting thermometer for oil temperature indication.

xliv) Weatherproof control cabinet for marshalling terminal connections from protective and indicative devices. The cabinet shall be provided with incandescent filament lighting, plugs etc.

xlv) Neutral Bushing C.T. suitable for installation in L.V. side of Power Transformer for 10MVA and Bushing C.T. suitable for installation in L.V. side in R, Y, B phases and also neutral C.T. of 10 MVA Power Transformer.

xlvi) Property label.

xlvii) Oil filling instruction plate shall be provided at i) conservator body, ii) tank body along with rating and diagram plate.

xlviii) Oil Surge Relay for OLTC tank and to be placed in between OLTC tank and OLTC Conservator

Note:

i) Any other fittings that are necessary for the satisfactory operation of the transformers shall be provided without any extra cost.

ii) All screw threads and nuts shall be made as per IS, and all valves shall be of standard tested quality and leak-proof.

4.41 NAME PLATE: Equipment should be provided with a name plate giving full details of manufacturers, capacities and other details as specified in the relevant ISs. The purchase order No. date and words “IIT Roorkee” must be etched on the name plate.

B. 33 KV OUTDOOR TYPE VCBs

1. SCOPE:

a) This specification covers design, engineering, manufacture, assembly, testing at the manufacturer's works, supply, delivery at the site, unloading, handling, storage, installing, testing, and commissioning at sites of 33 and 11KV, 3 Phase, 50 Hz Porcelain Clad, Vacuum Circuit Breaker of required rating as per site requirement (indoor and outdoor) as detailed in the specification given hereunder, complete with all fittings and accessories required for efficient and trouble-free operations. The Circuit Breakers are required to be complete with structures, operating mechanisms, and all associated accessories and auxiliaries.

b) The Equipment to be furnished under this Specification shall be packed for shipment so as to meet the weight and space limitations of transport facilities, specifically along with Rail, Road, and right of way.

c) The Equipment covered by this Specification shall be complete in all respects. Any material or accessory which may not have been specifically mentioned but is essential or necessary for satisfactory and trouble-free operation and maintenance of the Equipment shall be furnished without any extra charge to the purchaser.

d) The Equipment shall be supplied with all accessories listed in this Specification with such modifications and alternations as to safeguard the technical requirements.

e) External surfaces shall be given a coat of high-quality red oxide or other suitable primer and shall be finished with two coats of synthetic enamel paints of shade 631 of I.S. Such painting should be able to withstand the tropical climate of Roorkee.

2. STANDARD:

The finished VCBs and accessories, etc., that are used in the manufacturing of VCBs CTs/ PTs will conform in all respects to the relevant Indian Standard Specifications / IEC Standards, with the latest amendments as indicated below.

IS / IEC	**Title**
IEC: 62271	Specification for HV Switchgear and Control gear
IS: 13118	Specification for HV AC Circuit Breaker
IS/IEC 60137 (Superseding IS:2099) and 3347	Bushing for alternating voltage above 1000 volt
IS : 5621	Specification for porcelain hollow insulator.
IS : 8603	Specification for Dimension for Porcelain Transformer Bushing for use in heavily polluted area.
IS: 3347	Specification for Dimension for Porcelain Transformer Bushing for use in normal and lightly polluted area.
IS: 2633	Specification for method for testing uniformity of coating On Zinc coated articles
IS: 5561	Specification for Electrical Power Connectors

IS: 2147	Specification for Degree of Protection
IEC 56 and IS: 13118:1991	Specification for alternating current circuit breakers.
IS: 2705/1992	Current Transformer specification
IS: 3156/1992	Voltage Transformer specification
IS: 3842 IS: 3238 IS: 3231 (1987)	Application guide for electrical Relays for AC system. Specification for electrical relays for power system protection
IS: 375	Arrangement of Breakers Bus Bars main connection and auxiliary wiring.

Equipment meeting any other authoritative standard, which ensures an equal or better quality than the above standards, will also be acceptable. In such a case, a copy of the standard followed should be enclosed with the tender. Acceptability of any alternative standard is at the discretion of the Institute.

3. CLIMATIC CONDITIONS

The VCBs to be supplied against this Specification shall be suitable for satisfactory continuous operation for the climatic conditions of Roorkee, Uttarakhand.

4. DESIGN CRITERIA:

i. The equipment shall be designed as per the Technical Particulars of 33 and 11 kV VCBs mentioned in respective Annexures. The maximum temperature attained by any part of the Equipment at a specified rating should not exceed the permissible limit as stipulated in the relevant standards. Equipment shall be designed to take 50 Degrees C as the maximum ambient temperature.

ii. The circuit breakers and their components shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit current of the system without any damage or deterioration of the material. The circuit breakers shall have motor wound spring charged trip-free mechanism with an anti-pumping feature and shunt trip. In addition, a facility for manual charging of the spring shall be provided.

iii. Each breaker shall be provided with a manual close & open facility, mechanical ON-OFF indication, an operation counter, and Spring charge/discharge indicator.

iv. For the motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open-close-open operation of the circuit breaker shall be possible after the failure of the power supply to the motor. A visual mechanical indicating device will also be provided to show the position of the spring.

v. All controls shall be suitable for 85%, to 110% for closing & 70% to 110% for tripping of 24V D.C./ as per OEM's standard. The A.C. supply shall be available 415 Volt +/- 10%, 50 Hz. 3 phase 4 wire system.

vi. The operating duty of the Breaker will be 0-0.3 sec-CO-3 min-CO.

vii. There shall be no radio interference when the Equipment is operated up to maximum service voltage.

viii. The minimum safe clearance of all live parts of the Equipment shall be as per relevant standards.

ix. All electrical and mechanical interlocks which are necessary for the safe and satisfactory operation of the Breaker shall be furnished. The interlocking device shall be of proven quality.

x. The condition of the Breaker and its contacts shall be intact even under conditions of phase opposition that may arise due to faulty synchronization or otherwise. Bidders should confirm in this regard.

xi. The Breaker shall be capable of smooth and rapid interruption of current under all conditions, completely suppressing the undesirable phenomenon even under the most severe and persistent rated short circuit conditions. There will be no abnormal voltage rise subsequent to the switching ON/OFF of a capacitor bank within the rated capacity.

xii. The total makes and break time (in m sec/cycle) for the breaker throughout the range of their operating duty shall be indicated and guaranteed.

xiii. The breaker shall be suitable for interrupting low inductive currents without generation of abnormal over voltage.

xiv. The breaker shall be capable of interrupting rated breaking current with recovery voltage equal to maximum line Service Voltage and at all inductive power factor of the Circuit equal to or exceeding 0.15.

xv. The Circuit Breaker shall be capable of withstanding power frequency over Voltage 70 KV for 1 minute.

xvi. The tenderer may indicate in his offer the methods adopted for limiting overvoltage.

xvii. The Circuit Breaker with its galvanized steel structure shall be suitable for mounting on the concrete foundation. The height of the supporting structure will be such that it will be able to maintain clearance as per relevant standards.

xviii. The details of the steel structure, foundation design, and erection drawing shall be given. In GA/Structure drawing, the location of CB., point of application of dynamic load and its amplitude, dead load, etc. shall be indicated.

xix. Circuit Breaker shall be provided with two grounding pads with required bolts and spring washers for connection of purchaser grounding conductor (minimum 50x6 mm G.I. strips).

5. CONSTRUCTION:

i. Each vacuum Circuit breaker shall comprise of three identical poles linked together electrically and mechanically for synchronous operation.

ii. Vacuum Interrupter - The vacuum interrupter, consisting of fixed contact and moving contact, shall be interchangeable among the same type of interrupter. The short circuit capacity of the vacuum bottle should be as per technical specification sheet.

iii. Constructional features of the vacuum chamber, along with its functional arrangements, are to be shown in a drawing submitted along with tender documents / detailed engineering.

iv. The gap between contacts of the Circuit Breaker inside the interrupter should be capable of withstanding 1.5-time voltage to neutral at one atmospheric pressure at normal ambient conditions within the Breaker in the event of vacuum pressure drop due to leakage.

v. In a vacuum interrupter, the contact configuration, contact area, and contact pressure will be sufficient for carrying rated current and short-time rates current without any abnormal phenomena.

vi. Complete details of main contacts shall be furnished. The material of the contacts and coating of the contacts shall be suitable for vacuum Breaker technology. Evaporation of metal during arching and deposition of the same in the inner surface of the vacuum interrupter should be restricted by adopting suitable material. The tenderer shall furnish the justification for using the materials for contacts.

vii. Complete details of main contacts and arc quenching device, if any with sectional drawings shall be furnished at the time of offer. Measures taken to free the contacts from vibration during closing shall be clearly explained in the drawing, supported by test results.

viii. Contact erosion should be limited to 3 mm for useful life.

ix. The vacuum pressure within the interrupter shall be adequate to interrupt the fault current. Precaution shall be taken so that there will be no flush over on the outside of the vacuum interrupter inside the porcelain insulator.

x. The design of the vacuum bottle and its insulator encasing should be suitable for outdoor use, taking care of the required creepage distance considering the possibility of moisture condensation, if any, in the annular space between the vacuum bottle and insulator enclosure.

xi. The vacuum bottle with its insulator encasing chamber shall be hermetically sealed. Free passage of air in the chamber with or without the provision of circulation of hot air is not accepted.

xii. Tripping/Closing Coil burden of Equipment should be as per standard. The Circuit breaker shall be provided with a trip-free Mechanism so that tripping instructions can over-ride the closing instructions. An additional tripping coil shall also be provided in the trip circuit. The second coil shall have separate tripping lever arrangements in the mechanism, so as to avail full advantage of second trip coil. Also, the two trip coils shall have separate fuses in the DC circuit, so that in the event of any short circuit/damage in any one of the trip coils, the supply is available to the other one.

6. Operating Mechanism:

i. The operating mechanism shall be suitable for rapid closing and tripping. The opening and closing energy shall be obtained from the spring charge mechanism. The spring charging may be done by either motor operation with a facility for manual charging when required or by another suitable trouble-free mechanism. Local arrangements for operating breakers both electrically and mechanically shall be provided in addition to remote operation.

ii. The mechanism shall have anti pumping circuitry and will be trip free electrically and mechanically. The anti-pumping arrangement shall be initiated through normal „NO" type, direct auxiliary contact of the circuit breaker, and shall be of self-hold type. Plug-in type relay/Contactor for Anti pumping Relay will not be acceptable.

iii. The operated mechanism will be complete with an opening spring, closing spring, limit switch, and all necessary accessories to make the mechanism a complete operating unit.

iv. The contractor used for the anti-pumping relay shall be of reputable make.

v. There shall be a mechanical ON/OFF indicator, spring charge/discharge indication, and operation counter for each Breaker and also provision for remote indication.

vi. The operating mechanism box shall be fixed at a working height from ground level. View glass shall be provided on the hinged door at the front side.

vii. Spring charging LS shall have sufficient no. of spare contact.

7. Common Control Cubicle:

i. A free-standing outdoor type weatherproof, dust and vermin-proof cubicle shall be provided to house the operating mechanism and all other accessories except those which must be located in the pole box.

ii. The cubicle shall be of 3.00 mm thick sheet steel and shall have hinged doors at the front and rear for access to the mechanism. Doors should be of proper design for smooth opening and closing with pad locking arrangement.

iii. A removable gland plate of 3 mm thickness shall be provided at the bottom of the cubicles for the purchaser's Cable entry. Glands shall be sufficient in numbers and of suitable sizes.

iv. Terminal blocks for AC & DC shall be kept separate. Terminals shall be suitable for at least 2X 2.5 sq. mm copper leads. All wiring shall be of 1100 V grade PVC.

v. Thermostat-controlled heaters shall be provided to prevent condensation within the cubicle. A cubicle illumination Lamp with a switch and a 230 V., 15A, 3-pin socket with a Control Switch shall be provided.

vi. All controls, alarms, indications and interlocking devices furnished with breakers shall be wired up to the terminal Black in the common control cubicle. Not more than two wires shall be connected to one terminal.

vii. All wires shall be identified at both ends with the same ferrule marking in accordance with the approved wiring diagram.

viii. Terminal blocks shall have compression type multi-way terminals with bonding screws and washers. At least 15% of spare terminal shall be provided.

ix. Scheme diagram on a durable sticker shall be fixed on inside door of Control Cubicle.

8. Insulators:

i. Porcelain supports, interrupter housing of adequate mechanical and dielectric strength with suitable creepage distance shall have to be used. All Support/Interrupter Housing of identical ratings shall be interchangeable. Each Interrupter-Housing shall be provided with terminal stud/pad.

ii. The porcelain used in interrupter housing shall be made from wet process and shall be homogeneous, free from laminations, caustics and other flaws which may impair its mechanical or dielectric strength and shall be glossy, tough and impervious to moisture.

iii. The porcelain supports, interrupter –housing insulation shall be coordinated with that of Circuit Breaker. The puncture strength of the bushings shall be greater than the dry flashover value.

iv. When operating at rated voltage, there shall not be any electrical discharge between the live terminal and earth. No Radio disturbance shall be caused by the support insulators when operating up to the maximum System Voltage. It shall also be free from corona.

v. All iron parts shall be hot dip galvanized. The nuts, bolts, washers etc. shall also be hot dip galvanized steel or stainless steel.

vi. Each Circuit Breaker shall be provided with a Bi-metallic terminal stud/pad suitable for connection of pipe bus/ACSR Conductor.

9. Auxiliary Contacts:

i. Breaker shall be provided with 6 NO & 6 NC spare auxiliary contracts in addition to the auxiliary contracts required for Breaker's own operational requirements. Contact Multipliers must be provided if required.

ii. These contracts shall have a continuous current rating of at least 10A. The breaking capacity shall be adequate for the circuits controlled, or at least 12A at 24 V DC or available capacity of DC system DC with a circuit time constant of minimum 20 ms.

iii. All these contacts shall be wired up to terminal block in the control cubicle. Auxiliary contacts which are to be installed on the frame of Circuit Breaker shall be suitably protected against accidental arcing from the main circuit. Insulating materials of contacts shall be ceramics or other non-tracking materials.

10. Equipment Foundation and Steel Structure for outdoor type VCB:

i. The Circuit breaker etc. shall be furnished complete with base frame, anchor/foundation bolts and hardware. Details structure assembly drawing, mentioning part no. of each member and also indicating cross sectional area of member used with supporting calculations. The point of C.B., dynamic load and its amplitude, dead load etc. shall be mentioned.

ii. To enable the purchaser to proceed with design of Equipment foundation, the successful tenderers shall furnish necessary foundation/anchor details with designed loads within 30 (thirty) days from the date of issue of letter of intent/purchase order.

iii. A similar grounding pad as mentioned in the specifications is also to be provided.

11. Tender Drawing, Manuals and Type Test Certificates:

The following drawings and manuals shall be furnished for information purposes with each copy of the tender.

i. After issuing the letter of award, two (2) copies of various drawings data and manuals as mentioned below shall be submitted to the EIC for this work for approval.

ii. General Arrangement Drawings indicating all dimensions, electrical clearances and distance of each piece of Equipment showing constructional features and dispositions of various fittings and accessories and also static dead load at point of application.

iii. Foundation and anchor details including dead-load and impact load with direction and also point of application.

iv. Technical leaflets/manuals on each piece of Equipment explaining the function of various parts, principle of operation and special features. Technical leaflets/manuals for offered type of vacuum bottle etc.

v. Schematic diagram for spring charged operating mechanism schematic layout drawings.

vi. Name plate drawing and any other relevant drawing and data necessary for erection, operation and maintenance.

vii. Outline drawings of bushings, terminals and terminal connectors.

viii. Type Test Certificates as per IEC/relevant IS to be submitted on Similar rating breaker from reputed/recognized laboratory. Copies of relevant type test report as per latest IS/IEC, carried out within five (5) years, from due date of tender, from CPRI, NABL accredited / Govt. recognized test house, or laboratory shall be submitted before execution of the work.

ix.

12. Specific Limit of Auxiliary Supply Voltage:

i. The auxiliary supply voltage shall be 85% to 110% of the rated 24 V DC or available capacity of DC system for closing coil

ii. and the same shall be 70% to 110% for tripping coil.

iii. The operating voltage for the motor operated spring charged mechanism shall be 400V A.C., 3 phase, 50 Hz or 230 V. 1-phase, 50 Hz. The motor shall operate at a voltage variation of 85% to 110% of the supply voltage.

13. NAME PLATE:

i. Rated voltage/Maximum voltage
ii. Rated insulation level
iii. Type/Model No./Sl.No./Year of manufacture.
iv. Rated current
v. Rated frequency.
vi. Rated short Circuit Breaking Current.
vii. Rated transient recovery voltage for terminal fault.
viii. Rated short circuit making current.
ix. Rated operating sequence.
x. Rated short time current.
xi. Rated line charging/breaking current
xii. Rated Cable charging current.
xiii. Rated single capacitor bank charging/breaking current.
xiv. Rated small inductive breaking current.
xv. Rated Supply Voltage of auxiliary circuits (ac & dc).
xvi. Applicable standard.

14. ACCESSORIES:

i. Each Breaker shall be furnished complete with fittings and accessories as listed below (The list is illustrative & not exhaustive).
ii. Clamp-type terminal connectors for ACSR Conductor
iii. Base frame and foundation/anchor bolts.
iv. Operating mechanism, two nos trip and one no. close coil.
v. Auxiliary Contacts and Relays/Contacts.
vi. Local/Remote selector Switch and Close/Trip Control Switch.
vii. Manual close and trip devices.
viii. Mechanical ON/OFF indicators.

15. Operation counter.

- Weatherproof Control cubicle and operating mechanism boxes, with locking arrangement.
- Set of Switch-Fuse/MCB/MCCB units for A.C. & D.C. Supply.
- Piping of Inert Gas System, if any.
- Space heaters with thermostat and switch.
- Cubicle illumination Lamp with Switch.
- Terminal blocks and internal wiring.

- G.I. conduits and accessories for connection between Central Control Cubicle and operating mechanism boxes where applicable.
- Other standard accessories which are not specified but are necessary for efficient and trouble-free operation shall be supplied.

16. TEST AT FACTORY AND TEST CERTIFICATES

- All Acceptance tests may be carried out at manufacturer's works in presence of the IITR"s and Contractors" representatives.
- In addition to the above, all routine tests are also to be carried out on the breakers as per relevant IS. The entire cost of acceptance and routine test that to be carried out as per relevant IS" shall be treated as included in the quoted price of breakers.
- The contractor shall give at least 21(twenty-one) days advance notice intimating the actual date of inspection and details of all tests that are to be carried out from the date when the tests will be carried out.
- Routine tests on all breakers shall be carried out as per IEC-56 or IS-13118 and test reports shall be submitted along with respective inspection offer to the IIT Roorkee.

C. 11 KV INDOOR VCB PANEL

1. General and construction:

The switchgear cubicle (panel) shall be free standing floor mounting indoor type. There shall be sufficient reinforcement to have level surfaces resistance to vibration and rigidity during transportation & installation. Design & construction of the switchgear panel shall be of the highest order. All sheet steel work shall be treated as per the seven-tank process before applying primary coating. For the final coat (stowed) epoxy paint color shade of light admiral grey to shade No.697 as per IS:5 shall be used. Alternatively, powder coating may also be accepted. The panels after final painting shall present an aesthetically pleasing appearance, free of any dent or uneven surface. Cable compartments for the incomer shall be suitable for terminating 3nos. of 3x300 sq.mm XLPE cables and that for feeder shall be suitable to accommodate 2 nos. of 3x400 sq.mm. XLPE cables. Copper terminator strip of suitable size shall be provided for termination of cables and shall have adequate height inside to accommodate the heat shrinkable type indoor cable termination. The section covers the specification of metal clad indoor vacuum type switchgear unit with horizontal draw out circuit breaker as per IS/ IEC 62271-100/ IEC 62271- 200 or latest amendment thereof.

i) The equipment offered shall be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable of performing continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements.

ii) The switchgear shall be of CRCA steel / corrosion proof aluminium-zinc construction with sheet not less than 3 mm thickness for load bearing section and not less than 2mm thickness for non-load bearing and shall totally dust and vermin proof.

iii) The panels shall be rigid without using any external bracings.

iv) The switchboard panels should comply with relevant IS / IEC and revision thereof and shall be designed for easy operation maintenance and further extension. Each circuit shall have a separate vertical panel with distinct compartments. Bus bar, metering, circuit breaker chamber, cables and cable box chamber should have proper access for maintenance and proper interlocks should be provided. All instruments (Except the Relays) shall be non-draw out type and safeguard in every respect from damages and provided with mechanical indicator of connection and disconnection position.

v) The switchgear shall be completed with all necessary wiring, fuses, auxiliary contacts, terminal boards etc.

vi) The switchgear boards shall have a single front, single tier, fully compartmentalized, metal enclosed construction, comprising of row of freestanding floor mounted panels.

vii) The adjacent panels shall be completely separated by steel sheets except in busbar compartments where insulated barriers shall be provided to segregate adjacent panels. The switchgear assembly shall be dust, moisture, rodent and vermin proof, with the truck in any position SERVICE, ISOLATED, TEST or removed, and all doors and covers closed. All doors, removable covers and glass windows shall be gasketed all round with synthetic rubber or neoprene gaskets.

viii) The arcing contacts and bus bar should be rated for 25KA/31.5 KA faults for 3 seconds for 11kV system. Bus bars shall be capable of connecting one switchgear panel to other through proper insulated arrangement. The panels shall be modular in design.

ix) The switchgear will be installed in switchgear room, but the controls under normal conditions may be from the 11-kV remote supervisory control desk.

x) The breakers should be able to be drawn out in horizontal position at ground level [with vertical/horizontal isolation]. When breaker is drawn out in horizontal position none of the live components inside the 11KV switchgear panel should be accessible.

xi) The safety shutters shall be robust and shall automatically cover the live components when the breaker is drawn out. The switchgear shall have complete interlocking arrangements at the fully inserted and fully drawn out and test positions. Withdrawal of the breaker should not be possible in ON position, it should not be possible to close the circuit breaker in service unless the entire auxiliary and control circuit are connected.

xii) Circuit breaker shall be vacuum; draw out type housed in a separate cubicle of the switchboard and shall be enclosed from all sides. A sheet steel hinged lockable door shall be at the front. It shall be possible to withdraw the circuit breaker to 'Test' and "Isolated' position with the door closed. Door interlock shall be provided such that the door can only be opened after withdrawing the breaker to 'Isolated' position and the breaker cannot be racked into the 'Service' position unless the door is closed. A visual indication as to show when the breaker is in 'Service', 'Test' or 'Isolated' position shall be provided in front of the door.

xiii) Switchgear construction shall have a bushing or other sealing arrangement between the circuit breaker compartment and the busbar / cable compartments, so that there is no air communication around the isolating contacts in the shutter area with the truck in service position.

xiv) Built-in / separate trolley mounted earth switches for incomer (busbar earth) and outgoing (feeder cable earth) shall be provided.

xv) All the high voltage compartments must have pressure discharge flap for the exit of gas due to internal arc to ensure operator safety.

xvi) The bus PT/relay compartments shall have degree of protection not less than IP:52 in accordance with IS:2147. However, remaining compartments can have a degree of protection of IP:42. All louvers if provided shall have very fine brass or GI mesh screen, IPH-2 degree of protection as per IS: 3427 to all live parts shall (whether isolated or removed from panel) even when the breaker compartment door is open. Tight fitting garments / gaskets are to be provided at all openings in relay compartment.

xvii) The switchboard shall have the facility of extension on both sides of Adapter panels and dummy panels required to meet the Busbar.

xviii) Bus bars and all other electrical connection between various components shall be made of electrolytic copper of rectangular / tubular cross sections, as per the type tested and ratified design.

xix) The vacuum circuit breaker shall be draw out type suitable for installation in the switchgear cubicles (indoor). The breaker shall comply with IEC 62271-100 / IS- for circuit breaker and IEC 62271-200 for the switch gear and latest amendment thereof. Construction of breaker shall be such that the points, which require frequent maintenance, shall be easily accessible.

xx) The circuit breakers shall be spring operated, motor/manually charging of the spring feature, manually released. VCB shall have spring closing mechanism for 3 pole simultaneous operation. The speed of closing operation shall be independent of the speed of hand operating level. The indication device shall show the OPEN and CLOSE position of breaker visible from the front of cubical.

xxi) The circuit breakers shall be type tested as per IEC 62271 for compliance with the following requirements:

- E2 class: The circuit breakers shall not require maintenance of the interrupting part of the main circuit during its expected operating life.
- C2 class: The circuit breakers shall have very low probability of restrike during capacitive current breaking.
- M2 class: The circuit breaker should require very limited maintenance and should be tested for endurance for 10,000 close – open operations.

xxii) The breakers shall be capable of making and breaking the short time current in accordance with the requirement of IEC 62271-100 / IS 13118 (1991) and latest amendment thereof and shall have three phase rupturing capacity of 25KA for 3 second at 11 KV. The continuous current rating of all current carrying parts of breaker shall be 1250 Amps for all items. The total break / make time shall be not more than 4 cycles for break and 6 cycles for make time for all breakers.

xxiii) The spring release coil for VCB close and VCB trip coil shall both be rated for continuous energization at the rated close / trip voltage.

xxiv) The vacuum circuit breakers shall ensure high speed extinction and adequate control of pressure during breaking of current and also designed to limit excessive over voltages.

xxv) Comprehensive interlocking system to prevent any dangerous or inadvertent operation shall be provided. Isolation of circuit breaker from bus bar or insertion into bus bar shall only be possible when the breaker is in the open position.

xxvi) Vacuum Circuit Breaker shall have completely sealed interrupting units for interruption of arc inside the vacuum. The vacuum interrupter sealed for life.

xxvii) Vacuum interrupter should have an expected life of 30000 operations at rated current and should be capable for operating at least 100 times at rated short circuit current.

xxviii) The circuit breaker shall be provided with motor for spring charging operation.

xxix) Spring charging motor shall be suitable for 240V, 50 Hz, single phase AC and suitable DC Supply. Suitable rating starter/fuse shall be provided for Motor protection. Provision shall be available for charging the springs manually as well, and to close CB mechanically.

xxx) All circuit breakers shall have mechanical ON/OFF indicator and spring charge indicator. These shall be visible from the front without opening the panel door. Also, there shall be provision for mechanical (manual) tripping and also for manual charging of the springs.

xxxi) The switchgear shall be easily extendable in future.

2. CURRENT TRANSFORMERS at 11 KV VCB

- Primaries shall be wound or bar or window type, rigid, high conductivity grade copper conductor. Unavoidable joints on the primary conductor shall be welded type, preferably lap type.
- The current density at any point shall not exceed 1.6 A/sq. mm. The Insulation level of all the CTs shall be: 12/28/75 kV and the Class of Insulation shall be “E”.
- Short time current rating of CTs shall correspond to 25KA faults for 3 seconds of 11kv system. CTs shall be triple / double core and dual ratio. Instrument safety factor for metering core shall not exceed 2.5.
- The designed accuracy should be available even at the lowest ratios.
- The secondary terminal of the current transformers shall be such that effective and firm wire terminations are possible. Shorting links of adequate capacity shall be provided at the terminal blocks for sorting of the leads from secondary terminals of current transformers. The secondary terminal of the CTs shall be earthed at one point.
- CTs shall confirm to IS 2705 with latest amendment and relevant IEC standard, if any in all respect and will be subjected to all routine and type test specified in the IS/IEC. The CTs shall be resin/epoxy cast. Contact tips on primary terminals shall be silver plated.
- Correct polarity shall be invariably marked on each primary and secondary terminal. Secondary terminal studs shall be provided with at least three nuts, two plain and two spring washers for fixing leads. The stud, nut and washer shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. The space clearance between nuts on adjacent studs when fitted shall be at least 10 mm.

3. POTENTIAL TRANSFORMERS at 11 KV VCB

- 1 No. 3 phase resin cast, draw out type, bus bar connected, potential transformer of 5-limb construction, ratio 11000/110 volts, class 0.5 accuracy at 50 VA output per phase, complete with HT HRC fuse and Triple Pole & Neutral MCB, rated 1 Amp, with monitoring contacts on PT LV circuit. Primary and secondary neutrals of the PT must be brought out and earthed. If required, the busbar connected P.T. may be housed in a separate cubicle. PT mounted on top of the panel will not be acceptable
- H.V side shall be connected in star formation and L.V. side in star/open delta formation.
- PT may be provided in a separate compartment. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.
- Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.
- Secondary terminal studs shall be provided with at least three nuts, two plain and two spring washers for fixing leads. The stud, nut and washer shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 6 mm. The length of at least 15 mm shall be available on the studs for

inserting the leads. The space clearance between nuts on adjacent studs when fitted shall be at least 10 mm.

- **Details of PTs**

i) IS: 3156 and relevant IEC standard.
ii) Ratio: 11KV/√3/110V/√3
iii) No. Of phases: 3 Phases / star - star connected.
iv) Insulation level: 12/28/75 kV
v) Class of Insulation: Class E
vi) Rated voltage factor: 1.2 continuous & 1.5 for 30 Sec.
vii) Rated Burden: 100 VA or as per site requirement per phase
viii) Class of accuracy: 0.2S
ix) Purpose: Metering
x) Primary wiring of the PTs shall be protected by suitable H.R.C. fuse.
xi) Each secondary core will be protected by suitable MCB.

4. TESTS:

The design of circuit breaker shall be proven through all the routine and in accordance with IEC 62271-100 / 200 / IS 13118: 1991 and any amendment thereof. The bidder shall be required to submit complete set of the type test reports conducted within five years from NABL accredited laboratories before execution of work.

5. DRAWINGS & DOCUMENTATION

The successful tenderer shall submit 3 sets of complete drawings along with detailed bill of materials for approval. If any modifications are required on these, the same will be conveyed to the supplier who shall modify the drawings accordingly and furnish final drawings for approval. No delivery extension shall be granted for any delay in drawing submission.

List of drawings to be submitted are as under:

- GA of indoor 11 panel Switchgear.
- Typical single line diagram for 11 panel Switchgear.
- Sectional view of incomer, bus coupler & feeder panels.
- GA of Circuit Breaker truck.
- GA of Current Transformer
- GA of Potential Transformer.
- G. A. Drawing for Control Desk.
- Bill of material for complete switchgear.
- Technical particulars of Switchgears.

Successful tenderer shall furnish all above drawings and following additional drawings for approval before commencement of supply.

- Foundation details.
- Equipment door layout for incomer, bus coupler & feeder panels.
- Schematic Diagram for incomer bus coupler & feeder section of Switchgear
- Protection Circuit for incomer bus coupler & feeder section of Switchgear
- DC control circuit for incomer, bus coupler & feeder section.
- Metering circuit for incomers, bus coupler & feeder section.
- Annunciator and Alarm scheme.
- P.T. supply change over scheme.
- Terminal block details for incomer, bus coupler & feeder section.
- Cross section view for CTs.
- Name Plate & Connection diagram for CTs.
- Cross section view for PTs.
- Name Plate & Connection diagram for PTs.
- Schematic Diagram for Control Desk.
- G. A. Drawing for Chair.

- G. A. Drawing for Sliding Door Unit.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of the EIC. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the supplier's risk.

After approval of the drawings and bills of materials, the suppliers shall submit detailed packing lists for approval. After approval, copies of these packing lists shall be forwarded to the respective consignees.

3 set of final drawings, bill of materials, wiring schedules, technical literature and commissioning manuals shall invariably be forwarded to the consignee along with each panel consignment, and shall be listed out in the packing list when submitted for approval.

D. 33 KV OUTDOOR MOTORIZED BUS ISOLATOR

The scope of the work covers design, manufacture, testing at manufacturer' works, supply, delivery, installation, testing and commissioning of outdoor type 33 KV, 3-phase, triple pole, double break, gang operated, center rotating type Isolator with / without gang operated Earth switches, including Insulators and complete in all respects with arcing horns, bimetallic connectors, operating mechanism, indicating devices, fixing details etc. The required suitable supporting structure for the isolators is also in the scope of the contractor. The technical specifications contained in this section are for guidance of the tenderers.

E. CTs AT 33 KV

The scope of the work covers design, manufacture, testing at manufacturer' works, supply, delivery, installation, testing and commissioning of outdoor type current transformers complete in all respects for protection and metering system. The required suitable supporting structure for the isolators is also in the scope of the contractor. The technical specifications contained in this section are for guidance of the tenderers.

F. PTs AT 33 KV

The scope of the work covers design, manufacture, testing at manufacturer' works, supply, delivery, installation and testing of outdoor type potential transformers (PTs) complete in all respects for protection and metering system. The required suitable supporting structure for the isolators is also in the scope of the contractor. The technical specifications contained in this section are for guidance of the tenderers.

There were 6 nos. 33 kV Potential / Voltage Transformers at the time of augmentation of the 33/11 kV of existing substation with 02 nos. 33/11 kV, 10 MVA transformers.

However, after installing and commissioning the system, these PTs were frequently blasted, and now the process of installing suitable PTs at the 33 kV side are in progress.

G. TECHNICAL SPECIFICATION FOR LAs

The scope of the work covers design, manufacture, testing at manufacturer' works, supply, delivery, installation, testing and commissioning of outdoor type gapless, heavy duty, station class, Zinc Oxide type Lightning Arrestors complete in all respects. The required suitable supporting structure for the isolators is also in the scope of the contractor. Arrestors shall be hermetically sealed units suitable for outdoor installation on self-supporting base or structures to be supplied by the bidder.

H. HT FEEDER CONTROL & RELAY 33 KV PANEL

Technical specification of independent 33kV transformer and feeder control and relay panels for 33kV substation & for group control of 3 nos. 33/11 kV transformers considering 02 nos. existing transformer and 01 no. new 33/11 kV transformer as per technical specification / BoQ

1. Scope of the work

i) The scope of this work covers design, manufacture, assembly, testing before supply, inspection, packing, delivery, installation, testing, commissioning and other basic technical requirements in respect of control and relay panels for 33 kV feeder and 33/11KV Power Transformers with required relays and accessories.

ii) The equipment to be supplied against this specification is required for vital installations where continuity of service is very important.

iii) The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.

iv) The Bidder has to design the Schematics for protection and Control of all equipment (s) including monitoring indications, visual and audible alarm, interlocking schemes among different equipment.

v) Any other requirement which are not specifically covered here but which are necessary for successful commissioning of the Sub stations are also within the scope of the Contract. The equipment manufactured should conform to the relevant standards and of highest quality of engineering design and workmanship.

vi) The equipment manufactured shall ensure satisfactory and reliable performance throughout the service life. The Schedule of requirement of the Panel is as below for reference.

vii) A control and relay panel shall include the following

a) Protective and auxiliary relays required for the protection of transformers and lines.
b) Indicating instruments with necessary switches
c) Control switch for the remote control of 33 KV circuit breaker.
d) Supervision equipment
e) Mimic equipment
f) Alarm equipment
g) Terminals, wiring ferrules, fuses, links and sundries to complete the job.

2. STANDARDS:

All material and equipment shall comply in every respect with the requirements of the latest edition of the relevant standards as specified here. Equipment meeting any other internationally recognized standards will be acceptable.

- Protective relays IS: 3231
- Indicating Instruments IS: 1248
- Mimic colour shades IS: 1961

3. SYSTEM PARTICULARS AND AUXILIARY SUPPLIES:

i) 33 kV voltage supply will be 3 phase, 50 Hz.

ii) Wherever the neutral is provided on the power transformer, the same will be solidly earthed.

iii) A.C. supply at the 33KV sub-station for which the C&R panels against this specification are required will be 415/240 Volts, 3 phase, 4wire, 50Hz ±3% variation.

i. D.C. supply available at the sub stations for which the C&R panel against this specification is required will be 24 Volts, 2 wire available from the sub-station battery. The supply may have 2: 10% variation:

1. TEST SHEETS:

Guaranteed test sheets as per Annexures will be submitted by the tendered along with the tender. Relevant literature will be supplied for proper appreciation of the offered equipment.

2. DRAWING:

In addition to any other drawings which the tendered may like to enclose to explain the merits of his proposal, the following drawings shall be enclosed with the tender or shall be provided during detailed engineering -

i. Major dimensional drawing of each of the three types of C & R panel.
ii. Feeder circuit protection scheme.
iii. Transformer circuit protection scheme

3. **ILLUSTRATED AND PRINTED LITERATURE:**

Two copies each of the descriptive and printed literature in respect of all. Instruments switches and relays used on the offered. Panels shall be supplied along with the tender.

4. TESTS:

The following tests shall be carried out at the manufacturer's works after completing assemble of control and relay panel board and the test report of such tests supplied in quadruplicate for approval of IIT Roorkee before dispatch of equipment: -

i) Checking of wiring circuits and their continuity.
ii) One-minute applied voltage test for all equipment on panels and wiring.
iii) Insulation resistance of complete wiring, circuit by circuit, with all equipment mounted on the panel.
iv) Checking the operation of protective relays.
v) All instruments, auxiliary relays, and protective relays used on the panels shall comply with the latest edition of relevant Indian/Other internationally acceptable standards and routine test certificates for the same supplied and approved by the purchaser.
vi) Type test reports relating to all protective relays as per relevant standards shall be submitted by the bidder. The type test reports should not be more than five years old reckoned from the bid opening date.
vii) The type tests should be carried out by the Govt./Govt. approved NABL-accredited test house as per relevant IS.

5. MARKING:

The following particulars shall be marked distinctly and permanently on every relay preferably in a position visible from the front.
(a) Manufacturers name or the make by which he may be identified.
(b) Manufacturer's type reference.
(c) Rated current, rated voltage or both.
(d) Frequency.
(e) Particulars of auxiliary equipment.
(f) Setting indication.
(g) Manufacturer's serial Number.
(h) Country of manufacture. - Relays must be marked with ISI certification mark
Relays must be marked with ISI certification mark. Meters shall have markings as per ISS 1248-1983 or latest version thereof/equivalent IEC.

6. TECHNICAL PARTICULARS

6.1 GENERAL DESCRIPTION OF CONTROL & RELAY PANEL:

The control and relay panel shall consist of separate cubicles with side covers made of sheet steel and complete with internal wiring, terminals, ferrules, and illumination with door operated 'OFF' and 'ON' switches. The cubicle shall be suitable for floor mounting with its bottom open and shall be completely dust and vermin-proof. The cubicle shall be of suitable height with adequate depth and width so as to afford a comfortable working area inside the panel for testing staff. Each cubicle shall be fitted with a mounted steel hinged door and lock at the back, and all the equipment (control, supervisory, metering, and protective) will be mounted in front. The supply shall include the channel base, suitable grouting bolts, nuts, locknuts, washers, etc. Along with the panels.

The individual panels shall have provision for extension at both ends so as to form a board as per the requirement.

6.2 SUPERVISION SCHEME:

Each of the control and relay panels against the specification shall be fitted with the following supervision lamps: -

Circuit breaker close: Red

Circuit breaker open: Green

Auto-trip : Amber

Trip circuit healthy: White

(Monitor both when Breaker IS OFF/ON)

All shall be rated for 24-volt D.C. The lamps shall have low wattage consumption (LED Type) and shall provide a comfortable viewing. Glass/plastic lens of appropriate colour shall be screwed into the front of the lamp body

An engraved label indicating the purpose of the lamp shall be provided with each lamp. ..In the initial supply 20% of the lamps actually used on the switch board and 10% of lamp lenses of various colours shall be supplied loose to serve as spares.

6.3 ALARM SCHEME:

a) <u>Alarm scheme for trip alarm due to electrical faults:</u>

Trip commands due to operation of protective relays including Buchholz relay and winding temperature trip contacts will actuate bell and will be cancelled by the circuit breaker control handle. Auto trip lamp will glow on the panel and there will be flag indication on the concerned protective relay/auxiliary relay of the panel.

This scheme will conform to the following:

i. The closing of an initiating contract shall actuate a buzzer and will be accompanied by a flag indication on the concerned auxiliary relay.

ii. The closing of an initiating contact shall glow lamp, which will not reset until the fault has cleared.

iii. It shall be possible to silence the buzzer by pressing the ‘accept' push button. If after cancelling the alarm but before resetting the visual signal, the same fault persists the buzzer shall be suppressed.

iv. If after cancelling the alarm but before resetting the visual signal some other fault takes place, then the alarm accompanied by the flag indication on the conceded auxiliary relay shall take place.

v. If after cancelling the alarm and after resetting the visual signal, the same fault reappears or some other fault takes place, the alarm flag indication and non-trip lamp indication shall reappear as usual:

b) The non-trip alarms. Acceptance shall be by means of a push button and resetting to visual signal may also be done through a push button.

c) Means shall be provided for test checking the alarm and lamp circuits.

d) The equipment shall be suitable for 24 D.C. or as per OEM recommendation.

6.4 TRASFORMER PANELS:

6.4.1 Four ways for the annunciation of non-trip alarm on transformer panels with the following description shall be provided:

i) Buchholz alarm

ii) Winding temperature alarm

iii) Oil temperature alarm

iv) OLTC oil surge relay & low oil alarm

6.4.2 Four ways for annunciation of trip & alarm on TIF panels with following description shall

. be provided:

i) Buchholz trip
ii) Winding temperature trip
iii) Oil temperature trip.
iv) OLTC oil surge relay trip.

6.5 MIMIC SCHEME:

6.5.1 Suitably painted mimic diagram will be reproduced on the panels. Automatic semaphore indication for indicating OPEN and CLOSE position of circuit breakers, isolators and earth switches shall be suitably incorporated in the mimic diagram. The operating coil of the semaphore relays shall be suitable for use on 24VD.C.

6.5.2 Following colour scheme shall be used for mimic representation on the panels against this specification:

6.5.3 Voltage panel Colour Shade No. (according to ISS-1961)

6.5.4 33KV Brilliant green 221

6.5.5 11KV Sional 537

6.6 METERING SCHEME:

- Voltmeters & Ammeters on all the panels against the specification shall be of square, flush mounting type. The Transformer panels shall be mounted with both voltmeter, ammeter & Multi-Function Meter
- The voltmeter shall be accompanied by a suitable selector switch facilitating the measurement of voltage between phase to phase and between phase to neutral.
- The Voltmeter Should be Digital type with Voltage 24V DC Aux Supply. Meter Ratio 33KV/110V or Programmable. The meter should be 0.5 Class of Accuracy.
- Suitably sealed ammeter to cover CTs ratio or Programmable shall be accompanied by a selector switch facilitating the measurement of phase currents as well as the unbalanced current in the neutral. The ammeter should be digital type with 24V DC Aux. Supply.
- Meter Should be 0.5 Class of Accuracy.

7. CONTROL SCHEME AND CONTROL SWITCHES:

It shall be possible to close the breaker from the control room. For this purpose, control switches with built-in key-free locks having pistol grip type or handles of the spring return to neutral position type with alarm (cancellation) contacts shall be provided for the operation of circuit breakers.

8. PROTECTION SCHEME:

TRANSFORMER PANELS:

Triple pole over current relay IDMTL type with high set elements For Over Current protection a triple pole inverse definite minimum time lag over Current relay with a setting range of 50%-200% of 1 Amp Rating and fitted with high set elements of 500%-2000% of 1A for instantaneous clearance of faults within the transformer(s) shall be provided on each of the transformer control and relay panel.

9. TRANSFORMER DIFFERENTIAL PROTECTIOIN (For Capacity 10 MVA):

The relay shall: -

(a) Be triple pole numerical type.
(b) Have 3 instantaneous high set differential units.
(c) Have a second harmonic restraint or other inrush proof feature and be stable under normal over fluxing condition.
(d) Have a fifth harmonic bypass filter or similar other arrangement to prevent mal operation of the relay under operating conditions.
(e) Be suitable for rated current of 1A and include necessary ICTs for ratio & phase angle correction.

(f) Have operating current setting sufficiently low (15% or less) so as to cover practically the whole of the transformer against all types of faults.
(g) Have adjustable bias setting range of 20-50%. Have maximum operating time of 30milli seconds at 5 items the rated current.
(h) Be provided with necessary terminal & links to measure current in restraining circuits & in the operating circuits of all the phases under load without making any wiring changes.
(i) Display. Resolution of differential/pickup current should be 0.01A (10 MA).

10. SMALL WIRING:

- All the wiring shall be of switchboard type consisting of single tinned annealed copper conductor insulated with polyvinyl chloride insulation suitable for 660 volts service and in accordance with IS: 732-1963 (latest version thereof).
- The wiring of the following circuits shall be not less than the size specified below:
- CTs and PTs circuits: 2.5 mm sq
- Control alarm, supervision circuits: 1.5 mm sq.
- All wires will be continuous from one terminal to the other and also will have no tee- junction enroute. At the terminal connections, washers shall be interposed between terminals and holding nuts. All holding nuts shall be secured by locking nuts.
- Bus wires shall be fully insulated and run separately. Fuses and links shall be provided to enable all the circuits in a panel to be isolated from the bus wire. Wherever practicable all circuits in which the voltage exceeds 125 volts shall be kept physically separated from the remaining wiring. The function of each circuit shall be marked on the associated terminal board.
- All wiring diagrams for the control and relay panel shall be drawn as viewed from the back of the cubicle and shall be in accordance with. lS;. 375-1963 (latest version thereof). Multi core cable tails shall be so bound to its cable that each wire may be traced without difficulty.

11. TERMINAL BOARDS:

Terminals block connectors built from cells of moulded dielectric and brass stud inserts shall be provided for terminating the outgoing ends of the panel wiring and the corresponding tail ends of Control Cables. Insulating barriers shall be provided between adjacent connections.
The height of barriers and spacing between terminals should be such as to give adequate protection while allowing easy access to terminals.
Terminal blocks shall be suitable for 660 Volts service and for connection with both copper and aluminum wires.

12. CONTROL AND RELAY CUBICLES

i) The Control and Relay Cubicles shall be made of Sheet Steel of thickness not less than 10 SWG (3.251 mm) for the base frame, door frame, front & Rear portions of Cubicle & not less than 14 SWG (2.032 mm) for doors, side. Top & bottom portions, in place of sheet metal of 2 mm thickness.
ii) The main Differential relays & Over Current Earth Fault Relay should only be approved make.
iii) The C&R Panels should be of standard dimensions as under: -
iv) Depth =610 mm or as per OEM.
v) The height of the Board above the base frame = 2210 mm or as per OEM.
vi) Height of base frame = 102 mm or as per OEM.

13. FERRULES, SPACE HEATERS AND SAFETY EARTHING:

- Ferrules engraved with some number and letters as indicated in the connection and wiring diagram shall be provided on the terminal ends of all wires for easy identification of circuits for inspection and maintenance.

- Tubular space heaters suitable for connection to the single phase 230 Volts A.C. supply complete with switches shall be provided at the bottom of each control and relay panel to prevent condensation of moisture.
- Earthing of current free metallic parts or metallic bodies of the equipment mounted on the switch board shall be done with copper conductor of suitable size.

ANNEXURES

ANNEXURE-M1

TECHNICAL PARTICULARS FOR 10 MVA, 33/11 KV TRANSFORMER

S.No.	Specification	Desired Specification		Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
1.	Name of Manufacturer	Crompton/ ABB/ Schneider/ Voltamp/ Kirloskar / Tesla			
2.	Type of Transformer	Core Type, Outdoor, Oil Cooled T/F			
	Confirming Standard				
3.	Rating				
a.	Rated Output (MVA)	10 MVA			
		HV	LV		
b.	Rated Voltage of HV & LV (KV)	33 KV	11 KV		
c.	Rated Current of HV & LV (A)	174.95/524.86 A			
d.	No Load Voltage Ratio	33/11 KV			
e.	No. of Phase	3			
f.	Rated Frequency	50 Hz			
4.	Connections				
a.	High Voltage	Delta			
b.	Low Voltage	Star			
c.	Vector Group Symbol	Dyn 11			
5.	Cooling Arrangement				
a.	Type of Cooling	Oil Natural Air Natural (ONAN)			
b.	No. of Radiators Fins & Size				
c.	Cooling tubes / Radiators				
d.	Thickness of Sheet				
e.	Horizontal distance between radiators				
f.	Vertical distance between Core center line and radiator center line				
6.	Coverall Dimension of Tank with Fittings (mm) (Overall dimensions)				
a.	Length				
b.	Breadth				
c.	Height				
7.	Details of Oil				
a.	Standards of Oil	IS:335			
b.	Quantity of Oil (Ltr.)				
c.	Weight of Oil (Kg.)				
8.	Terminal arrangement HV Side	Bare Bushing			
9.	Terminal arrangement HV Side	Bare Bushing			

10.	Regulation at full load at 75^0C				
a.	At unity power factor	0.85%			
b.	At 0.8 power factor (lagging)	5.60%			
11.	Percentage efficiency at normal ratio, rated voltage and at 75^0C Average winding temperature				
a.	Full Load				
b.	¾ Full Load				
c.	½ Full Load				
d.	¼ Full Load				
12.	No Load current as percentage of full load current at rated Volt and Frequency	1.0 % approx.			
13.	Power Factor and no-load current at normal Volt and Frequency	0.2 % approx..			
14.	RMS Value of symmetrical short time current rating as per ISS which the transformer can withstand and its duration				
a.	HV Winding				
b.	LV Winding				
15	Insulation Level	HV	LV		
a.	Separate source power frequency Volt. Withstand – KV	70	28		
b.	Induced over voltage Withstand – KV				
c.	1.2/50 micro sec full wave lighting impulse withstand Voltage – KV				
i)	impulse	170	75		
ii)	Power frequency (Dry & Wet)	70	28		
d.	Performance reference Temp. (Deg. C)				
i)	Impedance voltage at rated full load and transformer		75		
ii)	Percentage reactance ratio at rated voltage & frequency at 75^0C		28		
16.	Performance reference Temp. (Deg. C)	75^0C			
17.	Impedance voltage at rated full load and transformer	8.35% (tol)			
18.	Percentage reactance ratio at rated voltage & frequency at 75 (Deg.)	8.335%			
19.	Percentage resistance at 75 (Deg.)	0.50%			
20.	Impedance voltage at principle tapping at 75 (Deg.). Average winding temp. expressed as a percentage of rated voltage b/w	8.35% (tol)			

	HV and LV winding %			
21.	The permissible overload duration follows continuous running at an average rated load at ambient temperature. of (Deg.)			
a.	10 % Overload	As per IS:6600		
b.	20 % Overload			
c.	30 % Overload			
22.	Maximum Temp. rise at full load (above max. average ambient Temp. of 50 (Deg.)			
a.	Of top oil by thermometer – Deg. C	50^0C		
b.	Of winding by resistance method – Deg. C	55^0C		
c.	By hot spot temperature Indicator – Deg. C for weighted average temperature of 32^0C	98^0C		
23.	Limit/Hot spot temperature for which designed – Deg. C	105^0C		
24.	Temperature Gradient between winding and Oil – Deg. C	22^0C approx..		
25.	Max. No Load loss at rated voltage on principal tapping at rated frequency (Guaranteed without any + tolerance) (including 25% stray on load loss for considering in consistencies of B-H curve characteristics of core material and workmanship)	7.5 KW (Max.)		
26.	Losses at 75^0C (Guaranteed without any + tolerance) including 10% stray loss	55 KW (Max.)		
27.	Tapping at 75^0C average winding temperature, as percent of rated voltage -0%	0.5 % (approx.)		
28.	Reactance voltage drop express as percent for rated voltage	8.335% (approx.)		
29.	Impedance voltage at principal tapping and at 75^0C average winding temperature expressed as percentage of rated voltage between HV & LV winding %	8.35% (approx.)		
30.	Temperature Indicators	Oil temp. indicator, winding temp. indicator		
a.	Make and Type			
b.	Permissible setting ranges for alarm & trip.	90-95^0C		
c.	No. of contacts	2		
d.	Current rating of each contact			

31.	Gas and oil actuated relay description data & range of settings, schematic diagram etc.				
32.	Type of pressure relief device & pressure at which it operates				
33.	Details of magnetic oil gauge	5 A at 240V AC/ 0.5 A at 220V			
34.	Particular of Bushings				
a.	Name of manufacturer				
b.	Type	Outdoor, Oil communicating type			
c.	Voltage rating – KV	HV-36 KV, LV-17.5KV			
d.	Visible power frequency voltage discharge test – KV	As per IS/IEC 60137 (Superseding IS:2099)			
e.	Dry power frequency withstand voltage for 1 minute	As per IS/IEC 60137 (Superseding IS:2099)			
f.	Wet power frequency withstand voltage for 30 minutes	As per IS/IEC 60137 (Superseding IS:2099)			
g.	Dry standard lightning impulse withstand volt-KVp	HV-170, LV-75			
h.	Creep age distance in air (mm) (protected and total)	25mm/KV			
i.	Recommended Gap Setting – mm	As per IS:3347			
35.	Rating				
a.	Rated Voltage	33KV			
b.	Rated Current	As per standard			
c.	Step Voltage	As per standard			
d.	No. of Step	16			
36.	Details of Winding	HV	LV		
a.	Type of Winding and material	Copper	Copper		
b.	Type of insulation class	Class A	Class A		

ANNEXURE-M2

MANDATORY PARTICULARS OF 33 KV OUTDOOR VCB SCADA COMPATIBLE VCB

S.No.	Specification	Desired Specification	Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
	Vacuum Circuit Breaker			
1.	Make	Siemens/ ABB/ L&T/ Schneider		
2.	Type	Porcelain-clad, Structure mounted		
3.	Reference Standard	IEC 62271		
4.	Arc quenching medium	Vacuum		
5.	No. of break / phase	One per phase		
6.	Rated voltage	33 KV		
7.	Highest voltage	36 KV		
8.	Frequency	50 Hz		
9.	Rated normal current (at 50 degrees ambient Temp)	1250A.		
10.	Breaking Capacity	25 KA for 3 sec		
11.	Making Capacity	62.5 KA		
12.	STC for 3 Sec.	25 KA		
13.	Insulation level	36 KV/70 KV/170 KV(P)		
14.	Minimum Creepage distance	900 mm		
15.	Temperature rise	As per IEC		
16.	Operating duty cycle	0-0.3 sec – CO-3min-CO		
17.	First pole to clear factor	1.5		
18.	Single-phase capacitor breaking capacity	As per IEC.		
19.	Cable charging breaking capacity.	As per IEC.		
20.	Operating mechanism	Motor wound spring charged stored energy with electrical control.		
21.	Anti pumping Relay	To be provided as per OEM / as per existing.		

ANNEXURE-M3

MANDATORY PARTICULARS OF 11 KV INDOOR SCADA COMPATIBLE VCB PANEL

S.No.		Desired Specification	Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
	11 kV Vacuum Circuit Breaker (3 Phase)			
1.	Make	**Siemens/ ABB/ L&T/ Schneider**		
2.	Type	Indoor panel type		
3.	Reference Standard	IEC 62271		
4.	Arc quenching medium	Vacuum		
5.	Rated voltage	11 KV		
6.	Highest voltage	12 KV		
7.	Frequency	50 Hz		
8.	Rated normal current (at 50 degrees ambient Temp)	630-1250A, as per site requirement		
9.	Breaking Capacity	25kA		
10.	Making Capacity	63kA		
11.	STC for 3 Sec.	31.5kA		
12.	Insulation level	As per IEC /IS		
13.	Minimum Creepage distance	As per IEC /IS		
14.	Temperature rise	As per IEC		
15.	Operating duty cycle	0-0.3 sec – CO-3min-CO		
16.	First pole to clear factor	1.5		
17.	Single phase capacitor breaking capacity	As per IEC.		
18.	Cable charging breaking capacity	As per IEC.		
19.	Minimum Pole to Pole clearance	As per IEC.		
20.	Anti-pumping Relay	To be provided as per OEM / as per existing.		

21.	**CURRENT TRANSFORMERS**	The requirement of ratio, VA capacity, class or accuracy, limit factor, etc. for resin cast CTs installed in different types of units are mentioned below.		
	Incoming Panel			
	Make	Automatic Electric / Precise / Kappa / CGL / Mehru / BHEL		
	Metering	800-400/5-5-5, 0.2S or as per site requirement		
	Protection	800-400/5-5-5, 5P, or as per site requirement		
	Protection	800-400/5-5-5, PS or as per site requirement		
	Outgoing Panel			
	Metering	400-200 /5-5, 0.2 or as per site requirement		
	Protection	400-200/5-5, 5P, or as per site requirement		
22.	Potential TRANSFORMERS	As per the site requirement Make: **Automatic Electric / Precise / Kappa / CGL / Mehru / BHEL**		

ANNEXURE-M4

MANDATORY PARTICULARS OF 33 KV OUTDOOR Motorized Bus Isolator

S. No.	Desired Specification		Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
1.	Main Switch			
2.	Service	Outdoor, 3 Phase		
3.	Applicable standard	DBCR		
4.	Pole	3 pole gang operators		
5.	Rated voltage nominal / maximum (kV)	33/36		
6.	Rated frequency	50 Hz		
7.	System earthing	Effectively earthed		
8.	Temperature rise	As per relevant IS/IEC		
9.	Insulation level impulse withstand voltage	As per relevant IS/IEC		
10.	1 minute power frequency withstand voltage	As per relevant IS/IEC		
11.	Rated current	1250 Amps		
12.	Short time current for 3 sec	31.5KA/ 25KA		
13.	Operating mechanism	Motor		
14.	Auxiliary voltage for control, interlock & indication	220V DC (80% to 110%)		
15.	Auxiliary voltage for Motor, heater, lamp & socket	415V, 3 phase, AC, 50Hz/220V, 1 phase, AC, 50Hz		
16.	Mounting structure	Upright on steel structure		
17.	Control	Local & Remote		
18.	Operating time	12 second or less		
19.	Earth Switch	Local & Remote (motorized & manual)		

ANNEXURE-M5

MANDATORY PARTICULARS OF CTs(33KV)

S. No.	Desired Specification		Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
1.	**Make:**	**Automatic Electric / Precise / Kappa / CGL / Mehru / BHEL**		
2.	Type of CT/Installation.	Single phase, Live/dead tank, oil filled, hermetically sealed, outdoor, self-cooled with junction box		
3.	Type of mounting	Pedestal type / Single phase Outdoor Dead Tank Type		
4.	System frequency	50 HZ		
5.	Rated voltage (KV rms)	33		
6.	Highest system voltage (KV rms)	36		
7.	Current ratio (A/A)	200-100/1-1-1, 400-200/1-1-1		
8.	Method of earthing	Effectively earthed		
9.	Rated continuous thermal current (A)	120 % of rated primary current		
10.	Acceptable limit of temperature rise	As per relevant IS/IEC		
11.	Insulation level impulse with stand voltage	As per relevant IS/IEC		
12.	1 minute power frequency with stand voltage	As per relevant IS/IEC		
13.	Rated short-time withstand current for I second at all ratios (KA rms)	25KA		
14.	Minimum Creepage Distance	As per relevant IS/IEC		
15.	Accuracy and Burden	0.2S/5P, 15 VA		
16.	Temperature Rise	As per relevant IS/IEC		

ANNEXURE-M6

MANDATORY PARTICULARS OF PTs (33 KV)

S. No.	Desired Specification	Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
1	The bidder shall provide 03 nos. (33000/√3)/(110/√3)V, 50 Hz, single-phase, outdoor type, Dual-core, 0.5 / 3P Class and suitable burden Potential Transformers (PTs) based on design calculation considering Smart non-linear damping resistor for mitigating the ferroresonance issue at site. Design calculations need to be provided by the contractor.		
2	Make: **Automatic Electric / Precise / Kappa / CGL / Mehru / BHEL**		

ANNEXURE-M7

MANDATORY PARTICULARS OF LAs (33 KV)

S. No.	Desired Specification		Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
	Nominal system voltage (KV)	33		
2.	Highest system voltage (KV)	36		
3.	System Neutral Earthing	NEE (Grounded Through Earthing Transformer)		
4.	Acceptable limit of temperature rise	As per relevant IS/IEC		
5.	Insulation level impulse with stand voltage	As per relevant IS/IEC		
6.	1 minute power frequency with stand voltage	As per relevant IS/IEC		
7.	Maxm. Continuous operating voltage (KVrms)	36		
8.	Rated Voltage (KV)	42		

9.	Nominal Discharge Current (KAp)	10		
10.	Line discharge class	2		
11.	Minimum Energy Discharge capability (KJ/KV)	5		
12.	Minimum creepage Distance acceptable (mm)	1100		
13.	Pressure Relief Class	To be tested in accordance with IEC		
14.	Rated Frequency (Hz)	50		
15.	System fault level (KA) for 3 sec	25 For 3 sec		

ANNEXURE-M8

Mandatory Items for Transformer Control and Protection Panel

S No	Transformer panel	Qty
1	Numerical IDMT relay with instantaneous over current, earth fault	1
2	Numerical Differential relay	1
3	Master Trip Relay	1
4	Auxiliary Relay for transformer protection WTI, OTI, Buchholz, MOG, PRVT etc.	4 / As per site requirement
5	Trip circuit supervision relay	1
6	Annunciator with test, accept, reset and mute push button and AC DC fail indication	1
7	Test terminal block for metering	1
8	Test terminal block for protection	1
9	Trivector meter	1
10	Ampere meter	1
11	Volt Meter	1
12	Frequency Meter	1
13	Ampere meter selector switch	1
14	Volt meter selector switch	1
15	TNC Switch	1
16	Indicating Lamp with R, Y, B (Supply indication) ON, OFF, Spring Charge, Auto Trip, Trip Circuit Healthy	As per requirement
17	Semaphore	1
18	Hooter for alarm, Trip and AC DC fail	3
19	MCBs	As per

		requirement
20	Socket 16A 3Pin 230V AC	1
21	Space Heater 100-Watt 230V AC	1
22	Thermo state Capillary 30-110 Deg. Changeover Cont. 1 NO+1NC	1
23	Tube Light-CFL 13 Watt with Fitting Compact mini	1
24	Panel Acce. Test Terminal Block 3PH 4 Wire	1
25	Limit Switch with push ROD open Execution type 1No+1NC	1
26	load Manager CL-1 with RS485 Aux 44-300V AC/DC 96 Sqmm	1
27	Power/VAF Meter CL-1 Aux 80-270V AC 96 Sqmm	1
28	EM Stop Push Button Red Turn to Release	1
29	Multi Protection Relay 48-110V DC with RS485	1
30	Voltage and frequency Protection Relay NOM 57-130V AC Aux 90-240V AC/250V DC with RS485	1
31	Voltage and frequency Protection Relay NOM 57-130V AC Aux 48-250V AC/DC with RS486	1
32	Aux Relay Double Element Aux 110V DC 2 NO Flush Mounting	4
33	Breaker Control Switch 25A 2P Spring Return 1-T 2-CL 0-N	2
34	Rotary Switch 6A 2P 2W with Off 60 Deg. 1-OFF-2	1
35	MF Transducer 3P4W CRT-/1A 4 AO 2 DO Aux 85-230V AC/DC	1

ANNEXURE-M9

Mandatory Items for Line / Bay Control and Protection Panel

S No	Line Panel	Qty
1.	Numerical IDMT relay with instantaneous over current, earth fault	1
2.	Master Trip Relay	1
3.	Trip circuit supervision relay	1
4.	Annunciator with test, accept, reset and mute push button and AC DC fail indication	1
5.	Test terminal block for metering	1
6.	Test terminal block for protection	1
7.	Trivector meter	1
8.	Ampere meter	1
9.	Volt Meter	1
10.	Frequency Meter	1
11.	Ampere meter selector switch	1
12.	Volt meter selector switch	1
13.	TNC Switch	1
14.	Indicating Lamp with R, Y, B (Supply indication) ON, OFF, Spring Charge, Auto Trip, Trip Circuit Healthy	As per requirement
15.	Semaphore	1
16.	Hooter for alarm, Trip and AC DC fail	3

17.	Auxiliary Relay	As per requirement
18.	MCBs	As per requirement
19.	Socket 16A 3Pin 230V AC	1
20.	Space Heater 100-Watt 230V AC	1
21.	Thermo state Capillary 30-110 Deg. Changeover Cont. 1 NO+1NC	1
22.	Tube Light-CFL 13 Watt with Fitting Compact mini	1
23.	Panel Acce. Test Terminal Block 3PH 4 Wire	1
24.	Limit Switch with push ROD open Execution type 1No+1NC	1
25.	load Manager CL-1 with RS485 Aux 44-300V AC/DC 96 Sqmm	1
26.	Power/VAF Meter CL-1 Aux 80-270V AC 96 Sqmm	1
27.	EM Stop Push Button Red Turn to Release	1
28.	Multi Protection Relay 48-110V DC with RS485	1
29.	Voltage and frequency Protection Relay NOM 57-130V AC Aux 90-240V AC/250V DC with RS485	1
30.	Voltage and frequency Protection Relay NOM 57-130V AC Aux 48-250V AC/DC with RS486	1
31.	Aux Relay Double Element Aux 110V DC 2 NO Flush Mounting	4
32.	Breaker Control Switch 25A 2P Spring Return 1-T 2-CL 0-N	2
33.	Rotary Switch 6A 2P 2W with Off 60 Deg. 1-OFF-2	1
34.	MF Transducer 3P4W CRT-/1A 4 AO 2 DO Aux 85-230V AC/DC	1

Note: The bidder should fill all mandatory Annexures. Equipment's Technical Specification of manufacturer must be attached with technical bid.

INSTITUTE WORK DEPARTMENT

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Schedule of Quantities

NAME OF WORK: **"Design, manufacturing, loading and unloading, transportation and SITC of 10 MVA 33/11 kV transformer including required electrical works for 33 kV & 11 kV Bays at IIT Roorkee**

Sl. No.	Item Description	Quantity	Units	Estimated Rate with GST & Cess in Rs. P	TOTAL AMOUNT With GST& Cess in Rs. P
1	2	4	5	6	54
1	SITC of 33/11 KV, 10 MVA, 3phase, ONAN, Copper Wound (Outdoor Type), step down Power Transformer with OLTC having taping +10% to -10% instep of 1.25% each along with RTCC panel with AVR complete with first filling of ISI marked transformer oil and all other fittings/accessories, as per IS 2026 and as per required technical specifications complete in all respect as mentioned in the tender documents.	1	Nos	10826132.43	10826132.43
2	SITC of 33KV,1250 Amp Bus Isolator Motorized as per required technical specifications complete in all respect as mentioned in the tender documents. Compatible and integrating with existing SCADA system (ABB-Hitachi make).	7	Nos	88844.96	621914.74
3	SITC of 33KV, 1250 Amp VCB (HT) panel as per required technical specifications complete in all respect as mentioned in the tender documents. Compatible and integrating with existing SCADA system (ABB-Hitachi make).	2	Nos	448489.24	896978.48
4	SITC of 33KV, 200-100/1-1-1 Amp, 0.2S/5P,15VA, CT with Junction Box as per required technical specifications complete in all respect as mentioned in the tender documents.	3	Nos	114880.58	344641.74
5	SITC of 33KV, 400-200/1-1-1 Amp, 0.2S/5P,15VA, CT with Junction Box as per required technical specifications complete in all respect as mentioned in the tender documents.	3	Nos	118803.69	356411.08
6	Design the improved version PTs as per site requirement, considering previous trends related to the failure of PTs, manufacturing, transportation, and SITC of 03 nos. (33000/√3)/(110/√3)V, 50 Hz, single-phase, outdoor type, Dual-core, 0.5 / 3P Class and suitable burden of Potential Transformers (PTs) based on design calculation considering Smart non-linear damping resistor for mitigating the ferroresonance issue at site. Design calculations need to be provided by the contractor.PT with Junction Box	3	Nos	363474.76	1090424.28
7	SITC of Control and relay panel for single transformer feeder as per required technical specifications complete in all respect as mentioned in the tender documents.	1	Nos	466366.24	466366.24

8	SITC of Control and relay panel for single Line feeder as per required technical specifications complete in all respect as mentioned in the tender documents.	1	Nos	441557.25	441557.25
9	SITC of 33KV, station class LA as per required technical specifications complete in all respect as mentioned in the tender documents.	3	Nos	19690.77	59072.30
10	SITC of 33KV, suitable Fuse set as per required technical specifications complete in all respect as mentioned in the tender documents.	1	Set	26909.36	26909.36
11	SITC of 11KV 800-1250 Amp VCB Incomer, as per required technical specifications complete in all respect as mentioned in the tender documents. Compatible and integrating with existing SCADA system (ABB-Hitachi make).	1	Nos	1210920.95	1210920.95
12	SITC of 11KV 800-1250 Amp VCB Bus Coupler, as per required technical specifications complete in all respect as mentioned in the tender documents. Compatible and integrating with existing SCADA system (ABB-Hitachi make).	1	Nos	1257080.85	1257080.85
13	SITC of 11KV 630-1250 Amp VCB Outgoing, as per required technical specifications complete in all respect as mentioned in the tender documents. Compatible and integrating with existing SCADA system (ABB-Hitachi make).	4	Nos	1166072.02	4664288.07
14	Supply and laying of Copper conductor, XLPE insulated, Un-armoured, PVC sheathed cable, 1100V grade, 2 core 2.5 mm2 on existing cable tray with M.S. clamps etc. of suitable size or as directed by the Engineer-In-charge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor as required etc.	150	Rm	214.12	32118.00
15	Supply and laying of Copper conductor, XLPE insulated, Un-armoured, PVC sheathed cable, 1100V grade, 4 core 2.5 mm2 on existing cable tray with M.S. clamps etc. of suitable size or as directed by the Engineer-In-charge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor as required etc.	200	Rm	319.16	63832.00
16	Supply and laying of Copper conductor, XLPE insulated, Un-armoured, PVC sheathed cable, 1100V grade, 10 core 2.5 mm2 on existing cable tray with M.S. clamps etc. of suitable size or as directed by the Engineer-In-charge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor as required etc.	100	Rm	676.70	67670.00
17	Supply and laying of Aluminium conductor, XLPE insulated, Armoured, PVC/XLPE sheathed cable, 11 KV, UE grade, 3 core 300 mm^2 at a depth of 1000 mm below ground level including excavation and refilling the trench over a cushion of 100 mm thick sand alround and protected with burnt bricks on sides and on top as directed by the Engineer-In charge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor by clamps etc. The cable shall be laid by boring the road as required and compaction of soil & repairing of surface in prior shape shall be done properly.	300	Mtr	4255.13	1276539.00

18	Supply and laying of Aluminium conductor, XLPE insulated, Armoured, PVC/XLPE sheathed cable, 33 KV grade, 3 core 300 mm² at a depth of 1000 mm below ground level including excavation and refilling the trench over a cushion of 100 mm thick sand alround and protected with burnt bricks on sides and on top as directed by the Engineer-In charge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor by clamps etc. The cable shall be laid by boring the road as required and compaction of soil & repairing of surface in prior shape shall be done properly.	50	Mtr	4971.22	248561.00
19	Supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3 core 300 mm², XLPE aluminium conductor cable of 11 kV (UE) grade as required.	6	Nos	3875.82	23254.95
20	Supplying and making outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3 core 300 mm², XLPE aluminium conductor cable of 11 kV (UE) grade as required.	6	Nos	6758.26	40549.56
21	Supplying and making outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3 core 240-300 mm², XLPE aluminium conductor cable of 33 kV grade as required.	2	Nos	76940.86	153881.71
22	Making earth point with boring 18 Mt. deep with 80 mm dia G.I. pipe “B” class ISI. The top pipe 6 mt. length will be duly holed across the pipe at a distance of 15 cm apart in 4 rows. Each joint should be welded/brazing, and the 30 cm x 30 cm CI / HDPE FRP chamber masonary housing should be completed as per the direction of the site in charge.	4	Nos	28496.14	113964.56
23	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure/ HDPE FRP Chamber with cover plate having locking arrangement and watering pipe of 2.7-Meter-long etc. with charcoal/ coke and salt as required.	10	Nos	8024.43	80244.27
24	Supplying and laying 32 mm X 6 mm G.I strip as strip earth electrode, including connection/ terminating with G.I. nut, bolt, spring, washer etc. as required.	600	mtr	209.42	125650.16
25	Supplying and laying 50 mm X 5 mm Copper strip as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required.	300	mtr	2269.22	680766.13
26	Supply of High Di-electric strength Insulating Rubber Chequered mat up to 33 kV , size 1 mtr x 2 mtr x 3 mm thick.	8	Nos	3267.35	26138.80
27	Structural steelwork riveted, bolted or welded in built-up sections, trusses, and framed work, including cutting, hoisting, fixing in position, and applying a priming coat of approved steel primer	200	P/kg	142.16	28432.64

	all complete.				
28	Providing Brickwork with common burnt clay F.P.S. (non-modular) bricks of class designation 7.5 in foundation and plinth in Cement mortar 1:6 (1 cement: 6 coarse sand)	4	Cum	7583.72	30334.89
29	12 mm Cement Plaster of Mix 1:6 (1 Cement: 6 Fine Sand)	20	Sqm	354.45	7089.02
30	Earth work in excavation in soft soil by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.	8	CuM	276.78	2214.22
31	Providing and laying in position cement concrete of 1:1.5:3 specified grade, excluding the cost of centering and shuttering.	8	CuM	8868.83	70950.61
32	Providing and laying in position cement concrete of 1:4:8 specified grade, excluding the cost of centering and shuttering.	8	CuM	7243.20	57945.60
33	Steel reinforcement for R.C.C. work, including straightening, cutting, bending, placing in position, and binding, is completed up to the plinth level and thermo-mechanically treated bars of grade Fe-500D or more.	200	Kg	114.68	22935.38
34	Designing, execution and commissioning of the electrical panel room in R.C.C. framed structure as per direction of EIC which will including floor height 3.60 meters or as per site requirement complete in all respects.	50	Sqmtr	24730.00	1236500.00
				Total Amount	**26652290.26**

Note:

1. **The vendor will arrange safety gear, such as safety shoes, safety helmets, gloves, etc., for the manpower deployed at his own cost. If the manpower is found not wearing safety gear, a penalty of Rs. 200 per violation will be imposed by the EIC.**