

**INSTITUTE WORKS DEPARTMENT  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

**E-TENDER DOCUMENT**

**For**

**“SITC of 1000 kVA 11/0.433 kV Transformer along with required HT/LT switchgear for providing power supply to the clean room project in Physics Deptt.. 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/Phy/115

Dated: 28.11.2024

**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 registered with CPWD / state PWD / MES or working contractors of IIT Roorkee 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)
<b>SITC of 1000 kVA 11/0.433 kV Transformer along with required HT/LT switchgear for providing power supply to the clean room project in Physics Deptt. at IIT Roorkee</b>	<b>Rs.124.00 Lacs (Including GST@ 18% &amp; 1% BOCWW Cess</b>	<b>04 Months</b>

- Interested eligible Bidders may obtain further information from IIT Roorkee website: [www.iitr.ac.in](http://www.iitr.ac.in) (<http://mm.iitr.ac.in/mmweb/tenders>) or from Central Public Procurement Portal (CPPP) <https://eprocure.gov.in/eprocure/app>.
- Intending bidders are advised to visit IIT Roorkee website [www.iitr.ac.in](http://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	<b>28.11.2024 (17:00 Hrs)</b>
6	Document Download / Sale Start Date	<b>28.11.2024 (17:00 Hrs)</b>
7	Pre-bid Meeting	<b>NA</b>
8	Seek Clarification Start Date	<b>28.11.2024 (17:00 Hrs)</b>
9	Seek Clarification End Date	<b>04.12.2024 (17:00 Hrs)</b>
10	Bid Submission Start Date	<b>06.12.2024 (17:00 Hrs)</b>
11	Bid Submission Closing Date	<b>19.12.2024 (12:00 Hrs)</b>
12	Bid Opening Date	<b>20.12.2024 (12:00 Hrs)</b>
13	Tender Fee (Exemption not allowed)	<b>Rs.1000.00+18% GST</b> (non-refundable). Payment of Tender Fee can be made by RTGS, NEFT in below mentioned account no. 1. Account Name- <b>NON MHRD GOVERNMENT</b>

		<p><b>FUND IIT ROORKEE</b></p> <p>2. Address- <b>IIT Roorkee, Haridwar.</b></p> <p>a. Account No.- <b>00000032685865515</b></p> <p>4. Account Description- <b>Regular SB Chq-Entities.</b></p> <p>5. Branch- <b>IIT Roorkee,</b></p> <p>6. CIF No- <b>86531323246</b></p> <p>7. IFS Code. - <b>SBIN0001069,</b></p> <p>8. MICR Code. - <b>247002094</b></p>
14	EMD (2%) (Exemption not allowed)	<p><b>Rs. 2,50,000.00/-</b> 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. &amp; 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.</p> <p>1. Account Name- <b>NON-MHRD GOVERNMENT FUND IIT ROORKEE</b></p> <p>2. Address- <b>IIT Roorkee, Haridwar.</b></p> <p>a. Account No.- <b>00000032685865515</b></p> <p>4. Account Description- <b>Regular SB Chq-Entities.</b></p> <p>5. Branch- <b>IIT Roorkee,</b></p> <p>6. CIF No- <b>86531323246</b></p> <p>7. IFS Code. - <b>SBIN0001069,</b></p> <p>8. MICR Code. - <b>247002094</b></p>
15	<b>Performance Guarantee (5%)</b>	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	<p><b>Documents to be uploaded on CPP Portal</b></p> <p><b>(<a href="http://eprocure.gov.in/eprocure/app">http://eprocure.gov.in/eprocure/app</a>)(related to eligibility criteria) on or before due date of submission of tender.</b></p>	<p>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.</p> <p>2) Self-certified copy of work orders along with work completion certificate as per eligibility criteria.</p> <p>3) Proof of online deposit of tender fee and EMD.</p> <p>4) Turnover certificate from CA preferably with UDIN Number, GST registration certificate, PAN Card, ESI registration certificate &amp; EPF registration certificate and Solvency certificate as per the NIT.</p> <p>5) Project-specific Authorization certificate from OEMs for the items as mentioned in the scope of work (only for</p>

		Transformer and RMU and ACB Panels) and undertaking from concerned OEM on the letterhead for confirmation of data as per BoQ and technical specifications. 6) Valid Electrical Contractor License Class-A, CPWD / state PWD / MES registration certificate or working contractors of IIT Roorkee. 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 Annexures M1 to M2.
20	Price Bid	To be uploaded only on CPP Portal ( <a href="http://eprocure.gov.in/eprocure/app">http://eprocure.gov.in/eprocure/app</a> ) in excel sheet.
21	Address for communication	<b>Executive Engineer (E/M), Institute Works Department, James Thomson Building, IIT Roorkee, Roorkee-247667 (India), Tel. No. 01332-284955 / 4858</b>
22	Email Address	<a href="mailto:tntiwari.eem2019@iitr.ac.in">tntiwari.eem2019@iitr.ac.in</a> , <a href="mailto:pradeepelectenggaad@iitr.ac.in">pradeepelectenggaad@iitr.ac.in</a>

**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 respects, 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 bidder's reply, 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 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 institute's decision 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 registered with CPWD / state PWD / MES or working contractors of IIT Roorkee 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 **“SITC of HT/LT switchgear for providing power supply clean room project in physics deptt. 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 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) The bidder should have registered with the CPWD / state PWD / MES or working contractors of IIT Roorkee.
- (f) Bidder shall provide the Project specific Authorization certificate from OEMs for the items as mentioned in scope of work (only for Transformer and RMU and ACBs) 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 can be seen / downloaded from IIT Roorkee website: [www.iitr.ac.in \(http://mm.iitr.ac.in/mmweb/tenders\)](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 for those bidders whose bids are found technically qualified.
9. The bid submitted shall become invalid, and the cost of the 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 shall be allowed if there is any misunderstanding. 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. The cost of the site visit shall be borne by the bidder.
11. All tenders in which any of the prescribed conditions is not fulfilled, or any condition, including that of the 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 the 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 Specifications and Special conditions, 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 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 the 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 into a 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 the bid validity period or if the successful Bidder fails to sign the contract / fails to deposit the 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. The Indian Institute of Technology Roorkee shall reject a bid valid for a shorter period as non-responsive.
10. **Language of Bid:** The document shall be written in English/Hindi. The total amount should be written in the same language.
11. **Document comprising the E-Tender:** No page of this tender document shall be removed, and the set must be submitted as it is. Each page of the tender document form must be signed by the Bidder and 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 work as described in the priced Schedule of Quantities submitted by the Bidder.
- 12.2 The tender submitted on behalf of the 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 it 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 the contract, drawings, specifications, special conditions of the contract, etc. The forms of the tender are to be filled out 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 the 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 initiated 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.

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**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 31<sup>st</sup> 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 the 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 therefrom. 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 the 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 the 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 advise 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 the 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 the Owner's 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**

**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 irrevocable Bank 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 of the 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 us within 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**

<b>S.No.</b>	<b>Materials/ Equipments</b>	<b>Manufacturer/ Make</b>
<b>A</b>	<b>I.E.I., MCBDB &amp; MCB, Cables &amp; Wires</b>	
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 cable 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)( <b>Note:</b> 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>B</b>	<b>Fans &amp; Fitting</b>	
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
<b>C</b>	<b>Street Lighting</b>	
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 Junction Box/ Enclosure	Hensel/ Spelsberg/ Neptune- Bals/ Cape Electric

4	XLPE insulated PVC Sheated Alum./ Copper conductor Armoured cable of 1.1KV Grade	Finolex/ Universal/ Polycab/ Havells/ Grandley/ Gemscap/ RPG Cable/ KEI/
<b>D</b>	<b>Sub Station Equipments</b>	
1	LT Panel/ Meter Panel Board/ Outdoor Feeder Pillar/ APFC Panel (less than 200 kVAR)/ Bus Ducts	Tricolite Electrical 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
<b>E</b>	<b>DG Sets</b>	
1	Diesel operated 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.**

(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:**

**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.

<p>Verification by Bank (one time only)</p> <p>Information given at 1,4,5,6&amp;7 verified by Bank</p> <p>Seal and Signature of the Bank</p>	<p>Seal and Signature of the Firm</p>
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# TECHNICAL SPECIFICATIONS



## **A. General**

### **1. SCOPE:**

- i. This specification covers design, engineering, manufacture, assembly, testing at the manufacturer's works, supply, delivery at the site, and unloading (But, in case Plinth is not ready, the supplier shall unload the transformer within Sub-station premises at a suitable location as per direction of site-in-charge of the customer), handling, storage, installing, testing and commissioning at site of Distribution Transformer, 11 kV RMU 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 ambient temperature should be 50 Degrees C.
- iii. All components/items to be supplied against this contract shall conform in all respects to the relevant Indian Standard Specifications / IEC Standards, with the 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 the 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 nameplate with full details of manufacturers, capacities, and other details as specified in the relevant ISs. The purchase order No. The date and words "IIT Roorkee" must be etched on the nameplate.
- v. This work also includes the construction of the suitable foundations of transformers, and other items per EIC's direction for efficient and trouble-free operations. Further, other required erection and civil works like the foundation of equipment, making suitable structures, cutting holes, demolishing the existing structure, etc. (as per requirement and as per direction of EIC) shall be within the scope of the bidder.
- vi. **04 nos. 800kVA, 11/0.433 kV Distribution Transformers are installed and working at the site.** The contractor must install and commission one additional 1000kVA, 11/0.415 kV Distribution Transformer along with the required infrastructure. The bidder shall be responsible for integrating the new system with the existing one, including the SCADA system (of Hitachi/ ABB make), without any additional cost implication to the 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 the premises.
- viii. The bidder shall ensure all safety protocols are followed 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. Ratings, Diagrams, property plates, and labeling shall be provided for each piece of equipment.
- xi. Any other requirements not explicitly covered here but necessary for successful commissioning of the Substations are also within the scope of the Contract. The manufactured equipment should conform to the relevant standards and have the highest engineering design and workmanship quality.
- 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, and the purchaser or his duly authorized agency shall have access to the supplier's works at any time during working hours to inspect the manufacture of the material, equipment, etc., and the supplier shall provide the necessary facilities for inspection.
- xiii. Within 15 days after the date of issue of the contract bond, the supplier shall furnish two (02) copies of each of the dimensional drawings, technical specifications sheets, schematic drawings, wiring drawings, and other required documents for the purchaser's approval.
- xiv. The 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 to the purchaser.
- xv. Approval of drawings/work by the purchaser shall not relieve the supplier of his responsibility and liability for ensuring the correctness and correct interpretation of the drawings for meeting the requirements of the contract, the latest revision of application standards, rules, and codes of practices.
- xvi. It needs to be noted that all equipment shall conform in all respects to high standards of engineering, design, workmanship, and the latest revisions of relevant standards at the time of order, and the purchaser shall have the power to reject any work or materials which, in his judgment is not in complete accordance in addition to that.
- 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 the Distribution Transformer and associated switchgear/accessories, shall be guaranteed 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/drawings along with the Warrantee certificate to EIC.
- xx. Instruction Booklets - Operating, testing, commissioning, and maintenance instructions in English 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 the 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 transport and storage and ensure correct dispatch to the destination.
- xxii. All the supplied plant/apparatus/equipment shall comply in all respects with the requirements of the Indian Electricity Act 2003 and Indian Electricity Rule 2003/IS and the latest amendment thereof during the execution of the contract, wherever 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.
  - The Bidder shall maintain test certificates conducted during manufacture. These shall be produced for verification as and when the purchaser desires them.
- xxiv. The following documents are 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.

## **1000 kVA, 11/0.433 KV, 3 PH DISTRIBUTION TRANSFORMER**

### **1. SCOPE:**

- i. This specification covers design, engineering, manufacture, assembly, testing at the manufacturer's works, supply, delivery at the site, and unloading (But, in case Plinth is not ready, the supplier shall unload the transformer within Sub-station premises at a suitable location as per direction of site-in-charge of the customer), handling, storage, installing, testing and commissioning at the site of **1000 kVA, 11/0.433 KV, 3 PH DISTRIBUTION 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 with Specific Technical parameters, and suitable for outdoor installation.
- iii. The rated capacity and voltage of the transformer shall be of an outdoor type.
- iv. **The transformers should be Type Tested (any Government-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 transformers with similar capacity within the last 5 years from the date of NIT shall have to be submitted by the contractor before execution of work.**

### **2. STANDARD:**

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

i)	IS:2026	- Specification for Distribution 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	- Distribution 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 Distribution 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 Distribution 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 under working conditions on the system, including those due to short circuits.
- 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 the class most suitable for working under specified conditions. 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 that 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 outdoor 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, and 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 of accidental short circuits 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 that 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 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 of uniform thickness, and free from defects. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the wire.

viii) Surfaces that 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, and fuses contained in any cubicle or marshaling kiosk.
- ii) Descriptive labels for mounting indoors or inside cubicles and kiosks shall be of a material that will ensure the permanence of lettering. A matt or satin finish shall be provided to avoid dazzle from reflected light. Labels mounted on a 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 that have received rust preventive treatment or that can be stuck with Araldite also.
- v) Labels should have sufficient lettering size for normal reading.

#### **4.5 Temperature Rise:**

The transformer shall be capable of operating continuously at its normal rating without exceeding temperature rise and hot spot limits as specified in the SCHEDULE of Technical Particulars.

#### **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 short circuit's designed time period will be 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 CI—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 outdoor installation and shall be provided with conservator's vessels. The type of cooling shall be as stated in the relevant specifications.

#### **4.8 Continuous Maximum Rating and Overloads:**

- i) Transformers shall comply regarding 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 the 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  $\pm 10\%$  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 to vary 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 a frequency variation of  $\pm 3\%$  from normal 50 C/S without exceeding the 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 with its associated transmission line.
- ii) All Transformers shall be capable of withstanding without damaging 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.

<b>Rating</b>	<b>1000 kVA, 11/0.433 kV</b>
Total losses @ 50% Load at rated voltage & frequency kW (MAX) 75° C	2.62 kW (max.)
Total losses @ 100% Load at rated voltage & frequency kW (MAX) 75° C	7.0 kW (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 the core assembly's tender, design, and details, including the constructional details, core diameter, net/gross sectional area of the core assembly, etc. The information must also be given with respect to voltages per turn at the principal tap for normal voltages. The loss curves for the type /grade of steel laminations used for the core shall also be provided along with the tender documents.
- iii) The bidder shall state no load or load loss at rated voltage and frequency; 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 Tank:**

The tank's exterior and other steel surfaces exposed to the weather shall be thoroughly cleaned, and a priming coat of zinc chromate shall be applied. The second coat shall be oil- and weather-resistant, preferably of a distinct color from the prime and finish coats. The final coat shall be glossy, oil, and weather-resisting, non-fading paint of a specified shade. The interior of the tank shall be cleaned by shot blasting and painting with two coats of heat-resistant and oil-insoluble paint.

- a) Steel bolts and nuts exposed to the atmosphere shall be galvanized.
- b) Unless otherwise stated, the tank, together with radiators, conservator, bushings, and other fittings, shall be designed to withstand without permanent distortion the following conditions:
- c) A full vacuum of 760 mm of Hg is used to fill oil with a vacuum.
- d) Internal gas pressure of 0.35 Kg/cm<sup>2</sup> (5 lbs/sq.in) or as per standard with oil at operating level.
- e) The tank cover shall be suitably sloped so that it does not retain rainwater.
- f) The material used for gaskets shall be cork neoprene or approved equivalent.

**4.16 Core:-**

- a) A transformer shall be double wound, core type with low loss, nonaging, high permeability PRIME GRADE, CRGO with M4 Grade or Better, perfectly insulated and clamped to minimize noise and vibrations. The following should be Mandatory for any Manufacturer:-
- b) The transformer shall be of BOLTLESS core design
- c) Core shall be purchased Directly from the Manufacturer or from their accredited Marketing organization of Repute & not through any agent.
- d) Stage inspection of the core may be done at the manufacturer's premises & inspection call shall be given with the following Documents
  - i. Invoice of the supplier
  - ii. Mill's test certificate
  - iii. Packing list
  - iv. Bill of landing & Bill of Entry certificate by customs
- e) Transformer manufacturers should have in-house core cutting facilities for proper control & monitoring of quality & to avoid mixing of Prime core with Second-grade/defective core materials. Transformer Manufacturers should have an in-house slitting Machine so that; the core is cut to width & stacked with a minimum air gap, thus ensuring the Burr level is less than 10 Microns.
- f) Core shall be procured from one of these reputed Manufacturers – Posco / Nippon/ Novex/ Ak Steels.
- g) The insulation structure for the core-to-bolts and core-to-clamp plates shall be such as to withstand a voltage of 2000V for one minute.

#### **4.17 WINDINGS:-**

- a) Winding shall be made with 99.9% pure electrolytic grade copper, insulated with thermally upgraded paper (Insulation Class A / Conductor Inter turn insulation Class E). The HV & LV winding should be able to withstand thermal and mechanical stress in the event of a short circuit.
- b) Winding shall be carried in an accessible area
- c) The completed core and coil assembly shall be dried in a vacuum and shall be immediately impregnated with oil after the drying process to ensure the elimination of air and moisture within the insulation.

#### **4.18 Oil:-** Transformer oil shall be as per IS 335.

#### **4.19 Temperature Indicator**

One set of winding temperature indicators with the necessary current transformer, heating coil, and a detector element and one set of oil temperature indicators with maximum reading pointer shall be mounted locally so as to be readable at a standing height from ground level. Each of the above indicators shall be provided with the necessary contacts for alarm and trip.

#### **4.20 Temperature Rise:** As per IS 1180

#### **4.21 Buchholz Relay**

The Buchholz relay shall be provided with two floats and two pairs of electrically separate contacts for alarm and trip. The relay shall have a facility for testing by injection of air by hand pump and with cock for draining and venting of air. The location of the relay shall be such that all rising gas will readily reach it.

#### **4.22 Bushings**

- i. All bushings shall be homogenous, solid porcelain oil commissioning type, uniformly glazed, free from blisters, burns, and other defects, and furnished with suitable terminal connectors of adequate capacity. The bushings shall be located so as to provide necessary electrical clearances between phases and phases to ground as specified in relevant standards.
- ii. Bushings rated for 400A and above shall have non-ferrous flanges and hardware.
- iii. All bushings shall have puncture strength greater than the dry flashover value.

- iv. Neutral CTs shall be furnished with secondary leads wired to the terminal blocks. The terminals for CT secondary leads shall have a provision for shorting. The arrangement shall be such that the CT can be removed from the transformer without removing the tank cover.

#### **4.23 Terminal Arrangement**

- i. Low voltage terminals of Power transformer shall be brought out to bushing inside the Cable Box
- ii. High voltage terminals of the Power transformer shall be in arrangement to the connection of the Cable inside the cable box
- iii. The cable box shall be suitable for cable termination kits and shall be self-supporting, weather proof, air filled type, complete with all hardware such as gland plate, brass glands, tinned copper lugs, armour clamps etc.

#### **4.24 Marshalling Box**

- i. A sheet steel weatherproof marshaling box of IP 55 construction shall be mounted on the transformer tank and accommodate all auxiliary devices except those that must be located directly on the transformer. All terminal blocks for external cable connections shall be located in this box. The terminal blocks shall be ELMEX 10 mm<sup>2</sup> or approved equal.
- ii. The marshaling box shall have the following as a minimum
  - a. Load disconnect switch for incoming power supply for auxiliaries.
  - b. All outgoing connections from transformer viz. Buchholz relay, temperature indicators, fault contacts for the annunciation system, etc.
  - c. Wiring and termination points of the following trip contacts for remote alarm and trip are individually wired.
    - Winding temperature high / very high
    - Oil temperature high / very high
    - Buchholz relay Alarm / Trip
    - Oil level low
- iii. A cubicle illumination lamp with a door switch, a space heater with a thermostat, and an ON/OFF switch shall be provided.
- iv. The marshaling box shall be designed to facilitate external cable entry from the bottom. Removable gland plates shall be furnished with double compression-type brass cable glands.
- v. Sufficient space shall be provided to avoid sharp bending and for easy cable connection. A minimum space of 200 mm from the gland plate to the nearest terminal block shall be provided.
- vi. Wiring shall be done with HR PVC 650 V grade wires. The wire size for CT circuits shall be 4 mm<sup>2</sup> copper, and for other circuits, it shall be a minimum of 2.5 mm<sup>2</sup> copper. Not more than two (2) wires shall be connected to a terminal. 10% spare terminals shall be provided.
- vii. All devices and terminal blocks within the marshaling box shall be identified by symbols corresponding to those used in applicable schematic or wiring diagrams.

#### **4.25 Grounding**

- i. Two grounding pads on the opposite sides of the tank shall be provided to connect the Switchyard ground mat for each transformer. Grounding pads shall have a clean, buffed surface with tapped holes. M10 G.I. bolts, nuts, and a spring washer shall be provided.



- ii. 2 Nos. Ground terminals shall also be provided on the marshaling box, cable box & OLTC panel to ensure effective earthing.
- iii. The Neutrals of the windings shall be brought out through neutral bushings at a suitable location. The neutrals shall be suitable for connecting 75x10 mm Copper flat.
- iv. For conductivity of earth connection, all gasketed joints shall be provided with a minimum of two nos. of copper strips of adequate size.

#### **4.26 ON Load Tap Changing Mechanism**

- i. Should comprise of 16 Steps: +5% to -15% @ 1.25% Each
- ii. RTCC & AVR to be supplied along with the OLTC
- iii. OLTC shall be as per the following
  - a) The OLTC gear shall be designed to successfully complete tap changes for the maximum current to which the transformer can be loaded, i.e., 150% of the rated current. Devices shall be incorporated to prevent tap change when the through current is in excess of the safe current that the tap changer can handle. The OLTC gear shall withstand through fault currents without injury.
  - b) When a tap change commences, it shall be completely independent of the operation of the control relays and switches. Necessary safeguards shall be provided to allow for failure of the auxiliary power supply or any other contingency that may result in the tap changer movement not being completed once it is commenced.
  - c) Oil in compartments containing the making and breaking contacts of the OLTC shall not mix with oil in other OTC compartments of the OLTC or with transformer oil. A pipe shall convey gases released from these compartments to a separate oil conservator or a segregated compartment within the main transformer conservator. An Oil surge relay shall be installed in the above pipe. The conservator shall be provided with a prismatic oil level gauge.
  - d) Oil in compartments of OLTC that do not contain the make-and-break contacts shall be maintained under the conservator's head by valve pipe connections. Any gas leaving these compartments shall pass through the Buchholz relay before entering the conservator.
  - e) Oil-filled compartments shall be provided with a filling plug, drain valve with plug, air release vent, oil sampling device, and inspection opening with gasket and bolted cover with lifting handles.
  - f) OLTC driving mechanism and its associated control equipment (local) shall be mounted in an outdoor, weatherproof cabinet with IP 55 protection, which shall Include: -
    - Driving motor (415V, 3-phase, 50 Hz. AC squirrel cage).
    - Motor starting contactor with Motor Protection Circuit Breaker, isolating switch, and HRC fuses.
    - Control switch: Raise/off/lower (spring return to normal type).
    - Remote/local selector switch (maintained contact type).
    - Mechanical tap position indicator showing rated tap voltage against each position and resettable maximum and minimum indicators.
    - Limit switches to prevent motor over-travel in either direction and final mechanical stops.
    - Brake or clutch to permit only one tap change at a time on manual operation.
    - Emergency manual operating device (hand crank or hand wheel).
    - A five-digit operation counter.
    - Electrically interlocked reversing contactors (preferably also mechanically interlocked).
    - 240V, 50 Hz. AC space heater with switch and HRC fuses.

- Interior lighting fixture with lamp door switch and HRC fuses.
  - Gasketed and hinged door with locking arrangement.
  - Terminal blocks, internal wiring, earthing terminals, and cable glands for power and control cables.
  - Necessary relays, contactors, current transformers, etc.
- f) Control requirements for OLTC: The following electrical control features shall be provided:
- Positive completion of load current transfer, once a tap change has been initiated, without stopping on any intermediate position, even in case of failure of external power supply.
  - Only one tap changes from each tap change impulse even if the control switches or push button is maintained in the operated position.
  - Cut off of electrical control when manual control is resorted to. Cut-off of a counter impulse for a reverse tap change until the mechanism rests and resets the circuits for a fresh operation.
  - Cut off the electrical control when it tends to operate the tap beyond its extreme position.
- g) Automatic Control of OLTC: Automatic OLTC control shall include the following items:
- Voltage setting device.
  - Voltage sensing and voltage regulating devices.
  - Line drop compensator with adjustable R and X elements.
- h) Automatic Control of OLTC: Automatic OLTC control shall include the following items:
- Voltage setting device.
  - Voltage sensing and voltage regulating devices.
  - Line drop compensator with adjustable R and X elements.
  - Timer 5-25 seconds for delaying the operation of the tap changer in the first step for every tap change operation.
  - Adjustable dead band for voltage variation.

i) **RTCC Panel:**

The OLTC remote control equipment shall be suitable for a 30V DC supply and housed in an indoor sheet cubicle in a remote control room. The OLTC control panel shall comprise rigid welded structural frames made of structural steel section or of pressed and formed cold rolled steel, and frame enclosures, doors, and partitions shall be of cold rolled steel of thickness 2 mm. Stiffeners shall be provided wherever necessary. All doors, removable covers, and plates shall be gasketed with neoprene gaskets. The panel shall be dust, weather, and vermin proof, providing a degree of protection of IP54. The color of the finish shade for the interior and exterior shall be Powder Coated RAL7032, respectively.

Earthing bus shall be of 25 x 6 mm copper.

Control switch: Raise/Off/Lower

(spring return to normal type)

Auto/manual selector switch:

(Maintained contact type)

Tap position indicator:

1) **Facia type alarm annunciator with “accept” and “lamp test” facilities.**

- a. A.C. supply failure
- b. Drive motor auto tripped
- c. Tap change delayed

2) **Necessary auxiliary relays**

3) **Lamp indications for:**

- a) Tap change in progress
- b) Lower limit reached
- c) Upper Limit reached
- d) 4) Cable glands for power and control cables
- e) 5) 240 V rated panel space heater with ON-OFF switch
- f) 6) Fluorescent-type interior lighting fixture with lamp and door switch
- g) HRC fuses
- h) Terminal blocks
- i) Internal wiring
- j) Earthing terminal
- k) Supply ON Indication Lamp.
- l) Labels for Accessories.
- m) Automatic Voltage Regulating Relay.
- n) Heater Switch (Rotary Type)
- o) Control Supply Switch (Rotary Type)
- p) Hooter for Facia annunciator (230V AC)
- q) Time Delay Relay for ‘Tap Change Delayed’ (110V AC)
- r) H.V. Voltmeter (Digital Type)
- s) H.V. Voltmeter Selector Switch (Rotary Type)
- t) L.V. Voltmeter (Digital Type)
- u) L.V. Voltmeter Selector Switch (Rotary Type)
- v) PT for AVR.
- w) **Tap the changer Counter to register**

**Transformer Manufacturers must supply sensors along with a supply transformer and should be of the same make for better integration with SCADA in the future.**

**4.27 Valves**

- i. Valves shall be of forged carbon steel above 50 mm and of gun metal for sizes upto 50mm. They shall be of full way type with screwed ends. They shall be opened by turning counter clock-wise when facing the hand wheel. There shall be no oil leakage when the valves are in closed position.
- ii. Every valve shall be provided with open/close position indicators. The valves shall be suitable for pad locking in open/close positions. All screwed valves shall be furnished with pipe plugs for protection.
- iii. All valves shall be provided with flanges with machined faces drilled to suit the applicable requirements.

- iv. Oil-tight blank flanges shall be provided for the following.
  - valves opening to the atmosphere.
  - for each connection for use when any radiator is detached.
- v. The bidder shall supply any special radiator valve tools required.

#### **4.28 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.

##### **4.28.1 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 vector relationship
- iv) Measurement of No-Load Loss and No-Load Current at 90, 100 and 110 percent rated voltage.
- 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. IR value 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 per CBIP 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.

**4.28.2 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.

#### **4.29 DOCUMENTATION:**

##### **a) General**

- 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.
- 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:**

- 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:
  - Complete identification, where applied, duration and transformer.
  - Method of application, where applied, duration and interpretation of results for each test.

##### **c) Test on Associated Equipment:**

- 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:**

- 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.

#### **4.30 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 for extended 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 with the 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 during transport.

- 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.

#### **4.31 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 as per 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 atmo seal, supporting bracket or structure and filling hole and gap and drain in cock.
- ii) Oil level gauge with 100°C, 300°C, 600°C and 900°C 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.
- xlid) Tank earthing terminals – 2 Nos.
- xlid) 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.
- xliv) 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.
- xlviid) Oil filling instruction plate shall be provided at i) conservator body, ii) tank body along with rating and diagram plate.
- xlviid) 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.

**4.32 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.

**4.32.1 LOSSES: Losses shall be as follows: -**

- a. Respective Current density & Flux Density shall be so as to suit the above required No load & loss levels.
- b. All the measurements of losses shall be carried out by digital meters of class 0.5 or better accuracy and should be certified by the manufacturer. If the losses measured are found to be out of the tolerance band as stated in the Standard and guaranteed losses declared by the manufacturer, the same shall be attributed to the manufacturer as per the capitalization formula till the end of the warranty period. In extreme conditions, the customer has absolute rights to reject the lot and terminate the contract of the vendor
- c. One transformer of each rating, selected randomly from the lot, shall be sent for measurement of losses, declared by the vendor (on the datasheet) at a third party / any NABL-accredited lab. In case of loss, figures deviate more than the tolerances specified in IS 1180; the purchaser reserves the rights to terminate the contract of the vendor

**4.32.2 REJECTION**

- a. PURCHASER may reject any transformer if, during tests or service, any of the following conditions arise:
- b. No load loss exceeds the guaranteed value greater than the tolerance limit mentioned in IS1180
- c. Load loss exceeds the guaranteed value greater than the tolerance limit mentioned in IS1180
- d. Impedance value differs the guaranteed value by  $\pm 10\%$  or more
- e. Winding temperature rise exceeds the specified value by 5°C
- f. Transformer fails on impulse test
- g. Transformer fails on power frequency voltage withstand test
- h. Transformer is proved to have been manufactured not in accordance with the agreed specification.
- i. The PURCHASER reserves the right to retain the rejected transformer and take it into service until the SELLER replaces the defective transformer with a new acceptable transformer at no extra cost to the PURCHASE.

## LT SWITCHGEAR PANELS

### Scope of Work:

This specification covers design, fabrication (after approval of drawing from IIT Roorkee), transportation, loading, unloading, dismantling of existing panel (if required), shifting of panel (if required), assembling, wiring, testing, packing, forwarding, delivery at site, installations and testing of 440V LT Panels including accessories complete in all respect. All panels should be CPRI approved.

All accessories required for normal operation of panels are deemed to be considered as a part of the contractor's scope of supply. It is not the intent to specify completely herein, all details of design and construction of the LT Panel. However, the LT Panel shall conform in all respects to high standard of engineering, design, testing and workmanship.

### Construction:

The panel shall be fabricated out of CRCA / Alu. Zinc sheet steel of 2 mm thick for frame work so as to meet impact strength requirement of IK08 and IP55. Wherever necessary, such sheet steel member shall be stiffened by angle iron frame work. All the elements of LT panels (frames, cubicles, doors etc.,) shall undergo seven tank surface treatments. Panels shall be painted by powder coating of approved shade / color (process with two coats of zinc chromate primer and two coats of powder painting). The painting should be done to get a smooth, scratch free and corrosion resistance surface.

General construction shall employ the principle of compartmentalization and segregation for each circuit for required separation form. Unless otherwise approved, incomer and bus section panels or sections shall be separate and independent and shall not be mixed with feeder's sections. Each section of the rear accessible type panel/ board shall have hinged access doors at the rear. Overall height of the Panel shall not exceed

2.40 meters. Operating levers, handle etc. of highest unit shall not be at a height more than 1.8 m, and that of the lowest unit shall not be less than 300 mm above finished floor level. Multi-tier mounting of feeders housing MCCBs is permissible. The general arrangement for multi-tier construction shall be such that the horizontal tiers formed present a pleasing and aesthetic look. The general arrangement shall get approved before fabrication. There shall be separate gland plate for each cable entry so that there will not be dislocation of already wired circuit when new feeders are added. The construction shall include necessary cable supports for clamping the cable in the cable alley or in rear cable chamber. The vermin proofing shall be such that the vermin cannot enter from one compartment to another/bus bar chambers. Neoprene gaskets shall be used for all doors, covers and openings

All retaining catches, screws and bolts for doors and covers shall be cadmium/chromium plated. Screws and bolts shall be captive. Gasket shall be provided properly on covers, doors and joints of all LT Panels. The LT panels shall be of bolted construction (no welded construction). Each vertical section shall be equipped with Anti- condensation space heaters with thermostat which is to be located in the cable alley.

### Bus Bars:

The main buses & connections shall be of high conductivity aluminium alloy as per IS: 5082 sized for specific current rating with maximum temperature limited to 85 degree C (i.e. 35 degree C rise over 50 degree C ambient). Bus bars shall be designed for a maximum current density of 0.8A/sqmm.

The bus bars should be designed considering the existing arrangement. The bus bars shall be insulated with heat shrink PVC sleeves with colour coding. The clearances between bus bars shall be adequate enough in view of short circuit capacity as per relevant IS/ IEC.

### Digital Multifunction Meter (DMFM):

This specification is for HT (3 Phase 3 / 4 wire ) & LT, 3 Phase 4 wire panel mounted Digital Multi-Functional Meters of accuracy class 1.0 with RS 485 based Serial Communication with MODBUS RTU protocol for easy integration with SCADA.

Multifunction digital panel meter shall be provided for accurate and reliable measurement of electrical quantities (I, V, Hz, p.f., kW, kWh, kVA, kVAr, etc.) for SCADA. It has to be a large multi-line backlit LCD panel which enables four parameters to be displayed at the same time. An expansion module can be fitted for enhanced functionality (pulse input/output).

#### i. Accuracy:

Class of accuracy of meter will be as per IEC62052-11 and IEC62053-22. Accuracy class: 1.0 (same accuracy for active and reactive power).

**ii. Starting current:**

The meter will start registering energy at 0.4 % of basic current (Ib).

The meter will have a built in "Real Time Clock" with an accuracy of  $\pm 3$  minutes per year or better.

**iii. Burden:** Aux- 5VA, Current Circuit-0.2VA, Voltage Circuit- 0.2VA

**iv. Electrical:**

Connection type (Aux. supply): Common product for HT3/ HT4/ LT-4 application.

Wiring configuration: Common product for 3 P-3 W and 3 P-4 W application

Voltage range: Measurement voltage range 50 to 550 VAC (phase to phase) and 28.86 to 300 VAC P-

N Aux power supply range: 80 to 300 VAC/DC

Current range Available: 5A

Main frequency: 50/60 Hz with -20% to +40%

**v. Value Added Features:**

RS485 Port: Meter will be provided with RS485 MODBUS port.

**vi. Load Survey:**

60 days for 6 parameters @ 15 min integration period.

**vii. Required Features:**

1. Large four-line seven-digit display with quadrant.
2. Configurable display units for Energy & Power
3. Magnitude of each harmonic distortion for voltage and current up to 31st harmonic shall be displayed either in soft or at meter end.
4. Measurement selection (star or delta/ 3P4W or 3P3W)
5. True root-mean squared (RMS) metering
6. Calibration LED for accuracy test on site
7. Wide-range auxiliary power supply, suitable for high-voltage or low-voltage installations
8. Maximum demand recording
9. Scroll-lock and 'Favorites Page' display customization
10. Expansion capability via add on hot pluggable modules for pulse inputs/outputs, and analogue outputs
11. Password protection for setup mode
12. Vendor executing the said work shall provide Register address of various parameters for modbus mapping.

**viii. Type Test:**

Meters should be type tested by NABL accredited lab.

**Accessories**

The panels shall be provided with TNC, fuses (wherever required), MCBs, RCCBs and LED type indication lamps for R, Y, B phases. Indication shall be provided for all feeders. All lamps shall be protected by proper control MCBs & Fuse Links.

All control wiring shall be carried out with multi core cable Fire Retardant PVC wires of size min. 1.5 sq.mm or Higher (as per panel OEM). Wiring for C.T. circuits it shall be 2.5 sq. mm or higher. Wiring shall be bunched and routed through cable alleys. Wiring shall be properly numbered with ferrules. All control circuits shall be suitable protected for short circuits with independent MCBs.

**Earthing:**

All components, frame etc. shall be properly earthed. Two nos. of earth bus shall be extended throughout the length of the LT panels. Minimum size of earth bus shall be 50x6 mm for GI or 30x10 mm for copper. The short circuit withstand capacity shall be as per IS. Suitable arrangement shall be provided at each end of horizontal earth bus for bolting. All ACB Cradles & doors are earthed properly with respective sizes.

**Standards:**

The LT panels shall conform to the latest revisions of relevant Indian and International Standard some of which are listed below. Copies of Type Test certificates shall be produced in this regard.

IS 2705: 1992 - Current Transformers  
IEC 60947 - Low-voltage switchgear and control gear  
IS 8623: 1993 - Specification for L.V. Switchgear & Control gear Assemblies.

### **Tests & Test Reports**

The type test certificate with respect to Ingres of protection from a govt. approved lab shall be produced.

At factory **routine test** such as HV test, IR before and after HV test, Primary/Secondary injection test, dimensional checks etc. shall be performed.

### **Inspection**

The panel shall be offered for inspection before dispatch. Routine tests as per Indian Standard will be carried out at the time of inspection. The bidder shall arrange all the test equipments in this regard.

### **Operating Manuals**

The supplier shall submit operating manuals for all components including items such as ACB, Relay and other equipment provided by the bidder. These manuals shall be in English. They shall include the ACB operating instructions. Context sensitivity shall be used to go directly to the appropriate place in the manual.

### **As-Built Documents and Drawings**

The supplier shall submit as built documents including applicable drawings. All deliverable documents and drawings shall be revised by the supplier to reflect the as- built ACB components including the entire Relay. Any errors in or modifications to LT panel resulting from its factory and/or site acceptance test shall be incorporated. Within this same context, all previously submitted documents that are changed because of engineering changes, contract changes, errors, or omissions shall be resubmitted.

## **AIR CIRCUIT BREAKERS (ACBs)**

### **Constructional Features**

The Circuit Breaker cradle shall be designed and constructed to permit smooth withdrawal and insertion. The movement shall be free of jerks, easy to operate. Mechanical latch shall be provided to identify the isolated, test & service position of breaker to prevent over racking. Automatically operated shutters shall be provided to screen live cluster contacts when the breaker is withdrawn from the cubicle. Sliding connections including those for the auxiliary contacts and control wiring shall also be of the self-aligning type. The fixed portion of the sliding connections shall have easy access for maintenance purposes.

### **Operating Mechanism**

The draw out mechanism shall be part of the fixed frame to reduce the weight of withdrawable part. Further, each position (service, test and isolated) shall be acknowledged by the operator before racking in / moving to the next position. The operating handle and mechanical trip push button shall be attached in front of and integral with the Circuit Breaker

The Circuit Breaker shall have the following three distinct and separate positions which shall be indicated on the face of the panel. The breaker shall get latched in each of three positions namely Service, Test and Isolated, operator to de latch before racking in/out to other position:

1. "Service" -- Both main and secondary isolating contacts closed
2. "Test" -- Main isolating contacts open and secondary isolating contacts closed
3. "Isolated" -- Both main and secondary isolating contacts open

Hence there shall be 3 distinct locking positions on the ACB for all 3 conditions as above.

There must be a provision for storing the racking handle (when not in use) within the ACB CIRCUIT BREAKER INTERLOCKS.

Sequence type strain free interlocks shall be provided to ensure the following:

1. It shall not be possible for the breaker to be withdrawn from the cubicle when in the "ON" position. To achieve this, a suitable mechanism shall be provided to lock the Breaker in the tripped position before the breaker is isolated.
2. It shall not be possible for the Breaker to be switched "ON" until it is either in the fully inserted position or, for testing purposes, it is in the fully isolated position.
3. It shall not be possible for the Circuit Breaker to be racked in unless it is in the OFF position.
4. Inbuilt Mechanical & Electrical anti-pumping relay features shall be incorporated into the ACB.

It should be possible to know the control voltage ratings for all electrical accessories without opening the panel door and should be click fit type to reduce maintenance shut-down time

### **Circuit Breaker Auxiliaries**

The Circuit Breaker shall have inbuilt a minimum of 4 NO/NC free auxiliary contacts. These contacts shall be approachable from the front to connect all external wiring from the front. They shall close before the main contacts when the Circuit Breaker is racked in and vice versa when the Circuit Breaker is Drawn Out of the cubicle.

The closing release, shunt trip release and under voltage release (where specified) shall be provided and secured on a metal plate with continuity to external earth in all circumstances. It shall be possible to connect all control and auxiliary wiring from the front of the circuit breaker.

### **Protection Release**

The Air Circuit Breakers shall have microprocessor release. There shall be separate LED indications on the protection release for trip on LSING. The release should be able to communicate on MODBUS RTU protocol using RS485 port & it should be possible to configure protection settings from remote through communication (2-way communicable). In a true 2-way communicable release, all settings should be through GUI navigation keys, not through BCD switches and through communication.

The release should be compatible with the SCADA system. On-line change of settings should be possible.

### **Earthing**

The frame of the Circuit Breaker shall be positively earthed when the Circuit Breaker is racked into the cubicle. There shall be provision for connection of panel earth at clearly marked locations on the metal frame of the cubicle.

### **Inspection and Testing**

Inspections and tests shall be performed to ensure ACB compliance with these Technical Specifications. Responsibility for conducting the inspections and tests shall rest with the supplier. The IIT Roorkee's representatives shall participate in the ACB inspections and shall witness the testing as described.

Following tests report shall be provided in addition to others specified in the IS/IEC: Combined sequence test report  
Dimensional and visual check

Mechanical operation test and checking of interlocks.

Dielectric test on main and control circuits. Internal Arc withstand test.  
Make/ Break test.

Short Time Current test.

At the IITs discretion, IIT representatives will witness such testing. This may include requesting the supplier to perform tests on ACB selected at random from each batch of ACB that the supplier deems ready to be delivered to site. Should any such test prove unsatisfactory, the IIT reserves the right to have further tests conducted and for delivery not to take place until a mutually agreed course of action has been reached.

**Relevant Standards**

IEC/IS 60947-2 - General Switchgears

IEC-60947-1/IES-60068-2-6/27 - Shock and Vibration Protection IEC

60529 - Degrees of Protection provided by Enclosures (IP Code)

*Wherever IEC standards are indicated, suitable equivalent IS standards may be considered*

**ACB SPECIFICATIONS**

S.No.	Description	Unit	Specifications			
1.00	ACB rating	A	800	800	1250	1600
2.00	No. Poles	No.	4	3	3	3
4.00	Iu (40 °C) Rated uninterrupted current (at 40 °C)	A	800	800	1250	1600
5.00	Ue Rated service voltage	V	440	440	440	440
6.00	Ui Rated insulation voltage	V	1000	1000	1000	1000
7.00	Uimp Rated impulse withstand voltage	kV	12	12	12	12
8.00	Operating temperature	oC	-25 to 70	-25 to 70	-25 to 70	-25 to 70
9.00	Storage temperature	oC	-40 to 70	-40 to 70	-40 to 70	-40 to 70
10.00	Version		Withdra wable	Withdra wable	Withdra wable	Withdra wable
11.00	Neutral Pole Current Carrying Capacity	%	100	100	100	100
12.00	Icu (440 V) Rated ultimate short-circuit breaking capacity	kA	50	50	50	50
13.00	Ics (440 V) Rated service short-circuit breaking capacity	kA	50	50	50	50
14.00	Icw (1s) Rated Short/time withstand current	kA	50	50	50	50
15.00	Icw (3s) Rated Short/time withstand current	kA	26	26	26	26
16.00	Icm (440 V) Rated making capacity in short circuit	kA	105	105	105	105
17.00	Draw-out type		EDO	EDO	EDO	EDO
23.00	Mechanical Life with regular ordinary maintenance (No. of operationX1000)	No.	20	20	20	20
24.00	Electrical Operation (400V) (No. of operationX1000)	No.	10	10	10	10
25.00	<b>Protection functions</b>					
25.01	Overload (L)		Yes	Yes	Yes	Yes

25.02	Selective short-circuit (S)		Yes	Yes	Yes	Yes
25.03	Instantaneous short-circuit (I)		Yes	Yes	Yes	Yes
25.04	Earth fault (G)		Yes	Yes	Yes	Yes
25.05	Phase unbalance (U)		Yes	Yes	Yes	Yes
25.06	Neutral protection(N)		Yes	Yes	Yes	Yes
25.07	Self Protection against over temperature		Yes	Yes	Yes	Yes
25.08	Zone selectivity for functions S and G		Yes	Yes	Yes	Yes
25.09	Residual current (Rc) with neutral CT		Yes	Yes	Yes	Yes
26.00	<b>Measurement function</b>					
26.01	Currents: three phases (L1, L2, L3) and neutral (Ne)		Yes	Yes	Yes	Yes
26.03	Maintenance: number of operations		Yes	Yes	Yes	Yes
26.05	Opening data storage (last 20 trips and 80 events).		Yes	Yes	Yes	Yes

### **MOULDED CASE CIRCUIT BREAKERS (MCCBs)**

Moulded case circuit breakers shall comply with the latest Indian Standards and IEC standards. MCCB's shall be designed for circuit protection of 440 V, three phase four wire AC distribution system. They shall be designed for use in panel boards as main breakers and for protection of feeder circuits and connecting equipment as per IS 13947 / IEC-947.

All MCCB's shall be provided with integrated static trip releases for overload, short circuit and earth fault with multiple characteristic curves and adjustable setting for each characteristic to ensure proper co- ordination with overload, short circuit and earth fault protection provided on upstream and downstream.

Each MCCB shall have a facility for padlocking in the "OFF" position. MCCB shall have front operating extended door operating handle. Potential free auxiliary contacts suitable for integration with SCADA shall be provided for MCCB's status indication (ON, OFF & TRIP).

### **AUTOMATIC POWER FACTOR CORRECTION (APFC) PANEL**

#### **Scope:**

The scope of this specification covers design, fabrication (after approval of drawing from IIT Roorkee), transportation, loading, unloading, dismantling of existing APFC panel, shifting of panel(if required),assembling, wiring, testing, packing, forwarding, delivery at site, installations and testing of 200kVAR APFC LT Panels including accessories complete in all respect.

#### **APFC Panels:**

Automatic Power Factor Correction panel shall be totally enclosed, metal clad, 2mm CRCAsheet steel fabricated, fixed feeder type, dust and vermin-proof, free standing, floor mounting type. The enclosure shall be pre-treated as per seven tank process and finished with powder coating of shade(as approved by IIT Roorkee). The panel shall be factory build to ensure proper thermal design, by providing louvers and fans in appropriate location, accurate selection of switchgear, capacitors-reactors and others in the panel. APFC panel should be SCADA compatible.

#### **Basic Design Specifications:**

An automatic power factor correction relay, microprocessor based, with arrangement for sensing the power factor

of the inductive load and giving signal to the feeders of power capacitors as per the setting of P.F. and electronic circuit to ensure that once a capacitor gets cut off, it is not put on at least for a minute. The relay should automatically manage capacitor banks according to the reactive power required to correct the power factor of the load to the power factor set on the relay. The capacitors bank must be turned “on” and “off” in steps to correct the power factor of the load to the power factor set on the relay. The relay should have the automatic and manual mode of operation with an LED to indicate the operating mode.

The relay should be able to communicate on MODBUS RTU protocol using RS485 port & it should be possible to configure protection settings from remote through communication (2-way communicable). In a true 2-way communicable relay, all settings should be done through GUI navigation keys, not through BCD switches and communication.

**Relevant Standards:**

IEC-61921 -Temperature rise  
limits IEC-60831-1+2 – Capacitor

**3 WAY (BREAKER MODULE) 11kV RMU COMPATIBLE WITH ABB MAKE SCADA SYSTEM**

**SCOPE:**

The SITC of 11kV RMU as per BoQ. **The work majorly includes digital multifunction meter, Metering CT, Protection CT, numeric relay etc. in the RMU. Detailed description regarding the scope of work already mentioned in the BoQ.**

Specification covers site survey, engineering, manufacturing, pre dispatch testing, supply, transportation, unloading at the site, complete erection, testing, and commissioning of 11KV feeders with 11KV Indoor RMU vertical (SCADA enabled) and in accordance with the technical requirements mentioned in the specification, relevant standard, code of operation. The earthing switches shall be housed in SF6 and the Circuit Breakers used in the RMU shall be vacuum interrupter type. The civil works and foundations works, including providing Earth pits and earth flats and their connectivity to earth pits for erection and commissioning of the RMU, are in the scope of the Bidder. The scope also includes handing over the complete installation after successful commissioning.

**STANDARDS:**

- a) The equipment delivered shall be new and of high quality, suitable for the purpose it is intended for, free from defects and imperfections and of the classifications listed herein, or their equivalents, subject to acceptance by the IIT Roorkee.
- b) Materials used in the manufacture of the specified equipment shall be of the kind, composition, and physical properties best suited to their various purposes and in accordance with the best engineering practices.
- c) The equipment design shall be suitable to render satisfactory operation under the conditions prevailing at the site, and the equipment shall operate satisfactorily under normal load and voltage variations and frequency variations (50 Hz  $\pm$  3%), ensuring safety, further including all necessary provisions ensuring the safety of the operating and maintenance personnel.
- d) The applicable standards of various equipment for the project is as specified here below:



Description	Standard
<b>11kV Ring Main unit</b>	
AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV	IS 3427
Classification of degrees of protection provided by enclosures of electrical equipment	IS 12063
High Voltage Switches	IS 9920 (Parts 1 to 4)
Specification for AC disconnectors and earthing switches for voltages above 1000 V	IS 9921 (Parts 1 to 5)
HV AC Circuit Breakers	IS 13118
Dimensions of terminals of HV Switchgear and Control gear	IS 10601
General requirements of switchgear and control gear for voltages exceeding 1000 V	IS 12729
High voltage/Low voltage prefabricated substations	IEC 1330
Common clauses for MV switchgear standards	IEC 62271-100/200
Monitoring and control	IEC 6081
Current Transformers	IS 2705
Voltage transformers	IS 3156
Specification for Static Protective Relays	IS 8686
Standards for high voltage metal clad switchgear up to 52 KV.	IEC 62271-200

**Wherever IEC standards are indicated, suitable equivalent IS standards may be considered**

**Key RMU Configurations of RING MAIN UNIT:**

As a minimum, the RMUs shall be equipped with a Vacuum Circuit Breaker, numerical relays for the protection of transformer feeders, and a digital multifunction meter for all bays. Tripping and protection functionalities from the Communicable Numerical relay to be provided on the RMU. The earthing switches shall be housed in SF6 and the Circuit Breakers used in the RMU shall be vacuum interrupter type.

## **CLIMATIC CONDITIONS OF THE INSTALLATIONS.**

The equipment designed shall be capable of withstanding the following climatic conditions.

Max. Ambient temp. : 45 °C

Max. Daily average ambient temp. : 35 °C

Min Ambient temp. : 0 °C

Maximum Humidity : 100%

Minimum Humidity : 10%

If the derating of the equipment is applicable for the above climatic conditions, the same shall be specified by the bidder.

### **Distribution Network Electrical Parameters**

The main parameters of the distribution network are as follows:

- Nominal system voltage: : 11 kV (r.m.s)
- Highest system voltage: : 12 kV (r.m.s)
- Number of phases: 3
- Frequency: : 50 Hz
- Variation in frequency: : 50 ±3% Hz
- Type of earthing: : Solid
- Power frequency withstand voltage: : 28 kV rms
- Basic impulse withstand voltage: : 75kV peak

### **RATINGS:**

The Protection and control unit range shall be designed to accommodate the control power supply voltages of 24 V DC.

### **Features**

- a) The RMU shall include potential-free contacts so as to connect to SCADA/DMS via FRTUs for remote operation of RMUs:
- b) Monitor and control the open/closed status of the RMU circuit breakers.
- c) Monitor the local/remote position of RMU manually-operated switches that can be used to enable and disable remote monitoring.
- d) Monitor the open/closed status of RMU earthing switches.
- e) Monitor for low SF6 gas pressure indication in case of SF6 Breaker.
- f) Monitor for circuit breaker relay operations.
- g) The civil works and foundations works, including providing of Earth pits and earth strips and their connectivity to earth pits for erection and commissioning of the RMU, are in the scope of the Bidder.
- h) Any site/ equipment/ statutory approvals at the site, etc., required shall be in the bidder's scope.

### **RMU shall have local indications as a minimum**

1. Operations counter on Front/Inside, with 4 digits, non-resettable type.
2. Cable charge status - LED indication for each phase
3. Spring charge status shall be provided.
4. Flag for CB Protection relay operated on Fault

## **11 kV RMU TECHNICAL PARAMETERS**

- The scope includes the supply of 11 kV RMU suitable for Indoor application.
- The RMU to be supplied shall be compact and shall meet the following requirements:
- The electrical installation shall meet the requirement of Indian Electricity Rules, 1956 as amended up to date, relevant IS code of practice and Indian Electricity Act, 1977. The Electricity Act, 2003 and Amendment if any shall also apply. In addition, other rules and regulations applicable to the work shall be followed. In case any discrepancy the most stringent and restrictive one shall be binding.
- The high-tension switchgear offered shall in general comply with the latest issues including amendments of the following standards but not restricted to them.
- All design features of the proposed RMU, as described in the supplier's bid and in the bid's reference materials, shall be fully supported by the equipment actually delivered. The key design features include those that relate to:
  - Convenient FRTU interconnection features.
  - IIT Roorkee intends to be self-reliant for RMU maintenance. To this end, the Supplier shall provide the support, documentation, and training necessary to operate and repair the RMU. IIT Roorkee prefers RMU designs that do not require periodic preventive maintenance and inspections.
- Each RMU shall have a design life of at least 20 years from the date of final acceptance. The Contractor shall make available, at no cost to the Employer, the manufacturing drawings, wiring diagrams, bill of material, foundation detail drawings, unpacking and transportation instructions, operation & maintenance manual, as-built drawings, installation and commissioning manual, and other relevant documentation. The specific components of each component /sub-assembly shall be identified and referenced in supplier-supplied documentation.

### **Indoor Features**

- The RMUs shall be explicitly designed for Indoor installation with an ingress protection degree of IP2XC.
- The main SF6 tank, housing the vacuum circuit breakers, should be of no other material except a 3mm stainless steel tank (+/- 0.5mm) of SS304 Grade to have high corrosion resistance and ensure high longevity. This tank containing SF6 to a maximum pressure of 1.55 bars should be hermetically welded and sealed for life, ensuring a leakage rate of not more than 0.1 % per annum. Except for stainless steel, all steel surfaces that are not galvanized shall be treated to protect against corrosion

### **Immunity to Electrical Stress and Disturbance**

- The electrical and electronic components of the RMU shall conform to relevant standards concerning insulation and isolation, and the product shall comply with IEC 60270 Immunity to electrical stress & disturbance. The ability to meet these requirements shall be verified by type tests carried out by accredited test laboratories that are independent of the bidder and/or the manufacturer of the RMU components. Certified copies of all available type test certificates and test results shall be included as part of the bidder's proposal.

### **Minimum Insulation of Equipment**

- The RMUs shall be of SF6 gas-insulated type with a maximum gas operating pressure of up to 1.2 BAR @ 20 deg C.

### **Nameplate Information**

RMU nameplate information shall be determined in agreement with the Employer. This information may include, for example:

- a) Name of manufacturer and country
- b) Type, design, and serial number
- c) Rated voltage and current
- d) Rated frequency
- e) Rated symmetrical breaking capacity
- f) Rated making capacity
- g) Rated short-time current and its duration
- h) Rated lightning impulse withstand voltage

- i) Purchase Order number and date
- j) Month and year of supply
- k) Each RMU shall also exhibit a Danger Board to indicate the presence of a high voltage (11,000 V).

**Interconnecting Cables, Wiring, Connectors, and Terminal Blocks**

The Contractor shall provide all interconnecting wires, cables, connectors, terminations and other wiring accessories such as terminal blocks required by the RMU.

**Metallic Cables**

- a) All metallic cables and wiring shall be of required cross-section solid or multiple strands of round copper conductors and have flame retardant insulation. All wiring shall be neatly laced and clamped.
- b) All wire and cable connectors and terminators shall be permanently labeled for identification. All connection points for external cables and wires shall be easily accessible for connection and disconnection and shall be permanently labeled. Conductors in multi-conductor cables shall be individually color-coded.

**Connectors**

Plug-type connectors with captive fasteners shall be used for all interconnections. The connectors shall be polarized to prevent improper assembly (wherever applicable).

**RMU-FRTU Connectors**

- a) For ease of installation and maintenance, the interconnection between the RMU and the FRTU (remote communicable for future FRTU installation later by IIT Roorkee separately in a separate enclosure) shall be supported by having heavy-duty terminal blocks with screw-type terminals shall be provided by the supplier for necessary cable terminations. Using a terminal block, no more than two cables or wires shall be connected to any of its individual terminals.
- b) Marking strips shall be used to identify all external connection blocks. Marking tags shall be read horizontally. All terminals connected to which battery or other high voltages shall be provided with fireproof covers.
- c) All individual status input, AC voltage input, and control output points shall be isolatable without the need to remove wiring by means of individual terminal blocks of the removable link type. In order to avoid open circuits on the secondary side of CTs, termination blocks with by-pass bridges shall be provided for all AC current inputs.
- d) Terminal blocks shall comply with IEC 60947-7-1 (2009): Low-voltage Switchgear and Control Gear, Part 7-1: Ancillary Equipment, Terminal Blocks for Copper Conductors.
- e) Each RMU shall be equipped with all necessary connectors, terminal blocks, and other accessories that will allow it to be connected to the FRTU.

**Parameter Requirements**

The RMUs shall be suitable for cable networks of 630 Amps and loop cable networks of 630 Amps. The minimum design parameters to which their major components shall conform or exceed are summarized in the following tables.

**Table 0-1: System Parameters**

Parameter	Value
Nominal System Voltage	11 kV

Highest System Voltage	12 kV
Rated Voltage	12 kV
System frequency	50 Hz
Number of Phases	3 Phase/3 Wire

**Table 0-2: Circuit Breaker Parameters**

Parameter	Value
Lightning Impulse Withstand Voltage Phase-to-Phase & Phase-to-Earth:	75 kV (peak)
Power Frequency Withstand Voltage to Earth, Between Poles, & Across Opening Span	28 kV rms for 1 minute
Rated Short Time Withstand/Breaking Current:	21 kA (rms)
Rated Duration of Short Circuit:	3 seconds
Rated Normal Current:	630 Amps (rms)

- a) The RMU switchgear shall be capable of withstanding the specified currents without damage in accordance with the latest versions of IEC 60694 (Common Specifications for High-Voltage Switchgear and Control Gear Standards) and IS 3427 (AC Metal Enclosed Switchgear and Control Gear for Rated Voltages above 1 kV and up to and including 52 kV).
- b) The equipment offered shall be as per the standards specified in the bid specification, and if the offered equipment is tested with any other international standards that are superior to the standards specified, they can also be considered, and the bidder has to submit the documentary evidence for the same to IIT Roorkee.

**Design Details**

- a) The RMU shall be designed to operate at the rated voltage of 12 kV.
- b) It shall include circuit breakers and earthing switches within the same metal enclosure for each Circuit Breaker.
- c) Suitable fool-proof interlocks shall be provided to the earthing switches to prevent inadvertent or accidental closing when the circuit is live, and the concerned Circuit Breaker is in its closed position.
- d) The active parts of the switchgear shall be maintenance-free. Otherwise, the RMU shall be of low-maintenance

type.

- e) The tank shall be made of a minimum 2.5 mm thickness of stainless steel.
- f) The Stainless Steel tank should be completely welded so as to ensure IP 67 degree of protection and shall be internal arc tested.
- g) The RMU shall be suitable for mounting on its connecting cable trench.
- h) For each RMU enclosure, a suitably sized nameplate clearly identifying the enclosure and the electrical characteristics of the enclosed devices shall be provided.
- i) The access to the cable compartment should be from the front of the switchgear only to have minimum operating & maintenance space at the site.
- j) The RMU design shall be such that access to live parts is impossible without using tools.
- k) The design shall incorporate features that prevent any accidental opening of the earth switch when it is in the closed position. Similarly, accidental closing of a Circuit Breaker shall be prevented when the same is in an open position.
- l) The RMU tank must be equipped with a suitable pressure relief device. The pressure relief must ensure that the escaping gases are dissipated to the rear of the switchgear.
- m) The complete RMU shall be tested in an accredited INDIAN or FOREIGN laboratory and designed for an Internal Arc.

### **Earthing**

- a) There shall be continuity between metallic parts of the RMUs and cables so that there is no dangerous electric field in the surrounding air and the safety of personnel is ensured.
- b) The RMU frames shall be connected to the main earth bars, and the cables shall be earthed by an Earthing Switch having the specified short circuit making capacity.
- c) The Earthing Switch shall be operable only when the main switch is open. In this respect, a suitable mechanical fail-proof interlock shall be provided.
- d) The Earthing Switch shall be provided with a reliable earthing terminal for connection to an earthing conductor having a clamping screw suitable for the specified earth fault conditions. The connection point shall be marked with the earth symbol. The flexible connections between the earthing blade and the frame shall have a cross-section of at least 50 mm<sup>2</sup> copper or equivalent in GI
- e) The Earthing Switch shall be fitted with its own operating mechanism. In this respect, manual closing shall be driven by a fast acting mechanism independent of the operator's action.

### **Circuit Breakers**

- a) The Circuit Breakers shall be maintenance free and, when standing in front of the RMU, their positions shall be clearly visible through the Mimic facia. The position indicator shall provide positive contact indication in accordance with IS 9920. The breakers shall have three positions (or states), i.e., Open, Closed, and Earthed, and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall be fully assembled, tested, and inspected in the factory.
- b) An operating mechanism shall be used to manually close the Circuit Breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping. There shall be no automatic reclosing.

The Circuit Breaker shall be capable of closing fully and latching against the rated-making current. Mechanical indication of the Circuit Breaker's OPEN, CLOSED, and EARTHED positions shall be provided.

- c) Each Circuit Breaker shall operate in conjunction with a suitable protection relay under transformer feeder/ circuit phase and earth fault conditions. In addition, the Circuit Breaker shall be provided with a motorized operating mechanism that can be remotely controlled by the SCADA (not for Manual RMU).
- d) The motor shall be used for spring charging of the Breaker. The protection of the control circuit and motor fuses of appropriate rating should be an integral part of the kit.
- e) There should be safety interlocks to ensure that the motor should not operate when the Cable compartment of that module is OPEN, and the motor should not operate when the Operating Handle is inserted in the Mechanism to operate it manually.
- f) The operation of the breaker can be done Locally as well as through remote command. For local operations, push buttons for ON and OFF to be provided.
- g) Test voltage for tables as above is + 10 / - 15 % for motor operations and closing coils and +10/ -30% for trip coils and opening coils.

**Characteristics of motor operation for V-module**

Rated voltage (V)	Power consumption (W) or (VA)	Operation times		Peak start current (A)	Fuse
		Charge / Closing time (s)	Opening time (ms)		
24	180	10-17	40-60	14	F 6,3 A

**The Digital Input List:**

- 1. Vacuum Circuit Breaker – ON
- 2. Vacuum Circuit Breaker – OFF
- 3. Vacuum Circuit Breaker – TRIP
- 4. Vacuum Circuit Breaker – SPRING CHARGED
- 5. Earthing Switch - ON
- 6. Earthing Switch – OFF
- 7. Relay Operated on Over current (O/C) fault
- 8. Relay Operating of Earth Fault (E/F)
- 9. Multifunction Meter with RS485 port
- 10. Gas Pressure Low

**The Digital Output List:**

- 1. Vacuum Circuit Breaker – ON
- 2. Vacuum Circuit Breaker – OFF

**Cable Termination**

- a) Bushings shall be conveniently located for working with the specified cables and shall allow for the termination

of these cables in accordance with the prevailing practice and guidelines of cable manufacturers. The dimensions of the terminals shall be in accordance with IS 10601.

- b) A non ferro-magnetic cable clamp arrangement shall be provided for each cable to be terminated in the RMU.
- c) A suitable arrangement for the Circuit Breakers, Earthing Switches shall be provided so that these devices can be padlocked in the "Open" and "Closed" positions.
- d) A permanent "Live Cable" indication as per IEC 61958 shall be provided for each cable using a capacitor voltage divider.
- e) It shall be possible to test the core or sheath insulation of the cables without disconnecting the cables in the cable compartment after accessing the cable compartment. The cable end kits, including the supply and erection, are in the scope of the bidder.
- f) Two earth pits of 2 ohms each shall be provided diagonally and earthing to the equipment shall be done as detailed in the scope of supply.
- g) Cable bushing should be site replaceable. Gas handling shall be possible at the site.

### **Safety of Equipment**

- a) With respect to the RMU's SF6-filled equipment, any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the enclosure so that the gas will be released away from the operator without endangering the operator or anyone else in the vicinity of the RMU.
- b) All motorized operations, monitoring of open/close position of switches/breakers, live line indicators, FPI indication, SF6 gas pressure indication and access to the cable compartment shall be carried out only from the front of the RMU.

### **Current and Voltage Transformers.**

The RMU **shall** be provided with current and voltage transformers. These CTs & PTs shall meet the electrical and mechanical ratings as per the relevant standards.

### **Current Transformers**

- a) 3 Nos. CTs shall be provided in each circuit breaker cable compartment for metering and protection purposes.
- b) The CTs shall conform to IS 2705. The design and construction shall be sufficiently robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.
- c) Further characteristics and features distinguishing CTs used for metering from CTs used for protection are listed as follows:

CTs for Metering:

- Material : Epoxy resin cast/ Tape wound
- Burden : 2.5VA
- Ratio : 100-50/1A (for transformer feeder)
- Accuracy Class : 0.5

### **CTs for Protection:**



- Material : Epoxy resin cast/ Tape wound
- Burden : 2.5VA
- Ratio : 100-50/1 A (for transformer feeder)
- Accuracy Class : 5P10

## **Voltage Transformers: As per site requirements**

### **Protection Relay**

- a) The circuit breaker shall be associated with an integrated protection unit that will operate without any auxiliary power supply and shall include:
  - Self-powered relay with RS 485 port.
  - Microprocessor-based relay with Short Circuit protection, Over Current protection(IDMT), and Earth Fault protection (Definite time) with high set.
  - A low-energy release
  - Relay should be draw-out type and rated for 1 A current.
  - The relay should be certified for Electro Magnetic Interference.
- b) The protection system will ensure circuit breaker tripping with minimum operating current ( $I_s$ ), which is the rated current of the underground network to be protected. It should have a setting from 8A to 600A.
- c) The phase protection mode shall have two separately adjustable settings:
  - The low setting may be chosen with a definite time or IDMT. The IDMT curves are in compliance with the IEC 255-3 standard. They are of the standard inverse, very inverse and extremely inverse types.
  - The low setting may also be used with the RI curve.
  - The high setting shall be of the definite time / instantaneous type
  - Like phase protection, earth protection shall be fitted with two separately adjustable settings.

### **Features and Characteristics**

The numerical relay shall have the following minimal features and characteristics, noting that variations may be acceptable as long as they provide similar or better functionality and/or flexibility:

- a) It shall be housed in a flush mounting case and powered by the RMU power supply unit.
- b) It shall have three phase overcurrent elements and one earth fault element.
- c) IDMT trip current settings shall be 50-200% in steps of 1% for phase overcurrent and 10-80% in steps of 1% for earth fault.
- d) Instantaneous trip current settings shall be 100-3000% in steps of 100% for phase overcurrent and 100-1200% in steps of 100% for earth fault.
- e) Selectable IDMT curves shall be provided to include, for example, Normal Inverse, Very Inverse, Extreme Inverse, Long Time Inverse, and Definite Time. Separate curve settings for phase overcurrent and earth fault shall be supported.
- f) For IDMT delay multiplication, the Time Multiplier Setting (TMS) shall be adjustable from

- g) 0.01 to 0.1 in 0.01 steps.
- h) The relay shall also be provided with:
- i) Alphanumeric Liquid Crystal Display (LCD) for relay setting.
- j) Communications via a MODBUS RS232/RS485/IEC 103 port to provide the FRTU (and hence the DMS) with phase current measurements. It is also desirable that the FRTU can use this same means of communication to send setting and control commands to the relay.
- k) Parameter change capability that is password protected.

### **Construction**

The RMU shall be sufficiently sturdy to withstand handling during shipment, installation, and start-up without damage. The configuration for shipment shall adequately protect the RMU equipment from scraping, banging, or any other damage.

### **Motors**

- a) The RMU shall be fitted with spring charging motors of high insulation class, allowing the circuit breakers to operate without manual intervention.
- b) In addition to allowing circuit breaker tripping by the RMU's protection relays, the motorized operating mechanism shall be suitable for remote control by the SCADA.
- c) The motors, along with the supplied control card and push buttons, shall allow the operator to electrically operate the circuit breakers at the site without any modification of the operating mechanism and without de-energizing the RMU.

### **Inspection and Test**

- a) Inspections and tests shall be performed to ensure RMU compliance with these Technical Specifications. Responsibility for conducting the inspections and tests shall rest with the Supplier. The employer's representatives shall participate in the RMU inspections and shall witness the testing as described in the following sub-clauses.

- **Inspections**

- a) Utility representatives shall be allowed access to the supplier's facility where the RMU or its parts are being produced or tested. Such access will be used to verify by inspection that the RMUs are being fabricated and tested in accordance with the technical specifications.
- b) The supplier shall give the employer's representatives 15 days' notice in writing concerning the date and place at which the equipment will be ready for inspection or testing. The supplier shall provide all the necessary assistance and facilities to the utility representatives to carry out such inspections and test witnessing.
- c) The supplier shall provide any and all documentation that is necessary to complete the inspections. The representatives shall be allowed to inspect the supplier's quality assurance standards, procedures, and records. Inspections, as a minimum, shall include checks on inventory, general appearance, cabling, drawing conformance, and labeling.

- **Test Procedures**

- a) The supplier shall provide test plans and detailed procedures for all required testing. The plans and procedures shall ensure that each test is comprehensive and verifies proper performance of the RMU under test and, in this respect, shall be submitted for review and approval by the Utility.
- b) The test plans shall include all routine tests and acceptance tests as per relevant BIS/IEC standards and shall describe the overall test process including the responsibilities of the test personnel and how the test results will be documented.

- c) The test procedures shall describe the individual tests segments and the steps comprising each segment, particularly the methods and processes to be followed.

- **Test Reports**

- a) The Tenderers should, along with the tender documents, submit copies of all Type test certificate of their make in full shape as confirming to relevant IS/IEC of latest issue obtained from a International/National Govt. Lab/Recognized laboratory.
- b) The above type test certificates should accompany the drawings for the materials duly signed by the institution that has type test certificate.
- c) The supplier shall maintain complete records of all test results. The records shall be keyed to the test procedures.
- d) Upon completion of each test, the supplier shall submit a test report summarizing the tests performed and the results of the tests.
- e) Following tests shall be necessarily conducted on the equipment and its components in addition to others specified in the IS/IEC:

- Dimensional and visual check
- Mechanical operation test and checking of interlocks
- Dielectric test on main and control circuits.
- Temperature Rise test.
- Internal Arc withstand test.
- Test to check the capability of main and earthing circuits subjected to rated peak and short time withstand current.
- Make/ Break test.
- Short Time Current test.

- **Factory Acceptance Test**

A formal factory acceptance test shall be conducted to ensure that the RMUs have been designed to meet the utility's functional requirements in all respects. Utility representatives shall witness the test on a representative RMU, and the test shall be carried out in accordance with the supplier's test plan and procedures as approved by the Utility. Should the factory acceptance test prove unsatisfactory in any way, the Utility reserves the right to have further tests conducted and, if applicable, request further improvements in the supplier's RMU design.

- **Routine Factory Tests**

- a) These tests shall be carried out during RMU manufacture as a quality control measure, i.e., to ensure each RMU to be delivered meets the Employer's minimum requirements including all relevant standards. Recording and reporting the routine test results shall be the responsibility of the Supplier.
- b) At the Utility's discretion, Utility representatives will witness such testing. This may include requesting the Supplier to perform tests on RMUs selected at random from each batch of RMUs that the Supplier deems ready to be delivered to site. Should any such test prove unsatisfactory, the Utility reserves the right to have further tests conducted and for delivery not to take place until a mutually agreed course of action has been reached.

- c) Further for additional reliability of the manufactured RMU it is mandatory to have the complete assembled tank tested for partial discharge.

- **Operating Manuals**

- a) The Supplier shall submit, operating manuals for all RMU components including items such as FPI, Relay, and other equipment provided by the bidder. These manuals shall be in English. They shall include the RMU operating instructions. Context sensitivity shall be used to go directly to the appropriate place in the manual.
- b) The manuals shall be organized for quick access to each detailed description of the operator procedures that are required to interact with the RMU functions. This shall include the procedures to define, build, edit, and expand all data points provided with the RMU.
- c) The manuals shall present in a clear and concise manner all information that operators, including maintenance personnel, need to know to understand and operate RMUs satisfactorily. The manuals shall make abundant use of diagrams and/or photographs to illustrate the various procedures involved.

- **As-Built Documents and Drawings**

- a) The supplier shall submit as-built documents, including applicable drawings, for review and approval. The supplier shall revise all deliverable documents and drawings to reflect the as-built RMU components, including all the FPI, LLI & Relay. Any errors in or modifications to an RMU resulting from its factory and/or site acceptance test shall be incorporated. Within this same context, all previously submitted documents that are changed
- b) because of engineering changes, contract changes, errors, or omissions shall be resubmitted for review and approval. The successful bidder has to provide his quality document to Utility.

## **OTHER CONDITIONS**

On receipt of order, the bidder shall submit detailed GA and Schematic drawings with bill of materials for approval before taking up the panel fabrication.

**All switchgears (i.e. ACBs and MCCBs) shall be sourced from the same manufacturer. Mixing of switchgear manufacturer is not permitted.**

The supplier shall arrange for training of engineers and technicians at IIT Roorkee. Supply and fixing of MS chequered plates to cover the left over trench portion after installation of LT panels with the necessary handling provisions. The MS chequered plates shall be duly painted.

Any other items which are not specially mentioned in the technical specifications but which are necessary to complete of the work shall be done without any extra cost.

Replacement/ repair of faulty component /equipment should be done free of cost during defect liability period.

# ANNEXURES

**TECHNICAL PARTICULARS FOR 1000 kVA, 11/0.433 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		
3	Rating			
a)	KVA Rating	1000 kVA		
b)	No of phase and rated frequency	3, 50 Hz		
c)	Rated voltage ( kV)	11/0.433 KV		
d)	HV	11 KV		
e)	LV	0.433 KV		
4	Current Rating			
a)	HV	Current: 52.49 amps		
b)	LV	Current: 1333.37 amps		
5	Connection			
a)	HV	Delta		
b)	LV	Star		
c)	VECTOR GROUP	Dyn 11		
6	Winding			
a)	HV	copper		
b)	LV	copper		
c)	Insulation level (Impulse withstand) (kVpeak)	(HV)- 75 (LV)-		
d)	Insulation level ( power frequency withstand ) (kVrms)			
	HV	28		
	LV	3		
7	Tapping			
a)	Range	+5% to -15% @ 1.25% Each		
b)	No of Steps	16		
c)	Tap changer type	OLTC		
d)	Type of Cooling	ONAN		
8	<b>Bushings</b>	<b>HV</b>		
i.	Reference standard	IS 2099 & IS 3347		

ii.	Type of bushing	Porcelain		
iii.	Voltage Rating (kV)	17.5		
iv.	Current Rating Amps	250A		
9	Bushing	LV		
i.	Reference standard	IS 2099 & IS 3347		
ii.	Type of bushing	Epoxy		
iii.	Voltage Rating (kV)	1		
iv.	Current Rating Amps	2000A		
10	Regulation at full load at 75°C			
i.	At unity power factor	0.85%		
11	No Load current as a percentage of full load current at rated Volt and Frequency	1.0 % approx.		
12	Power Factor and no-load current at normal Volt and Frequency	0.2 % approx..		
13	Performance reference Temp. (Deg. C)	75°C		
14	% Impedance at 75°C , rated current & Frequency % (subject to IS tol)	5%		
15	Percentage resistance at 75 (Deg.)	0.50%		
16	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			
17	Maximum Temp. rise at full load (above max. average ambient Temp. of 50 (Deg.)			
a.	Of top oil by thermometer – Deg. C	50°C		
b.	Of winding by resistance method – Deg. C	55°C		
c.	By hot spot temperature Indicator – Deg. C for the weighted average temperature of 32°C	98°C		
18	Limit/Hot spot temperature for which designed – Deg. C	105°C		
19	Temperature Gradient between winding and Oil – Deg. C	22°C approx..		
20	Temperature Indicators	Oil temp. indicator, winding temp. indicator		
a.	Make and Type			
b.	Permissible setting ranges for alarm & trip.	90-95°C		
c.	No. of contacts	2		
d.	Current rating of each contact			

21	Gas and oil actuated relay description data & range of settings, schematic diagram etc.			
22	Type of pressure relief device & pressure at which it operates			
23	Details of magnetic oil gauge	5 A at 240V AC/ 0.5 A at 220V		
24	Details of Winding	HV	LV	
a.	Type of Winding and material	Copper	Copper	
b.	Type of insulation class	Class A	Class A	



**MANDATORY PARTICULARS OF 11 KV INDOOR SCADA COMPATIBLE 3 WAY RMU**

S.No.		Desired Specification	Offered Specification by the Bidder	Compliance by Bidder to Desired Specification (Yes / No)
1.	Make	<b>Siemens/ ABB/ L&amp;T/ Schneider</b>		
2.	Type	Indoor panel type		
3.	Arc quenching medium	Vacuum		
4.	Rated voltage	11 KV		
5.	Highest voltage	12 KV		
6.	Frequency	50 Hz		
7.	Rated normal current (at 50 degrees ambient Temp)	630A 21 kA/03 Sec, as per site requirement		
8.	Insulation level	As per IEC /IS		
9.	Minimum Creepage distance	As per IEC /IS		
10.	Temperature rise	As per IEC		
11.	Operating duty cycle	0-0.3 sec – CO-3min-CO		
12.	First pole to clear factor	1.5		
13.	Single phase capacitor breaking capacity	As per IEC.		
14.	Cable charging breaking capacity	As per IEC.		
15.	Minimum Pole to Pole clearance	As per IEC.		
16.				

**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: "SITC of HT/LT switchgear for providing power supply clean room project in physics deptt. at IIT Roorkee."

Tender No: IWD/DI/Phy/

Dated:

Sl. No.	Item Description	Quantity	Units	Estimated Rate including GST@18% & 1% Cess in Rs. P	TOTAL AMOUNT including GST @18% & Cess @1% in Rs. P	TOTAL AMOUNT In Words
1	2	4	5	6	53	55
1	SITC, Loading & Unloading of 11 kV,630 Amps. 21 kA/03 Sec, SF6 gas insulated 03 way (Breaker Module of Indoor Ring main Unit with Motor operated vacuum circuit breaker and 01 Air insulated metering module and 02 nos. LBS module both side extensible as per detailed specification). Note: <b>The bidder has to ensure the compatibility of new 3 way RMU with existing panel including SCADA communication. The work shall be completed including shifting / dismantling of existing (if required )ABB Make HT RMU to add module in this 03 way RMU as per actual site requirement.</b>	1	Each	909785	<b>909785.00</b>	INR Nine Lakh Nine Thousand Seven Hundred & Eighty Five Only
2	SITC of Transformer 1000 kVA , 11/0.433 KV rating oil immersed ONAN cooling, Dyn 11 vector group, equiped with OLTC(On load tap changer, Should be Separately mounted out tank Type & RTCC-AVR system, Buchholz relay provide with two floats & two pair of electrically separate contact for alarm & trip, Marshalling box with OTI WTI & oil low level, Delta/Star connection, copper winding with insulation class A/ conductor insulation class E complete with all connections etc. as required. as per detailed specification.	1	Each	5035090	<b>5035090.00</b>	INR Fifty Lakh Thirty Five Thousand & Ninety Only
3	SITC of 200kVAR APFC Panel in ratio of 1:1:2 with MPPH/CLMD series capacitor and 500A 35kA TP MCCB as incommer Auto manual type with metering ,selector switch, indication etc complete with wiring etc. The panel shall be dust and vermin proof with IP42 protection and designed for front and back access and cable entry from entry from top/ bottom. The panel shall be made out of 2.00 mm thick CRCA sheet, pre trated and powder coated and colour shade as per direction of EIC.	1	Each	710625	<b>710625.00</b>	INR Seven Lakh Ten Thousand Six Hundred & Twenty Five Only
4	SITC of New 800A, 3/4Pole, ICU=ICS=50KA, ICW=50KA (1Sec), Electrical operated Drawout Air Circuit Breaker(ACB), Electrical Trip Indication, Communication Module, Mechanical Key Lock, Last 20 Trip History 80 Events , <b>suiatble and compatible for existing ABB make SCADA system confirming to IEC-61850. Make equivalent to Schneider, 800A LSIG &amp; ABB E1N800A PR121/P-LSIG.</b>	1	Each	568435	<b>568435.00</b>	INR Five Lakh Sixty Eight Thousand Four Hundred & Thirty Five Only

5	SITC of New 1250A, 3/4Pole, ICU=ICS=50KA, ICW=50KA (1Sec), Electrical operated Drawout Circuit Breaker, Electrical Trip Indication, Communication Module, Mechanical Key Lock, Last 20 Trip History 80 Events, <b>suitable and compatible for existing ABB make SCADA system confirming to IEC-61850</b> . Make equivalent to Schneider, 1250A LSI& ABB E1N1250A PR121/P-LSIG.	2	Each	585027	<b>1170054.00</b>	INR Eleven Lakh Seventy Thousand & Fifty Four Only
6	SITC of New 1600A, 3/4Pole, ICU=ICS=50KA, ICW=50KA (1Sec), Electrical operated Drawout Circuit Breaker, Electrical Trip Indication, Communication Module, Mechanical Key Lock, Last 20 Trip History 80 Events & suitable for SCADA compatible confirming to IEC-61850. Make equivalent to Schneider, 1600A.& ABB E1N1600A PR121/P-LSIG.	1	Each	589119	<b>589119.00</b>	INR Five Lakh Eighty Nine Thousand One Hundred & Nineteen Only
7	Providing and fixing 400 amp, 35 KA, rating and breaking capacity TPMCCB in existing cubicle panel board including drilling holes in cubicle panel, making connections etc. as required.	2	Each	23182	<b>46364.00</b>	INR Forty Six Thousand Three Hundred & Sixty Four Only
8	Do-but 630 amp 50 KA MCCB	2	Each	29920	<b>59840.00</b>	INR Fifty Nine Thousand Eight Hundred & Forty Only
9	Supply, erection, testing and commissioning of factory fabricated metal clad dust and vermin proof- floor mounted 1600A cap 440 V, 50 HZ, 3 phase and neutral electric Panel double door <b>1000 mm</b> depth duly powder coated spray painted with separate chamber for instruments (e.g. ampere meter, volt meter, frequency meter, KWH meter etc.) & switch gears (like I/C & O/G MCB's/MCCB's, C/o switch with extentionable/rotary handle etc.). The electrical panel shall have 1600Amp, 415V TPN electrolyte aluminium bus bar as per IS 8623 insulated with heat shrink sleeve and mounted on nonhygroscopic supports with detachable side with hinge and locking. The switches shall be completed with lug and cable gland of suitable size of cables with connection as required. The panel should be made with 2 mm CRCA sheet. The panel should be fixed on with base M.S.channel size 125mmX65mmX6mm. or as required for proper completion of work as suited for existing panel as per direction of site in charge/ EIC.	62	Sq.Ft.	5722	<b>354764.00</b>	INR Three Lakh Fifty Four Thousand Seven Hundred & Sixty Four Only
10	SITC of 3-phase 3/4 wire accuracy class 0.5 Digital Multifunction Meter with RS 485 MODBUS communication port, large four line seven digit LCD/LED display with quadrant, SCADA compatible as per IEC 62052-11 and IEC 62053-22 complete in all respect as per specification.	6	Each	31152	<b>186912.00</b>	INR One Lakh Eighty Six Thousand Nine Hundred & Twelve Only
11	SITC of tap wound and ring type Current Transformer (CT) ratio (100/5 to 1600/5) Accuracy Class: 0.5, burden 15VA complete with all accessories and connections in all respect.	18	Units	2346	<b>42228.00</b>	INR Forty Two Thousand Two Hundred & Twenty Eight Only
12	Supplying and fixing of Indicator in existing panel/DB complete with all connections, testing and commissioning etc as required.	45	Each	112	<b>5040.00</b>	INR Five Thousand & Forty Only

13	Supply and laying of aluminium conductor, XLPE insulated, armoured, PVC sheathed cable, 11kV(UE) grade, 3 core 185 mm <sup>2</sup> at a depth of 1000mm below ground level over a cushion of 75mm thick sand around and protected with burnt bricks on sides and on top. On surface, the cable run shall be fixed on M.S. clamps etc. of suitable size or as directed by the Engineer-Incharge, 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.	30	Meter	3238	<b>97140.00</b>	INR Ninety Seven Thousand One Hundred & Forty Only
14	Supply and laying of aluminium conductor, XLPE insulated, armoured, PVC sheathed cable, 1100V grade, 4CX300 sqmm at a depth of 750mm below ground level over a cushion of 75mm thick sand around and protected with burnt bricks on sides and on top. On surface, the cable run shall be fixed on M.S. clamps etc. of suitable size or as directed by the Engineer-Incharge, 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.	120	Meter	3393	<b>407160.00</b>	INR Four Lakh Seven Thousand One Hundred & Sixty Only
15	Supply and laying of aluminium conductor, XLPE insulated, PVC armoured sheathed cable, 1100V grade, 4 core 300 mm <sup>2</sup> , in the existing masonry open duct as required.	180	Meter	2926	<b>526680.00</b>	INR Five Lakh Twenty Six Thousand Six Hundred & Eighty Only
16	Supply and laying of aluminium conductor, XLPE insulated, armoured, PVC sheathed cable, 1100V grade, 1.0CX800 sqmm at a depth of 750mm below ground level over a cushion of 75mm thick sand around and protected with burnt bricks on sides and on top. On surface, the cable run shall be fixed on M.S. clamps etc. of suitable size or as directed by the Engineer-Incharge, 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	Meter	2432	<b>729600.00</b>	INR Seven Lakh Twenty Nine Thousand Six Hundred Only
17	Supply and laying of copper conductor, XLPE insulated, armoured, PVC sheathed cable, 1100V grade, 4.0 Core 2.5 sqmm on existing cable tray with M.S. clamps/ Cable tie etc. of suitable size or as directed by the Engineer-Incharge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor by clamps etc.	50	Meter	307	<b>15350.00</b>	INR Fifteen Thousand Three Hundred & Fifty Only
18	Supply and laying of copper conductor, XLPE insulated, armoured, PVC sheathed cable, 1100V grade, 7.0 Core 2.5 sqmm on existing cable tray with M.S. clamps/ Cable tie etc. of suitable size or as directed by the Engineer-Incharge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor by clamps etc.	50	Meter	479	<b>23950.00</b>	INR Twenty Three Thousand Nine Hundred & Fifty Only
19	Supply and laying of copper conductor, XLPE insulated, armoured, PVC sheathed cable, 1100V grade, 12.0 Core 2.5 sqmm on existing cable tray with M.S. clamps/ Cable tie etc. of suitable size or as directed by the Engineer-Incharge, complete in all respects. The armouring of the cable shall be properly connected with the earth conductor by clamps etc.	50	Meter	781	<b>39050.00</b>	INR Thirty Nine Thousand & Fifty Only

20	Removal or Laying of one number PVC insulated and PVC sheathed /XLPE power cable of 1.1 KV grade up to 35 sqmm size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.	10	Meter	416	<b>4160.00</b>	INR Four Thousand One Hundred & Sixty Only
21	... do but above 185 sqmm and up to 400 sqmm	30	Meter	509	<b>15270.00</b>	INR Fifteen Thousand Two Hundred & Seventy Only
22	Removal or laying of one nnumber PVC insulated and PVC sheathed /XLPE power cable of 1.1 KV grade up to 35 sqmm size direct in ground including excavation and refilling the trench etc as required. but excluding sand cushioning and protective covering.	20	Meter	215	<b>4300.00</b>	INR Four Thousand Three Hundred Only
23	... do but above 185 sqmm and up to 400 sqmm	30	Meter	308	<b>9240.00</b>	INR Nine Thousand Two Hundred & Forty Only
24	Supplying and making end termination with brass compression double gland and copper lugs for termination for 04CX2.50 sqmm. of PVC insulated and PVC sheathed / XLPE copper conductor cable of 1.1 KV grade as required.	15	Each	640	<b>9600.00</b>	INR Nine Thousand Six Hundred Only
25	Supplying and making end termination with brass compression double gland and copper lugs for termination for 07CX2.50 sqmm. of PVC insulated and PVC sheathed / XLPE copper conductor cable of 1.1 KV grade as required.	15	Each	910	<b>13650.00</b>	INR Thirteen Thousand Six Hundred & Fifty Only
26	Supplying and making end termination with brass compression double gland and copper lugs for termination for 12 CX2.50 sqmm. of PVC insulated and PVC sheathed / XLPE copper conductor cable of 1.1 KV grade as required.	12	Each	1459	<b>17508.00</b>	INR Seventeen Thousand Five Hundred & Eight Only
27	Supplying and making end termination with brass compression double gland and aluminium lugs for termination for 01CX800 sqmm. of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.	10	Each	6719	<b>67190.00</b>	INR Sixty Seven Thousand One Hundred & Ninety Only
28	Supplying and making outdoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3CX 185-300 sqmm size , XLPE aluminium conductor cable of 11 KV grade as required :	1	Each	24480	<b>24480.00</b>	INR Twenty Four Thousand Four Hundred & Eighty Only
29	S/M indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3CX 185-300 sqmm 11 kV(UE) grade as required.	10	Each	17450	<b>174500.00</b>	INR One Lakh Seventy Four Thousand Five Hundred Only
30	Supplying and making straight through cable jointing with heat shrinkable jointing kit complete with all accessories including ferrules suitable for following size of 3 core 185-300 sqmm , XLPE aluminium conductor cable of 11 KV grade as required	1	Each	44989	<b>44989.00</b>	INR Forty Four Thousand Nine Hundred & Eighty Nine Only
31	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. The each joint should be welded, 30 cm <sup>2</sup> CI / HDPE FRP chamber	1	Each	28365	<b>28365.00</b>	INR Twenty Eight Thousand Three Hundred &

	masonry housing complete as per direction of site in charge complete.					Sixty Five Only
32	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	6	SET	8024	<b>48144.00</b>	INR Forty Eight Thousand One Hundred & Forty Four Only
33	Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	2	SET	14861	<b>29722.00</b>	INR Twenty Nine Thousand Seven Hundred & Twenty Two Only
34	Supplying and laying 25 mm X 5 mm copper strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of brass nut bolt & spring washer spaced at 50mm)	50	Meter	1044	<b>52200.00</b>	INR Fifty Two Thousand Two Hundred Only
35	Supplying and laying 25 mm X 5 mm G.I strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with G.I. nut, bolt, spring, washer etc. as required. (Jointing shall be done by overlapping and with 2 sets of G.I. nut bolt & spring washer spaced at 50mm)	100	Meter	155	<b>15500.00</b>	INR Fifteen Thousand Five Hundred Only
36	Providing and fixing earth bus of 50 mm X 5 mm copper strip on surface for connections etc. as required.	100	Meter	2269	<b>226900.00</b>	INR Two Lakh Twenty Six Thousand Nine Hundred Only
37	Providing and fixing of 100 mm dia GI pipe (medium class) in ground complete with G I pipe fittings trenching (75 cm deep) and refling if required.	20	Meter	1940	<b>38800.00</b>	INR Thirty Eight Thousand Eight Hundred Only
38	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level. Thermo-Mechanically Treated bars of grade Fe-500D or more.	20	P/kg	114.68	<b>2293.60</b>	INR Two Thousand Two Hundred & Ninety Three and Paise Sixty Only
39	Centering and shuttering including strutting, propping etc. and removal of form for foundations, footings, bases of columns, etc for mass concrete.	1	sqmm	416.97	<b>416.97</b>	INR Four Hundred & Sixteen and Paise Ninety Seven Only
40	Structural steel work 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 all complete.	20	kg	142.16	<b>2843.20</b>	INR Two Thousand Eight Hundred & Forty Three and Paise Twenty Only
41	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m including getting out the excavating trenching of required width for pipes, cable, etc including excavation for sockets, and dressing of sides, ramming of bottoms depth up to 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m.	1	cum	229.25	<b>229.25</b>	INR Two Hundred & Twenty Nine and Paise Twenty Five Only

42	Providing and laying in position cement concrete of 1:3:6 (1 cement : 3 coarse sand derived from natural source : 6 graded stone aggregate 20 mm nominal size derived from naural sources) 1:3:6 specified grade excluding the cost of centering and shuttering.	1	cum	7756.45	<b>7756.45</b>	INR Seven Thousand Seven Hundred & Fifty Six and Paise Forty Five Only
43	Brick work 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)	1	cum	7583.72	<b>7583.72</b>	INR Seven Thousand Five Hundred & Eighty Three and Paise Seventy Two Only
44	Providing and laying 12 mm cement plaster of mix 1:4 (1 cement: 4 coarse sand) at all level.	1	sqm	354.34	<b>354.34</b>	INR Three Hundred & Fifty Four and Paise Thirty Four Only
<b>Total in Figures</b>					<b>12363181.53</b>	INR One Crore Twenty Three Lakh Sixty Three Thousand One Hundred & Eighty One and Paise Fifty Three Only

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, the EIC will impose a penalty of Rs. 200 per violation.