

SECTION-I	PRESS NOTICE	
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**POSTGRADUATE INSTITUTE OF MEDICAL EDUCATION AND RESEARCH, CHANDIGARH
DEPARTMENT OF HOSPITAL ENGINEERING & PLANNING
ELECTRICAL DIVISION**

NOTICE INVITING e-TENDER

The Hospital Engineer (Electrical), PGIMER Chandigarh invites on behalf of the Director PGIMER Chandigarh **online Percentage rate bids** from the the specialized agencies dealing in **SITC of Substation equipments** in two bid system (Eligibility & Financial Bid) for the following work:-

1.	NIT No.	PGI/Engg./Elect./2026-27/02
2.	Name of work	Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh.
3.	Estimated cost of work	Rs. 491.98 Lakh
4..	Earnest Money	Rs. 9,83,960/-
5.	Period of Completion	9 Months
6.	Last date & time for submission of bid	20.05.2026 at 11:00 AM
7.	Date &Time for Pre Bid Meeing	05.05.2026 at 11:00 AM
8.	Date &Time for opening of Eligibility Cum Technical Bid	21.05.2026 at 11:00 AM
9.	Date &Time for opening of Financial bid	To be declared later

The Original EMD or EMD exemption certificate for MSE/MSME as scanned & uploaded shall be deposited physically by all the intending bidders in the office of H.E. (Electrical) as per above schedule failing which the bid shall be treated as invalid.


The MSME firms registered in NSIC under PP policy are exempted from payment of EMD for goods and services only

The tender forms and other details can be obtained from the website: <https://eprocure.gov.in/eprocure/app> and official website of the PGIMER www.pgimer.edu.in. **Press notice is also available on www.eprocure.gov.in. The Contractors are requested to get their firm registered on the website <https://eprocure.gov.in/eprocure/app> for participating in e-tendering process (Helpdesk no. 0172-2755806, 2755843, email id:- electricaldivisionpgi@gmail.com).**

SECTION-II	CHECK LIST	
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CHECK LIST FOR CONTRACTORS FOR SUBMISSION OF TENDERS ONLINE:

1. THE FIRM MUST UPLOAD THE NECESSARY DOCUMENTS AS MENTIONED IN LIST OF DOCUMENTS TO BE SCANNED AND UPLOADED WITHIN THE PERIOD OF BID SUBMISSION AT PAGE 13 OF BID DOCUMENTS.
2. IF ANY DISCREPANCY IS NOTICED BETWEEN UPLOADED EMD AT THE TIME OF SUBMISSION OF BID AND ORIGINAL EMD OR EMD EXEMPTION CERTIFICATE SUBMITTED PHYSICALLY BY THE BIDDERS IN THE OFFICE OF THE BID OPENING AUTHORITY, THE BID SUBMITTED SHALL BECOME INVALID.
3. TENDER TO BE WITNESSED AT SPECIFIED PAGE OF TENDERED DOCUMENTS AT THE TIME OF DRAWING AGREEMENT WITH THE SUCCESSFUL BIDDER.
4. THE TENDER / TENDERS CONTAINING CONDITIONS CONTRARY TO THOSE SPECIFIED IN THIS DOCUMENT SHALL BE SUMMARILY REJECTED.
5. THE INTENDING BIDDER SHALL QUOTE HIS PERCENTAGE RATE IN FIGURE ONLY. THE RATES IN WORDS, AMOUNT AND THE TOTAL IS GENERATED AUTOMATICALLY. THEREFORE, THE RATE QUOTED BY THE BIDDER IN FIGURES IS TO BE TAKEN AS CORRECT.
6. THE CONTRACTOR(S) SHALL QUOTE THE RATES KEEPING IN MIND, CPWD GENERAL CONDITIONS OF CONTRACT 2023 FOR MAINTENANCE WORKS, SPECIAL CONDITIONS OF CONTRACT ETC.
7. IT MAY BE NOTED THAT IN THE PRESENT CONTRACT CLAUSE 10B (II), 10C & 10CA ARE APPLICABLE BUT 10CC IS NOT APPLICABLE.
8. ONCE THE BID UPLOADED BY THE BIDDER IS WITHDRAWN, HE WILL NOT BE ALLOWED TO RESUBMIT HIS BID, HOWEVER, HE CAN EDIT HIS BID ANY NUMBER OF TIMES BUT BEFORE LAST DATE & TIME OF SUBMISSION OF BID.

SECTION-III	<u>Form- 6 FOR</u> <u>e TENDERING</u>	
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1. Percentage rate bids are invited on behalf of the Director, PGIMER, Chandigarh from the specialized agencies dealing in **SITC of Substation equipments** for the work of **“Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh.”**
 - 1.1 The work is estimated to cost **Rs. 491.97 Lakh**. This estimate, however, is given merely as a rough guide.
 - 1.2 Contractors who fulfill the following requirements shall be eligible to apply. Joint ventures are not accepted
 - 1.2.1 Intending bidder is eligible to submit the bid provided 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 in last 7 years ending last day of month to one in which tenders are invited:-
Three similar works each costing not less than **Rs. 196.80 Lakh** OR two similar works each costing not less than **Rs. 295.20 Lakh** OR one similar work costing not less than **Rs. 393.60 Lakh**. **(Similar work shall mean SITC of Substation equipments including transformer of minimum 15 MVA capacity each)**
The completion certificate should be certified by an officer not below the rank of Executive Engineer / Project manager/ General Manager of a firm/owner for whom work is executed (if private works are shown in support of eligibility, certified copy of the tax deducted at source certificate (TDS) shall be submitted along with the experience certificate and the TDS amount shall tally with the actual amount of work done.
The value of executed works shall be brought to 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 submission of bid.
 - 1.2.2 Proof of valid Minimum 66KV electrical license issued from U.T. Electricity Department / any state electricity boards/ Department **(Scanned copy to be uploaded)**.
 - 1.2.3 Should have Certificate of Registration for GSTIN
 - 1.2.4 Shall have to furnish General Technical Particulars on the prescribed proforma attached at page 44-46 of the bid document. **(Scanned copy of filled proforma to be uploaded)**. The financial bids of only those bidders shall be opened who fulfill the technical requirement of the GTP.
 - 1.2.5 Should have had average annual financial turnover of **Rs. 147.60 Lakh** in works during the last three years ending 31st March 2025 on the proforma of Form A attached page 88 of the bid document. **(Scanned copy of certificate from CA to be uploaded)**.
 - 1.2.6 Should not have incurred any loss in more than two years during the last five years ending 31st March 2025 on the proforma of Form B attached page 89 of the bid document. **(Scanned copy of certificate from CA to be uploaded)**.
 - 1.2.7 Should have a solvency of not less than **Rs. 196.80 Lakh** issued by a scheduled bank on the proforma of form C attached at page 90 of bid documents **(scanned copy of the solvency certificate to be uploaded)**. The date of issue of solvency certificate shall not be more than six months prior to the stipulated date of submission
OR
Should have a Net worth Certificate of Value not less than **Rs 49.20 Lakh** issued by certified Chartered Accountant on the proforma of Form D attached page 90 of the bid document. **(Scanned copy of original Net worth Certificate to be uploaded)**.
 - 1.2.8 Should have bidding capacity equal to or more than the estimated cost of the work put to tender on the proforma of form A attached at page-91 of bid documents **(Scanned copy of the original certificate to be uploaded)**. The bidding capacity shall be worked out by the following formula:

Bidding Capacity = {[AxNx1.5]-B}

Where,

A = Maximum turnover during the last seven yearstaking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Number of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

1.2.9 To become eligible, the bidders shall have to furnish an affidavit on non judicial stamp paper duly attested by a notary public or District magistrate as under:-

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

-That I/We have not been blacklisted / debarred in any Govt. Deptts./ Boards/ Corporations/ Federations/ Agencies /any Autonomous Bodies in any State/ Central Government Departments etc. as on the date of submission of the bid in the present tender.

- That he / she / Director(s)/Partners (s) of the proprietorship / firm / company / agency have never been convicted of any criminal offence.

- That I/we also undertake that the particulars given by me are true and correct to the best of my knowledge & belief and nothing has been concealed thereof. I am aware that in case of any discrepancy / false statement if found, it will lead to rejection of my bid/tender and PGI will debar / blacklist proprietorship / firm / company / agency. **(Scanned copy to be uploaded at the time of submission of bid)**

1.2.10 At the time of uploading the bids, the contractor is required to submit an undertaking from the OEM of Transformer that:-

- a) Authorization certificate in favour of the contractor.
- b) OEM will extend unconditionally support to the contractor technically throughout the execution period & CMC period for useful life of the system.
- c) OEM will provide all the spares required for healthy functioning of the equipment for atleast seven years from the date of supply of equipment.
- d) Manufacturer shall be compliant to the Public Procurement(Preference to Make In India), Order 2017 (as amended from time to time) issued by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry

1.2.11 It is presumed that all the bidders who have submitted the bid have gone through the entire bid documents including integrity pact and that all the terms & conditions are acceptable to them.

2. Agreement shall be drawn with the successful bidders on CPWD General Conditions of Contract 2023 for Construction work which is available with the concerned Hospital Engineer and the bidders shall quote his rates as per various terms and conditions of the said form subject to the exclusions / modifications attached at page 26 which will form part of the agreement.
3. The time allowed for carrying out the work will be **9 Months** from the date of start as defined in Schedule-F or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.
4. (i) The site for the work is available.
(ii)The architectural drawings, if required, shall be issued as per site requirement.
5. The bid 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 except Standard General Conditions of Contract Form can be seen on website <https://eprocure.gov.in/eprocure/app> and official website of the PGIMER www.pgimer.edu.in free of cost.
6. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.

7. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.
8. When bids are invited in Three stage system and if it is desired to submit revised financial bid then it shall be mandatory to submit revised financial bid. If not submitted then the bid submitted earlier shall become invalid.
9. Earnest Money in the form of Demand Draft or Pay order or Banker's Cheque or Deposit at Call Receipt or Fixed Deposit Receipt (drawn in favour of ***Postgraduate Institute of Medical Education And Research, Chandigarh***) shall be scanned and uploaded to the e-Tendering website within the period of bid submission.

A part of earnest money is acceptable in the form of bank guarantee also. In such case, minimum 50% of earnest money or Rs. 20 lac, whichever is less, shall have to be deposited in shape prescribed above, and balance may be deposited in shape of Bank Guarantee of any scheduled bank having validity for Two months or more from the last date of receipt of bids which is to be scanned and uploaded by the intending bidders.

The original EMD or EMD exemption certificate for MSE/MSME as scanned & uploaded shall be deposited physically by all the intending bidders in the office of H.E. (Electrical) before opening of Eligibility cum Technical bid failing which the bid shall be treated as invalid.

Copy of documents as specified in press notice shall be scanned and uploaded to the e-tendering website within the period of bid submission. However, certified copy of all the scanned and uploaded documents as specified in press notice shall have to be submitted by the highest scorer bidder within a week physically in the office of tender opening authority.

Online bid documents submitted by intending bidders shall be opened only of those bidders, whose Earnest Money Deposit found in order.

The MSME firms registered in NSIC under PP policy are exempted from payment of EMD for services only

The bid submitted shall be opened on 21.05.2026 at 11:00 AM.

10. The bid submitted shall become invalid if:
 - (i) The bidder is found ineligible.
 - (ii) The bidder does not upload all the documents as stipulated in the bid document.
 - (iii) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the lowest bidder in the office of bid opening authority.
 - (iv) The intending bidder does not deposit original EMD or EMD exemption certificate for MSE/MSME physically as scanned & uploaded upto 20.05.2026 at 11:00 AM.
 - (v) If tendered quotes 'Nil' Charges 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.
11. The contractor whose bid is accepted, will be required to furnish performance guarantee of 5% (FivePercent) of the tendered amount within the period specified in Schedule F. This guarantee shall be in the form of Deposit at Call receipt of any scheduled bank/Banker's cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F' including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. The Earnest Money deposited along with bid shall be returned after receiving the aforesaid performance guarantee.

The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/registrations or proof of applying for obtaining labour licenses, registrations with GST, EPFO, ESIC and BOCW Welfare Board including Provident Fund Code No. if applicable and also ensure the compliance of aforesaid provisions by the sub contractor, if any engaged by the contractor for the said work and Programme Chart (Time and Progress) within the Period specified in Schedule F.

12. PRE-BID MEETING

Pre Bid conference shall be held before eligibility bid in the Committee room, Superintending Hospital Engineering & Planning, First floor, SPH building, Sec-12, PGIMER, Chandigarh on 05.05.2026 at 11:00 AM to clear the doubt of intending bidders, if any. Bidders are advised to go through complete tender documents including SOQ, Terms & Conditions, Design and Scope of work, Specification, Drawing, List of makes etc carefully for each service and come prepared for commercial / technical discussion on the same.

At this stage contractors are welcome to give their suggestion / improvement in specification / Design in addition to pointing out discrepancies if any.

Any doubt in respect to any condition / specification may be got clear during this stage. Based upon discussion held and decision taken in the pre bid meeting, revised tender documents/ corrigendum will be reloaded if required.

Pre bid meeting shall be held on single day.

13. The description of the work is as follows:

Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh

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 bid. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidders 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 bid by a bidders 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 Government and local conditions and other factors having a bearing on the execution of the work.

14. The competent authority on behalf of the Director PGIMER does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.

15. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable for rejection.

16. The competent authority on behalf of the Director PGIMER reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.

17. The contractor shall not be permitted to bid for works in the Institute's Engineering Department (responsible for award and execution of contracts) in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of Superintending Hospital Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer in the Institute's Engineering Department. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.

18. No Engineer or other officers employed in Engineering or Administrative duties in Engineering Department of the Institute is allowed to work as a contractor for a period of one year after his retirement from Institute's service without the previous permission of the competent authority in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the competent authority as aforesaid before submission of the tender or engagement in the contractor's service.
19. The bid for the works shall remain open for acceptance for a period of 75 days from the receipt of technicalcum eligibility bids. If any bidders withdraws his tender 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 department, then the Institute shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the bidders shall not be allowed to participate in the rebidding process of the work.
20. This Notice inviting bid shall form a part of the contract document. The successful bidder/contractor, on an acceptance of his bid by the Accepting Authority, shall within 15 days from the stipulated date of start of the work sign the contract consisting of:
 - a) The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings etc., if any, forming the tender as issued at the time of invitation of bid and acceptance thereof together with any correspondence leading thereto.
 - b) Standard Form 7/8 or other Standard Form as applicable.

21. **For Composite Bids**

- 20.1.1 The Hospital Engineer in charge of the major component will call bids for the composite work. The cost of bid document Earnest Money will be fixed with respect to the combined estimated cost put to tender for the composite bid.
- 20.1.2 The bid document will include following three components:


Part A: - Form 6, Form 7/8 including schedule A to F for the major component of the work, Standard General Conditions of Contract for CPWD 2023, exclusions / modifications attached at Page No. 27.

Part B: - General / specific conditions, specifications and schedule of quantities applicable to major component of the work.

Part C: - Schedule A to F for minor components of the work (Hospital Engineer in charge of the major component shall also be competent authority under Clause 2 and Clause 5 as mentioned in Schedule A to F for major component), general / specific conditions, specifications and schedule of quantities applicable to minor components of the work.
- 20.1.3 The bidders must associate himself, with agencies of the appropriate class eligible to bid for each of the minor component individually *as per eligibility criteria specified at clause 1.2.11 page 4 of DNIT.*
- 20.1.4 The eligible bidders shall quote percentage rates for all items of major component as well as for all items of minor components of work.
- 20.1.5 After acceptance of the bid by competent authority, the Hospital Engineer in charge of major component of the work shall issue letter of award on behalf of the Director, PGIMER. After the work is awarded, the main contractor will have to enter into one agreement with Hospital Engineer in charge of major component and has also to sign two or more copies of agreement depending upon number of Hospital Engineer in charge of minor components. One such signed set of agreement shall be handed over to Hospital Engineer in charge of minor component. Hospital Engineer of major component will operate part A and part B of the agreement. Hospital Engineer in charge of minor component(s) shall operate part C alongwith part A of the agreement.
- 20.1.6 Entire work under the scope of composite bid including major and all minor components shall be executed under one agreement.

- 20.1.7 Security Deposit (PBG) will be worked out separately for each component corresponding to the estimated cost of the respective component of works.
- 20.1.8 The main contractor has to associate agency(s) for minor component conforming to eligibility criteria as defined in the tender documents and has to submit detail of such agency(s) to Engineer-in-charge of minor component within prescribed time. Name of the agency(s) to be associated shall be approved by Engineer-in-charge of minor component.
- 20.1.9 In case the main contractor intends to change any of the above agency/agencies during the operation of the contract, he shall obtain prior approval of Engineer-in-charge of minor component. The new agency/agencies shall also have to satisfy the laid down eligibility criteria. In case Engineer-in-charge is not satisfied with the performance of any agency, he can direct the contractor to change the agency executing such items of work and this shall be binding on the contractor.
- 20.1.10 The main contractor has to enter into agreement with the contractor(s) associated by him for execution of minor component. Copy of such agreement shall be submitted to Hospital Engineer in charge of minor component as well as to Hospital Engineer in charge of major component. In case of change of associate contractor, the main contractor has to enter into agreement with the new contractor associated by him.
- 20.1.11 Running payment for the major component shall be made by Hospital Engineer of major discipline to the main contractor. Running payment for minor components shall be made by the Engineer-Incharge of the discipline of minor component directly to the main contractor.
- 20.1.12 (a) The composite work shall be treated as complete when all the components of the work are completed. The completion certificate of the composite work shall be recorded by Engineer-in-charge of major component after the completion certificate of all other components.
- (b) Final bill of whole work shall be finalized and paid by the Hospital Engineer of major component. Engineer in charge of minor component will prepare and pass the final bill for their component of work and pass on the same to the Hospital Engineer of major component for including in the final bill for composite contract.
22. All the payments to the contractor shall be deposited in their bank account through RTGS and the contractor shall submit the detail of his bank account & IFSC code after award of work.
23. In case, date for opening of Eligibility /Technical/ Financial bid is declared/happens to be public holiday, the Eligibility / Technical/ Financial bid will be opened on the next working day.
24. The contractor shall comply to the "Solid Waste Management Byelaws 2018" & "Construction & Demolition Rules 2016". Any penalty imposed by the competent authority on account of non-compliance of these provisions, if not deposited in time by the contractor, would be recovered from the payment due to the contractor,
25. The scope of work taken in this contract can be Increased / Decreased as per requirement of the PGIMER.
26. The contractor must follow the statutory requirements of prevalent environment norms and shall use the fly ash in the adequate proportion as per relevant environment norms.
27. When the installation is complete, the contractor shall arrange for inspection and testing of the installation. Test results obtained shall be recorded. The installation shall not be accepted until it complies with the requirement of these Specifications. The Sub Station installation shall be got inspected by the contractor from Government Electrical Inspector and their clearance taken before energizing the Sub Station. All the observations/ deficiencies pointed out by the inspecting authorities shall be complied with by the contractor on priority. The department shall pay mandatory charges to Government Electrical Inspectorate and local licensee, if any, in this regard.

28. The Power Transformer, 66 KV switchgears, APFC panels, Control relay panel, substation automation system, VCB panel, shall be got installed from the OEM / Channel partner of the OEM and commissioning report of the same shall be submitted by contractor after installation of the Bus ducts.
29. Shop drawing & GAD of all proposed equipments shall be prepared by the contractor and got approved by the Engineer-in-Charge prior to execution of the work.
30. The payment shall be released as per “**Terms of payment**” mentioned at clause 7 in Schedule A to F at page 23 of the Bid document.

SECTION-IV	INFORMATION AND INSTRUCTIONS FOR BIDDERS	
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INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR E-TENDERING FORMING PART OF BID DOCUMENT

The Hospital Engineer (Electrical), PGIMER Chandigarh on behalf of the Director PGIMER Chandigarh invites **online Percentage rate bids** from the the specialized agencies dealing in **SITC of minimum 66 KV Substation** in two bid system (Eligibility & Financial Bid) for the following work:-

1.	NIT No.	PGI/Engg./Elect./2026-27/02
2.	Name of work & Location	Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh.
3.	Estimated cost put to bid	Rs. 491.98 Lakh
4.	Earnest Money	Rs. 9,83,960/-
5.	Period of Completion	9 Months
6.	Last date & time of submission of bid and other documents as specified in the press notice	20.05.2026 at 11:00 AM
7.	Last date & time for submission of Original EMD:	20.05.2026 at 11:00 AM
8.	Date &Time of opening of Eligibility bid	21.05.2026 at 11:00 AM

1. Contractors who fulfill the following requirements shall be eligible to apply. Joint ventures are not accepted.
 - a) Should have satisfactorily completed the works as mentioned below during the last Seven years ending last day of month to one in which tenders are invited:-
Three similar works each costing not less than **Rs. 196.80 Lakh** OR two similar works each costing not less than **Rs. 295.20 Lakh** OR one similar work costing not less than **Rs. 393.60 Lakh. (Similar work shall mean SITC of Substation equipments including transformer of minimum 15 MVA capacity each).**
The completion certificate should be certified by an officer not below the rank of Executive Engineer / Project manager/ General Manager of a firm/owner for whom work is executed (if private works are shown in support of eligibility, certified copy of the tax deducted at source certificate (TDS) shall be submitted alongwith the experience certificate and the TDS amount shall tally with the actual amount of work done
The value of executed works shall be brought to 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 submission of bid.
 - b) Should have Valid Certificate of Registration for GSTIN.
 - c) Proof of valid Minimum 66KV electrical license issued from U.T. Electricity Department / any state electricity boards/ Department (**Scanned copy to be uploaded**)
 - d) Shall have to furnish General Technical Particulars on the prescribed proforma attached at page 44-46 of the bid document. (**Scanned copy of filled proforma to be uploaded**). The financial bids of only those bidders shall be opened who fulfill the technical requirement of the GTP.

- e) Should have had average annual financial turnover of **Rs. 147.60 Lakh** on construction works during the last three years ending 31st March 2025 on the proforma of Form-A attached page 88 of the bid document. **(Scanned copy of certificate from CA to be uploaded).**
- f) Should not have incurred any loss in more than two years during the last five years ending 31st March 2025 on the proforma of Form-B attached page 89 of the bid document. **(Scanned copy of certificate from CA to be uploaded).**

- g) Should have a solvency of not less than **Rs.196.80 Lakh** issued by a scheduled bank on the proforma of form C attached at page-90 of bid documents (Scanned copy of the solvency certificate to be uploaded). The date of issue of solvency certificate shall not be more than six months prior to the stipulated date of submission

OR

Should have a Net worth Certificate of Value not less than **Rs 49.20 Lakh** issued by certified Chartered Accountant on the proforma of Form-D attached page 90 of the bid document. **(Scanned copy of original Net worth Certificate to be uploaded).**

- h) Should have bidding capacity equal to or more than the estimated cost of the work put to tender on the proforma of form A attached at page-91 of bid documents **(Scanned copy of the original certificate to be uploaded).** The bidding capacity shall be worked out by the following formula:

$$\text{Bidding Capacity} = \{[A \times N \times 1.5] - B\}$$

Where,

A = Maximum turnover during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Number of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

- i) At the time of uploading the bids, the contractor is required to submit an undertaking from the OEM of Transformer that:-
- i) Authorization certificate in favour of the contractor
 - ii) OEM will extend unconditionally support to the contractor technically throughout the execution period & CMC period for useful life of the system.
 - iii) OEM will provide all the spares required for healthy functioning of the equipment for atleast seven years from the date of supply of equipment.
 - iv) Manufacturer shall be compliant to the Public Procurement(Preference to Make In India), Order 2017 (as amended from time to time) issued by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry

2. The intending bidder must read the terms and conditions of Form-6 carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.

3. Information and Instructions for bidders posted on website shall form of bid document.

4. The bid 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 and downloaded from the website: <https://eprocure.gov.in/eprocure/app> and official website of the PGIMER [www. pgimer.edu.in](http://www.pgimer.edu.in). free of cost.

5. But the bid can only be submitted after uploading the mandatory scanned documents such as Demand Draft or Pay order or Banker`s Cheque or Deposit at call Receipt or Fixed Deposit Receipts and Bank Guarantee of any Scheduled Bank towards EMD in favour of **Postgraduate**

Institute of Medical Education And Research, Chandigarh or EMD exemption certificate for MSE/MSME and other documents as specified.

6. Those contractors not registered on the website mentioned above, are required to get registered beforehand. If needed they can be imparted training on online bidding process as per details available on the website.
7. The intending bidder must have valid class-III digital signature to submit the bid.
8. On opening date, the contractor can login and see the bid opening process. After opening of bids he will receive the competitor bid sheets.
9. Contractor can upload documents in the form of **JPG** format and **PDF** format.
10. Contractor must ensure to quote percentage rate in the schedule of Quantity. The column meant for quoting percentage rate in figures appears in pink colour and the moment rate is entered, it turns sky blue.
11. The agency shall submit the status of his firm w.r.t. proprietary firm / partnership firm or Limited company as per detail given below:-

If the bidder is a proprietary firm, a self undertaking of the proprietorship shall be uploaded by the bidder.

If the bidder is a firm in partnership, the bid documents shall be signed by all the partners of the firm above their full typewritten names and current addresses, or, alternatively, by a partner holding power of attorney for the firm. In the later case a certified copy of the power of attorney should be uploaded. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should also be uploaded.

If the bidder is a limited company or a corporation, the bid documents shall be signed by a duly authorized person holding power of attorney for signing the bid documents accompanied by a copy of the power of attorney/ Authorization Letter. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

12. The Technical cum eligibility bids shall be opened first on date and time as mentioned above. The time and date of opening of financial bid of contractors qualifying the eligibility bid shall be communicated to them at a later date.

***LIST OF DOCUMENTS TO BE SCANNED AND UPLOADED WITHIN THE PERIOD OF
BID SUBMISSION:***

- I. EMD or EMD exemption certificate for MSE/MSMEs as per detail given in Clause No. 9 at page 5 of the DNIT.
- II. Certificates of Work Experience of Main bidder as per detail given in Clause no. 1.2.1 at page 3 of the DNIT.
- III. Valid electrical license as per detail given in Clause 1.2.2 at Page no. 3 of the DNIT.
- IV. General Technical Particulars on the prescribed proforma attached at page 44-46.
- V. Certificate of Financial Turnover from CA as per detail given in Clause No. 1.2.5 at page 3 on the proforma of Form A attached page 88.
- VI. Certificate of Profit & Loss from CA certifying as per detail given in Clause No. 1.2.6 at page 3 on the proforma of Form B attached page 89.
- VII. Bank solvency form a scheduled bank as per detailed given in Clause No. 1.2.7 at page 3 on the proforma of Form C attached page 90.
OR
Networth Certificate from a certified Chartered Accountant as per detail given in Clause No. 1.2.7 at page 3 on the proforma of Form D attached page 90.
- VIII. Bidding capacity as per detail given in Clause No. 1.2.8 at page 3 on the proforma of Form A attached at page 91.
- IX. Affidavit on non judicial stamp paper duly attested by a notary public or District magistrate as per detail given in Clause No. 1.2.9 at page 4 of the DNIT.
- X. Undertaking as per detail given in Clause No. 1.2.10 at page 4 of the DNIT.
- XI. Status of firm as per detail given in Clause No. 11 at page 11 of the DNIT
- XII. Valid Certificate of Registration for GSTIN.

SECTION-V	TENDER AND CONTRACT	
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Percentage Rate Tender & Contract For Works

Tender for the work of: Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh.

- Date & time for submission of bid 20.05.2026 at 11:00 AM
- Date & Time for Pre Bid Meeting 05.05.2026 at 11:00 AM
- Date & time for submission of original EMD 20.05.2026 at 11:00 AM
- Eligibility Bid To be opened online on 21.05.2026 at 11:00 AM

TENDER

I/we have read and examined the notice inviting tender, schedule A, B, C, D, E & F specifications applicable, Drawings and Designs, General Rules and Directions, conditions of Contract, clauses of contract, special conditions, additional terms & conditions & specifications, schedule of rate and other documents and rules referred to in the conditions of contract and all other contents in the tender documents for the work.

I/we hereby tender for the execution of the work specified for the Institute within the time specified in schedule 'F' viz. schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of general rules and Directions and in Clause 11 of the conditions of contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

I/we agree to keep the tender open for 75 days from the receipt of technical cum eligibility bids and not to make any modifications in its terms and conditions.

A sum of **Rs. 9,83,960/-** is hereby forwarded in the shape of deposit at call receipt of a scheduled bank/ demand draft of a scheduled bank/ Fixed deposit receipt of scheduled bank in favour of the **Postgraduate Institute of Medical Education And Research, Chandigarh** payable at Chandigarh as earnest money. If I/We, fail to furnish the prescribed performance guarantee within prescribed period. I/We agree that the said the Director, PGIMER or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that Director PGIMER or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the 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 therein and to carryout such deviation as may be ordered upto maximum of the percentage mentioned in Schedule-F and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form.

Further, I/We agree that in case of forfeiture Earnest Money & 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 contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then

I/We shall be debarred for tendering in PGI in future forever. Also, if such a violation comes to the notice of Department 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 Institute.

Dated:- _____ Signature of Contractor
Postal Address:
Witness:
Address: _____ Telephone No.:
Fax No.:
Occupation: _____ E-Mail.:

ACCEPTANCE


The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the Institute for a sum of Rs. _____

The letters referred to below shall form part of this contract agreement:

- i) _____
- ii) _____
- iii) _____

Dated _____

Hospital Engineer (Construction)
For & on behalf of the Director,
PGIMER, Chandigarh

SECTION-VI	INTEGRITY PACT	
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To,

.....,
.....,
.....

Sub: NIT No. PGI/Engg/Elect./2025/___ for the work of **Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh**

Dear Sir,

It is here by declared that PGIMER, CHANDIGARH is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the Institute.

Yours faithfully

Hospital Engineer (Electrical)

To,

Hospital Engineer (Electrical),

.....,
.....

Sub: Submission of Tender for the work of **Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh.**

Dear Sir,

I/We acknowledge that PGIMER, CHANDIGARH is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process.

I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT. I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by PGIMER, CHANDIGARH. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, PGIMER, CHANDIGARH shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of Institute.

INTEGRITY AGREEMENT

This Integrity Agreement is made at on thisday of20.....**BETWEEN** Director PGIMER, Chandigarh represented through Hospital Engineer, (Construction), PGIMER, Chandigarh (Hereinafter referred as the (Address of Division) ‘**Principal/Owner**’, which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

..... (Name and Address of the Individual/firm/Company) through (Hereinafter referred to as the (Details of duly authorized signatory) “**Bidder/Contractor**” and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns) **Preamble** WHEREAS the Principal / Owner has floated the Tender (NIT No.....) (hereinafter referred to as “**Tender/Bid**”) and intends to award, under laid down organizational procedure, contract for (Name of work) hereinafter referred to as the “**Contract**”.

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as “**Integrity Pact**” or “**Pact**”), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

(c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Institute all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

d) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose (with each tender as per proforma enclosed) any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

3) The Bidder(s)/Contractor(s) will not instigate third persons to omit offences outlined above or be an accessory to such offences.

4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Institute interests.

5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes.

The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

2) Forfeiture of EMD Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit Performance Guarantee and Security Deposit of the Bidder/Contractor.

3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of Indian Penal code (IPC)/Prevention of Corruption Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/ Subcontractors

1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/ sub-vendors.

2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded. If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority of PGIMER, Chandigarh.

Article 7- Other Provisions

1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Chandigarh.

2) Changes and supplements need to be made in writing. Side agreements have not been made.

3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....
(For and on behalf of Principal/Owner)

.....
(For and on behalf of Bidder/Contractor)


WITNESSES:

1.
(signature, name and address)

2.
(signature, name and address)

Place:

Dated :

SECTION-VII	PROFORMA OF SCHEDULE A TO F	
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SCHEDULE 'A'

Schedule of quantities attached at page no. 94-113 of DNIT

SCHEDULE 'D'

Extra schedule for specific requirements / documents for the work, if any:

As mentioned in tender documents

SCHEDULE 'E'

Reference to General Conditions of contract.

CPWD General Condition of Contract 2023 for Construction Works.

Name of Work :

Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER, Chandigarh

Estimated cost of work :

Rs. 491.98 Lakh

Earnest Money :

Rs. 9,87,960/-

(to be returned after receiving Performance guarantee)

Performance Guarantee :

5% of the tendered value

Security Deposit :

2.5% of the tendered value

SCHEDULE 'F'

GENERAL CONDITION OF CONTRACT

Officer inviting tender

**Hospital Engineer (Electrical)
PGIMER, Chandigarh.**

GENERAL RULES & DIRECTIONS

Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3:

See below

Definitions:

2 (v)

Engineer- in- charge

Hospital Engineer (Electrical)
PGIMER, Chandigarh.

2 (viii)

Accepting Authority

Director
PGIMER, Chandigarh.

2 (x)

Percentage on cost of material and labour to cover all overheads and profits

15%

2 (xi)

Standard Schedule of Rates

DSR 2022 (E&M)

2 (xii)

Department

P.G.I.M.E.R., CHANDIGARH

9 (ii)

Standard contract Form

Form-7/8, CPWD General Conditions of Contract 2023 for Construction works.

Clause 1

- (iv) Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and applicable labour licenses registration with EPFO, ESIC and BOCW Welfare Board or proof of applying thereof from the date of issue of letter of acceptance **15 days**
- (v) Maximum allowable extension **with late fee @ 0.1 % per day of performance guarantee amount** beyond the period provided in (i) above **07 days**

Clause 2

Authority for fixing compensation under clause-2 **Superintending Hospital Engineer, PGIMER, Chandigarh**

Clause 2A **Applicable clause 2 / clause 2A** **Clause-2**

Clause 5 Number of days from the date of issue of letter of acceptance for reckoning date of start = 15 Days

Mile stones(s) as per table given below:-

S.No.	Description of Milestone (Physical)	Time allowed in days (from date of start)	Amount to be withheld in case of non achievement of milestone
1	Submission of Drawings including removal of observations raised by the Institute, if any.	D*+1 month	-
2	Delivery of all equipments including Transformers	D*+5 month	1.25%
3	Installation of all equipments including Transformers	D*+6 months	1.25%
4	Testing, Commissioning of the equipments.	D*+8 months	1.25%
5	Handing over of the site	D*+9 months	1.25%
	D* = Date of commencement.		In the event of not achieving the necessary progress as assessed from the running payment, 1.25% of the tendered value of work will be withheld for failure of each milestone from SI No 1 to 4. Maximum amount to be with held shall not exceed 5% of tendered value of work.

Time allowed for execution of work 09 Months

Authority to decide:

- (i) Extension of time : **Superintendent Hospital Engineer**
- (ii) Rescheduling of mile stones : **Superintending Hospital Engineer or his successor**

- (iii) Shifting of date of start in case of delay **Superintending Hospital Engineer**
in handing over of site:

PROFORMA OF SCHEDULES

Clause 5 Schedule of handing over of site:

Part	Part Portion of site	Description	Time Period for handing over reckoned from date of issue of letter of intent.
Part A	Portion without any hindrance	Site is available	15 days
Part B	Portions with encumbrances	--	--
Part C	Portions dependent on work of other agencies	--	--

Applicable Clause 5 / Clause 5A

Clause-5

Clause 7

Gross work to be done together with net payment /adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment

Terms of payment:

- 75% after inspection and delivery at site in good conditions on pro-rata basis
- 15% after completion of installation in all respect on pro-rata basis
- Balance 10% after satisfactory testing, commissioning of equipments and handling over of site.

Clause 7A

Whether Clause 7A shall be applicable

Applicable

Clause

10A

List of equipments to be provided by the contractor at site lab.

- 1.....2..... As per site requirement
3.....4.....
5.....6.....

10B(ii)

Whether Clause 10 B (ii) shall be applicable **Applicable**

Clause 10C

Component of labour expressed as percent of value of work = **Applicable**

Clause

10CC

Payment due to increase/decrease in Prices/Wages (Not Applicable)

Clause 11

Specifications be followed for execution of work. i) NIT Specifications.
ii) Latest CPWD Specifications with amendments.

iii) Bureau of Indian Standards & CEA wherever no such specifications exists in S.No. i) & ii).

Clauses 12 Authority to decide deviation upto 1.5 times of tendered amount **Superintending Hospital Engineer PGI, Chandigarh.**

Type of work Original work

12.2 & 12.3 Deviation limit beyond which clause 12.2 & 12.3 shall apply for building work 100%

12.5 i) Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for foundation Work (except item mentioned in earth work subhead in DSR and related items) 100%

ii) Deviation Limit for items in earth work subhead of DSR and related items 100%

Clause 16 Competent authority for deciding reduced rates **Superintending Hospital Engineer PGI, Chandigarh.**

Clause 18 List of mandatory machinery, tools & plants to be deployed by the contractor at site/ manufacturing unit:-.

As per site requirement

Clause 19C Authority to decide penalty for each default. **Hospital Engineer (Electrical), PGIMER, Chandigarh.**

Clause 19D Authority to decide penalty for each default. **Hospital Engineer (Electrical), PGIMER, Chandigarh.**

Clause 19G Authority to decide penalty for each default. **Hospital Engineer (Electrical), PGIMER, Chandigarh.**

Clause 19K Authority to decide penalty for each default. **Hospital Engineer (Electrical), PGIMER, Chandigarh.**

Clause 25		
(i)	Conciliator	Director, PGI, Chandigarh.
	Arbitrator Appointing Authority	Director, PGI, Chandigarh.
(iii)	Place of Arbitration	Chandigarh


Clause 32 Requirement of Technical Representative(s) and recovery Rate

.No.	Minimum Qualification of Technical Representative	Discipline	Designation (Principal Technical/ Technical Representative)	Minimum Experience	Number	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36(i)	
						Figures	Words
1.	Graduate Engineer OR Diploma Holder	Electrical	(Project Manager cum Planning/Quality Site/ billing Engineer)	2 Years OR 5 Years	1+1	Rs. 15,000/- P/month	Rs. Fifteen thousand only P/month

Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers

Diploma holder with minimum 10 year relevant experience with a reputed Electrical co. can be treated at par with Graduate Engineers for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineers.

Clause 38 (NOT APPLICABLE)

SECTION-VIII	EXCLUSIONS / MODIFICATIONS IN CPWD GENERAL CONDITIONS OF CONTRACT2023 (CONSTRUCTION WORKS)	
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Clause No. & Page No. of CPWD GCC 2023	Exclusions / Modifications
<u>CONDITIONS OF CONTRACT</u>	
i) Clause 2 (iv), Page 9	The word President / President of India and his successors wherever appears shall be read as the Director, PGIMER and his successors.
ii) Clause 2 (v), Page 9	The word Government or Government of India wherever appears shall be read as PGIMER, Chandigarh.
iii) Clause 2 (vi), Page 9	The Engineer-in-charge means the Hospital Engineer (Electrical) who shall supervise and be Incharge of the work and who shall sign the contract on behalf of the Director, PGIMER as mentioned in Schedule 'F' hereunder.
iv) Clause 2 (xi), Page 10	Department shall means Director, PGIMER or any Division of PGIMER which invites tenders on behalf of Institute as specified in the Schedule 'F'.
<u>CLAUSES OF CONTRACT</u>	
v) Clause 9, Page 24	The following provisions under this clause are not applicable:- If the final bill is submitted by the contractor within the period specified above and payment of final bills is made by the deptt. after prescribed time limit , a simple interest @ 5 % per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis, provided the final bill submitted by the contractor is found to be in order.
vi) Clause 30, Page 47	The following provisions are also added in this clause: ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in-Charge, unsatisfactory. In such case, water charges @ 1.5 % shall be recovered on gross amount of the work done. The contractor shall take water connection from source of Municipal Corporation, Chandigarh / Chandigarh Administration at his own cost. He will pay the bills raised by concerned department regularly. However, PGIMER will help the contractor to take connection from concerned authority. If, the contractor fails to deposit the water bill, the Engineer Incharge will have the authority to deduct the such amount from contractor's bills and deposit the same to concerned department. iii) The contractor shall make his own arrangements for power supply including laying of cables, switchgears and energy meter for the required load upto the main source of U.T. electricity department / Institute's source of supply (If U.T. electricity is not available) at his own cost for the proper execution of the work and will pay the charges for the electric power consumed.

SECTION-IX	ADDITIONAL TERMS AND CONDITIONS OF CONTRACT	
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1. The successful tenderer must sign the Integrity pact Annexed in section-VI at page 16 of the DNIT after award of work.
2. PGIMER reserves the right to accept/reject any or all tenders without assigning any reason thereof.
3. All the disputes concerning this tender in any way are subject to Chandigarh Jurisdiction only.
4. **Tenderers to study entire tender document carefully**
 - a) Submission of a tender by a tenderer implies that he has read all the stipulations contained in this booklet and all other contract documents and has acquainted himself of the nature, site conditions scope and specifications of the works to be executed and of conditions and rates at which stores will be issued to him by the PGIMER. The contractor shall also be deemed to have acquainted himself with local conditions and other factors which have a bearing on the execution of the works.
 - b) No claim will be entertained on account of ignorance of site conditions.
5. **CONTRACTOR SHALL SUBMIT FABRICATION DRAWING FOR OBTAINING APPROVAL**

The contractor shall submit fabrication drawing in triplicate for obtaining preliminary approval of the Engineer-in-Charge for all design drawings structural steel elements, **electrical panels and Air-Conditioning ducts wherever required**. One copy of this drawings duly corrected and signed wherever necessary by Institute will be returned to the contractor for preparing and resubmitting drawings after incorporating the said corrections again in triplicate for final approval. Along with the completion and approval of fabrication drawing, the contractor shall also submit the materials list, for checking and approval to the institute. No drawing shall be approved finally without material list. Once the drawing is finally approved, no request for any alternative section will be entertained. The contractor shall also submit **3 copies** of design calculations for the designs of joints **if required** All joints shall be designed for full strength of members, unless otherwise specified. Approval of fabrication drawings however will not absolve the contractor of his responsibility for the safety and correctness of the fabrication.
6. **SALE OF TENDERS TO CONTRACTORS WITH A BLEMISHED RECORD**

If the Engineer In-charge receives adverse report against any working contractor of the Institute, either from the department in which he is enlisted or from any other Department or Hospital Engineers of the Institute, he may stop issue of tenders to that contractor on the basis of such a report.

On the receipt of a case of adverse performance/ Misbehavior/ Threatening of site staff or any other such reasons, the Director PGIMER shall issue show cause to such contractors and after considering their reply, He shall have full powers to debar such contractor for a period as decided by him. Such debarred contractor shall be ineligible to take up any work in the Institute during the period of debarring.

A copy of such orders shall be posted on PGIMER website so that every field unit of the Institute becomes aware and does not issue tender to such debarred contractors.

If the NIT approving authority not lower than the rank of Superintending Hospital Engineer is satisfied that it is in the interest of the Institute to allow a contractor who has been debarred for reason of inactivity, to participate in the tendering process for getting competitive tenders, he may do so.
7. **WORK AND WORKMANSHIP**

To determine the acceptable standard or workmanship, the Engineer-in-Charge may order the contractor to execute certain portions of works and service such as walls, flooring, joinery, finishes, roads and the like under the close supervision of the Engineer-in-Charge. On approval, these items shall be labeled as guiding samples and works executed to conform to these samples.
8. **WORK IN TWO SHIFT:**

To speed-up the work, the institute may direct the agency to work in **Two shifts** and the tenderer will have to make adequate arrangements for carrying out work in Two shifts for which nothing extra shall be payable

9. **GATE PASSES**

All tools and plants, surplus/dismantled/ rejected/ materials to be taken away by the contractor from the work site should have a valid gate pass (4 copies) issued by the competent authority of the Institute. One copy of the gate pass shall be delivered to the security staff, one copy at the Exit gate, the third copy shall be retained by the contractor and fourth copy shall be retained by the officer issuing the gate pass.

10. All other information such as documents and drawing supplied by the tenderer will also be in the English language only. Drawing and designs shall be dimensioned according to the metric system of measurements.
11. Tenders who do not full fill all or any of the conditions laid down in this notice, or contain conditions not covered and/or not contemplated by the General Conditions of contract and /or expressly prohibited therein or stipulated addition/alternative conditions shall be liable to be rejected.
12. The institute reserves the right to revise or amend the tender documents prior to the date notified for opening of the tenders and also the right to postpone the date of presentation and opening of tenders without assigning any reason, whatsoever.
13. Each tenderer shall upload only one tender; either by him or as partners in a joint venture. A tenderer who uploads more than one tender will be disqualified.
14. Unless otherwise stated, the contract shall be for the whole work as described in the “Schedule of items of Works” and the drawings. The contractor shall be bound to complete the whole work as described in the schedule of items of works and the drawings, including additional items, if any, as per drawings and instructions. The issuance of certificate of completion as issued by the Engineer-in-Charge shall be mandatory and will be conclusive proof of completion of work.
15. Interpretations, corrections and changes to the Tenders Documents shall be made by Addendum, if required.
16. The quantities taken in the tender can be executed at anywhere in the Institute as per requirements and directions of Engineer Incharge and Contractors shall be bound to execute the same without claiming anything extra.
17. The Contractor shall strictly comply with the provision of EPF/ESI acts and shall furnish PF/ESI codes. It would however, be mandatory on the part of the contractor to provide proof of having deposited PF and ESI contribution as per law provides together with PF account number of employees in whose account the amount has been deposited (As an affidavit duly attested by Ist class Magistrate) on completion of work. Security shall be released after receipt of the above.

SECTION-X	SPECIAL CONDITIONS FOR INTERNAL E.I WORKS	
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1. All hardware items such as screws, thimbles, G.I. Wires, etc. which are essentially required for completing an item as per specifications will be deemed to be included in the item even when the same have not been specifically mentioned.
2. All hardware materials such as nuts/bolts/screws/washers etc. to be used in the work shall be zinc/cadmium plated iron.
3. Any conduit which is not be wired by the contractor shall be provided with GI fish wire for wiring by some other agency subsequently. Nothing extra shall be paid for the same. Color coding shall be done for conducts laid for different services as per direction of Engineer-in-charge.
4. While laying conduit, suitable junction boxes shall be left for pulling the wires.
5. PVC insulated copper conductor wire on the work shall be F.R.L.S grade.
6. Copper wire shall be multi-stranded conductor. Termination of multi-stranded conductors shall be done using crimping type thimbles at both the ends. Nothing extra shall be paid for the same.
7. While deciding the size of switch boxes for light point/fan points/exhaust fan point items, wherever fan regulators are to be provided, extra two modules will be provided for fan regulators (fan regulator is to be provided in separate item).
8. The earthing shall be carried out in the presence of the Engineer-in-charge or his authorized representative.
9. After completion of the installation, testing shall be carried out as provided in CPWD specifications. The contractor will have to furnish completion plans and completion certificate as per specifications.
10. The work shall be carried out strictly in accordance with CPWD latest Specifications for Internal and External Electrical Works as amended upto date and in accordance with latest Indian Electricity Rules 2005, Indian Electricity Act 2003 as amended upto date as per instructions of the Engineer-in-Charge including as below and nothing will be paid extra.
11. All material to be used on this work by the contractor shall be got approved from the Engineer-in-Charge before installation at site.
12. The contractor has to get the conduit layout approved from the Engineer-in-Charge prior to execution of the work. However the Engineer-in-Charge has the right to change the layout as per the site requirements and the contractor shall not have any claim due to change in layout.

13. All repairs & patch work shall be neatly carried out to match with the original finish & all damages caused to the building installation during the execution of work shall have to be made good by the contractor immediately at his own cost to the entire satisfaction of Engineer-in-charge. In case contractor fails to comply with the instructions of the Engineer-in-charge, Engineer-in-charge shall be at liberty to get the work done by any other agency and recover such amount as paid to the other agency from the bill(s) of the contractor. Contractor shall have no claim, whatsoever, on the extent of such amount.
14. The bad workmanship will not be accepted and defects shall be rectified at contractor's cost of the satisfaction of the Engineer-in-Charge. The programme of electrical works are to be co-ordinated in accordance with the building work.
15. All debris/malba resulting due to electrical work shall be removed on daily basis and completion of the work shall only be accepted after the site has been cleaned of all melba. In case, contractor fails to comply, the same shall be got removed by the other agency and the payment so made shall be recovered from the bill(s) of the .
16. Cement for this bonafide work is to be arranged and used by the contractor himself and nothing extra will be paid on this account.
17. The contractor or his representative is bound to sign the site order book as and when required by the Engineer-in-Charge and to comply with the remarks therein.
18. The contractor shall make his own arrangement at his own cost for electrical/general tools and plants required for the work.
19. Main Board and Main Distribution board : The work shall be carried out according to the drawings / details as approved by the Engineer-in-Charge. The contractor shall have to get the samples approved before the whole lot is brought to site and it shall include all inter connections etc.
20. The entire installation shall be at the risk and responsibility of the contractor until these are tested and handed over to the department. However if there is any delay in construction from the department side, the installation may be taken over in parts, but the decision on the same shall rest with Engineer-in-charge which shall be a binding on the contractor.
21. The connection & inter-connection shall be done by the contractor wherever required and nothing extra shall be paid on this account.
22. The position of points (light, fan, Exhaust fan), light plugs, power plugs etc., can be changed by the Engineer -in-charge according to the requirement at site. The contractor has to accept and execute the work accordingly without any extra cost.
23. The contractor shall provide junction boxes/ looping boxes of required sizes and such boxes shall be measured as part of conduit / batten wiring without any extra payment except M.S. adopter boxes.
24. For items of power plugs, 15 Amp socket shall be of universal 6 pin type.
25. All the hidden work shall be carried out in the presence of Engineer-in-charge or his representatives.

26. Adapter boxes wherever used shall be of not less than 16 SWG MS Sheet.
27. The contractor shall ensure that all the persons executing the electrical work have the valid electrical license, consequences arising due to the fault of contraction to comply with the above conditions would be contractor responsibility.
28. The telephone conduits shall be laid with GI fish wires kept, pulled in for pulling of wires, at least 1000mm extra at outlets.
29. Wherever ceiling roses are not required to be provided in the light/fan/exhaust fan points, due to site conditions, the contractor shall use suitable three pin connectors for which nothing extra shall be paid. Wiring shall be carried out with F.R.L.S wires.
30. Contractor shall provide polythene/PVC plastic cover for all MDB's/SDB's/DB's to protect them from rust/damages, during execution of work till the work is actually completed and handed over to the department.
31. The loose wire boxes/cable end boxes (adaptor boxes) shall be provided on the various electrical boards to facilitate the termination of the wiring in the various mountings. The boxes shall be of the same make as the DB's as far as possible. Wherever the company made cable end boxes are not available they shall be neatly fabricated with 16 SWG CRCA sheet steel, duly powder coated, dust & vermin proof and the front cover of MS sheet shall be with rubber gasket suitably screwed or with 3mm thick phenolic laminated sheet of Hylam/Formica instead of MS sheet, as desired by the Engineer-in-charge. The length of such boxes shall be same/or more as the width of the electrical switchboard. Such loose wireboxes are deemed included in the scope of the work and no extra payment shall be made for them.
32. The contractor shall have to make arrangements, at his own risk and cost, for transportation of materials from the point of issue of stores to site of work, if any.
33. Makes of all items that are not covered in the schedule of work/additional specifications shall be got approved from the Engineer-in-charge and shall conform to relevant Indian Standard as applicable.
34. The schematic diagram/dimensional drawings of the various electrical cubical panels shall be got approved from the Engineer-in-charge before fabrication and shall comply with latest CPWD specifications and Indian Electricity Rules. The panels shall conform to IS: 8623/1993. All panels shall be powder coated inside out, in shade approved by the Engineer-in-charge.
35. All floor-mounted panels shall be mounted on 100mm X 50mm X 5mm thick M.S. channel on all the sides. It shall have a continuous earth bus of the same size and material as the main phase running continuously along the length of the panel extending on either side for earth connection.
36. The doors of all cubicle panels shall be hinged type including those of bus bar chambers and cable alleys. The locking shall be with chrome plated metal key locks. All doors shall be earthed with copper conductor wire as approved by the Engineer-in-charge.
37. All model of modular accessories required for the work shall be got approved from the Engineer-in-charge from among the approved makes. The base plate shall be preferably in sheet steel or otherwise in unbreakable polycarbonate. The shades of the cover plates shall be approved by the Engineer-in-charge.

38. Contractor shall have to check the Site Order Book for any instructions of the Engineer-in-charge or his authorized representative and sign the site order book. He shall be bound to ensure compliance with the instructions recorded therein.
39. The MCCB's shall be compatible for reliable protection and accurate measurement. The rated Service breaking capacity (KA rms) shall be 100% of Ultimate breaking capacity (KA rms). All MCCB's shall be current limiting type with features as per relevant IS codes and CPWD specification.
40. MCCB's shall be used with terminal spreaders and all terminals shall be shrouded to avoid direct contact.
41. Mechanical Castle key interlock shall be provided among the incomer MCCB's, wherever, as applicable, two different incomer sources are provided in the panel as per the directions of the Engineer in charge. The same is deemed included in the scope of work.
42. All measuring and indicating instruments shall be protected through fuses/ MCB's and isolating switches.
43. General arrangement drawing of the switchboard shall be got approved from the Engineer-in-Charge before commencement of manufacturing.
44. For the items like LT panels, feeder pillars and accessories, etc, the firm shall arrange for inspection in the factory and provide for all facilities for testing. The cost of the visit of Engineer-in-Charge or his representative shall be borne by department. However, firm will be responsible for arranging the inspections as required.
45. Conduit layout as per switching arrangement shall be prepared by contractor and got approved from the Engineer-in-Charge before slab casting.
46. All CI/metal boxes & junction boxes should be cleaned properly and painted from inside before wiring & fixing the accessories.
47. In wiring items like point wiring / wiring for light/fan/call bell, the item includes the cost of conduit also.

SECTION-XI	SPECIFICATIONS FOR EXTERNAL E.I WORKS	
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A. Oil Filled Power Transformer

1.0 GENERAL CONSTRUCTIONAL FEATURES:

- 1.1 All material used shall be of best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of atmosphere temperature and other atmospheric conditions, overloads, over-excitation, short circuits as per specified standards, without distortion or deterioration or the setting up of undue stresses in any part, and also without affecting the strength and suitability of the various parts for the work which they have to perform.
- 1.2 Similar parts, particularly removable ones, shall be interchangeable.
- 1.3 Exterior of pipes and pipe fittings, screws, studs, nuts and bolts used for external connections shall be hot dip galvanized.

2.0 ELECTRICAL & PERFORMANCE REQUIREMENTS:

- 2.1 Transformers shall operate without injurious heating at the rated kVA at any voltage within 10% of the rated voltage of that particular tap.
- 2.2 Transformers shall be capable of delivering the rated current at a voltage equal to 105% of the rated voltage without exceeding the limiting temperature rise.
- 2.3 Overloads shall be allowed within the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, tap-changers or other auxiliary equipment shall apply.
- 2.4 The neutral terminal of windings with star or zig-zag connection shall be designed for the highest overcurrent that can flow through this winding.
- 2.5 Every care shall be taken to ensure that the design and manufacture of the transformers shall be such as to reduce noise and vibration to the level obtained in good modern practice. The noise level shall not exceed the level specified in applicable standard.
- 2.6 For transformers with tapping, full power tapping shall be provided.
- 2.7 The thermal and dynamic ability to withstand short circuit shall be demonstrated by tests or by reference to tests on similar transformers.
- 2.8 The transformers shall be designed with particular attention to the suppression of harmonic voltage, especially the third and fifth, so as to minimize wave form distortion and from any possibility of high frequency disturbances reaching such a magnitude as to cause interference with communication circuits.
- 2.9 All rated quantities subject to the VENDOR's guarantees shall be within the tolerances given in applicable standards.
- 2.10 Unless otherwise specified in Data Sheet –A transformers shall be designed for the following over fluxing withstand capability:
 - a) 110% - Continuous for all transformers

- b) 125% - For 1 minute and 140% for 5 Sec. for generator transformers and unit aux. transformers

Transformers shall operate below the knee of the saturation curve at 110% voltage to preclude ferro resonance and non-linear oscillations.

- 2.11 Transformers, complete with bushings/ cable boxes, shall be designed and constructed to withstand without damage, the effects of external short circuits as per the specified standards.

3.0 CORE:

- 3.1 The magnetic circuit shall be constructed from low loss, non-ageing, high permeability prime grade, Cold rolled non-ageing grain oriented silicon steel laminations of HI-B Grade or better, perfectly insulated and clamped to minimize noise and vibrations.
- 3.2 The transformer core shall be of BOLTLESS core design.
- 3.3 The construction is to be of 'core' type.
- 3.4 The insulation structure for the core to bolts and core to clamp plates shall be such as to withstand a voltage of 2000 V for one minute.
- 3.5 The finally assembled core with all the clamping structures shall be free from deformation and shall not vibrate during operation.
- 3.6 The core clamping structure shall be designed to minimize eddy current loss.
- 3.7 The core shall be provided with lugs suitable for lifting the complete core and coil assembly.

4.0 WINDINGS:

- 4.1 Winding shall be made with 99.9% pure electrolytic grade paper insulation class A Kraft paper. The winding should be able withstand thermal and mechanical stress in the event of short circuit.
- 4.2 Windings shall be subjected to a shrinking and seasoning process, so that no further shrinkage occurs during service.
- 4.3 The conductors shall be transposed at sufficient intervals in order to minimise eddy currents and equalise the distribution of currents and temperatures along the windings.
- 4.4 Materials used in the insulation and assembly of the windings shall be insoluble, non-catalytic and chemically inactive in the hot transformer oil, and shall not soften or be otherwise affected under the operating conditions.
- 4.5 Varnish application on coil windings may be given only for mechanical protection and not for improvement in dielectric properties. In no case varnish or other adhesive be used which will seal the coil and prevent evacuation of air and moisture and impregnation by oil.
- 4.6 All threaded connections shall be locked. Leads from the winding to the terminal board and bushings shall be rigidly supported to prevent injury from vibration. Guide tubes shall be used where practicable.
- 4.7 Windings and connections shall be braced to withstand shocks during transport or short circuits.
- 4.8 Permanent current carrying joints in the windings and leads shall be welded or brazed. Clamping bolts for current carrying parts inside oil shall be made of oil resistant material which shall not be affected by acidity in the oil. Steel bolts, if used, shall be suitably treated.
- 4.9 The completed core and coil assembly shall be dried in vacuum at not more than 0.5mm of mercury absolute pressure and shall be immediately impregnated with oil after the drying process to ensure the elimination of air and moisture within the insulation. Vacuum may be applied in either vacuum oven tank or in the transformer tank. Vapour phase dry out shall be preferred.

5.0 TANK:

- 5.1 Tank shall be made from good commercial grade, low carbon steel and shall be of welded construction.
- 5.2 Tank shall be designed to permit lifting, by crane or jacks of the complete transformer assembly filled with oil. Suitable lugs and bosses shall be provided for this purpose.
- 5.3 Tank together with radiators, conservator, bushings and other fittings shall be designed to withstand without permanent distortion for the following conditions:
 - a) Full vacuum of 760mm of Hg. for filling with oil by vacuum.
 - b) Internal gas pressure of 0.35 kg/cm² (5 lbs/sq.in) with oil at operating level.
- 5.4 The transformer top shall be provided with a detachable tank cover with a bolted flanged gasket joint. Lifting lugs shall be provided for removing the cover. The surface of the cover shall be suitably sloped so that it does not retain rainwater.
- 5.5 The material used for gaskets shall be cork-neoprene or approved equivalent. Gasketed joints for tank, bushings and other bolted attachments shall be so designed that the gasket will not be exposed to the weather.
- 5.6 The exterior of tank and other steel surfaces exposed to the weather shall be thoroughly cleaned and have a priming coat of zinc chromate applied. The second coat shall be of an oil and weather resistant nature, preferably of distinct colour from the prime and finish coats. The final coat shall be of a glossy, oil and weather resisting non-fading paint of specified shade. The interior of the tank shall be cleaned by shot blasting and painted with two coats of heat resistant and oil insoluble paint.
- 5.7 Tank shall be provided with a pressure release device, which shall operate at a pressure below the test pressure for the tank and radiators. The device shall be rainproof after blowing and shall be provided with a device visible from ground to indicate operation. An equaliser pipe connecting the pressure relief device to the conservator shall be supplied. This device shall be provided for all transformers rated 500 kVA and above. Explosion vent shall be equipped with remote monitoring/alarm contacts.
- 5.8 Adequate space shall be provided at the bottom of the tank for collection of sediments.
- 5.9 Manholes with bolted covers shall be provided in the top or sides of transformer for easy access to the lower ends of bushings, tap changers and to permit replacement of auxiliaries without removing tank cover.

6.0 VALVES:

- 6.1 Valves shall be of forged carbon steel up to 50mm size and of gunmetal or of cast iron bodies with gunmetal fittings for sizes above 50mm. They shall be of full-way type with screwed ends and shall be opened by turning counter clockwise when facing the hand wheel. There shall be no oil leakage when the valves are in closed position.
- 6.2 Every valve shall be provided with an indicator to show the open and closed positions and shall be provided with facility for padlocking in either open or closed position. All screwed valves shall be furnished with pipe plugs for protection.
- 6.3 All valves shall be provided with flanges having machined faces drilled to suit the applicable requirements. Oil-tight blank flanges shall be provided for each connection for use when any radiator is detached and for all valves opening to atmosphere. If any special radiator valve tools are required, the VENDOR shall supply the same.
- 6.4 The transformer shall be provided with following valves on the tank:
 - a) Drain valve with cover plate so located as to completely drain the tank. The same can be used as bottom filter valve and the size shall be 50 mm.
 - b) Filter valve at top of transformer tank, one of 50mm size.
 - c) Oil sampling valves not less than 8 mm, at top and bottom of main tank.
 - d) One 15 mm air release device.
 - e) Valves between radiators
 - f) Two plugged pipe outlets for applying vacuum

10.0 UNDER-CARRIAGE:

The under-carriage of the transformer shall be provided with detachable steel flanged wheels or flat rollers as specified in Data Sheet-A. Flanged wheels shall be spaced to allow specified rail gauge. Wheels shall be provided with suitable bearings, which will resist rust and corrosion and shall be equipped with fittings for lubrication. Unless otherwise approved, it shall be possible to swivel the wheels or rollers in two directions, at right angles to or parallel to the main axis of the transformer, thereby permitting movement in two directions. The wheels or rollers will be swivelled after jacking the transformer and they shall be lockable in both the positions.

11.0 TRANSFORMER COOLING:

- 11.1 Radiators shall be designed to withstand the vacuum and pressure conditions specified for the tank. They shall be so designed as to avoid pockets in which moisture may collect, to completely drain oil into the tank and to prevent formation of gas pockets when the tank is being filled.
- 11.2 The clearance between all pipe work and live parts shall be more than the clearance for live parts to earth.
- 11.3 Tank mounted radiators/ coolers shall be of the detachable type with bolted and gasketed flanged connections. The following accessories shall be provided for radiator:
 - a) Shut-off valves and blanking plates on transformer tank at each point of connection.
 - b) Top and bottom shut-off valves and blanking plates on each radiator.
 - c) Lifting lugs
 - d) Top oil filling plug 19mm size
 - e) Air release plug at top
 - f) Oil drain plug at bottom, 19 mm size.

12.0 TAP CHANGING GEAR

12.1 Off-Circuit Tap Changing Gear

The off circuit tap changer shall be operable by means of an operating handle brought outside the tank and operable from ground level. It shall be equipped with an indicating device to show the tap in use and shall be provided with a locking arrangement to lock the switch in any tap position. The tap changer contacts and connections shall be accessible through an access hole having a bolted gasketed cover.

12.2 On-load Tap Changing Gear (OLTC)

- 12.2.1 The OLTC gear shall be designed to complete successfully tap changes for the maximum current to which 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 current without injury.
- 12.2.2 When a tap change has been commenced, it shall be completed independently of the operation of the control relays and switches. Necessary safeguard shall be provided to allow for failure of auxiliary power supply or any other contingency, which may result in the tap changer movement not being completed once it is commenced.
- 12.2.3 Oil in compartments, which contain the making and breaking contacts of the OLTC, shall not mix with oil in other compartments of the OLTC or with transformer oil. Gases released from these compartments shall be conveyed by a pipe to a separate oil conservator or to segregated compartment within the main transformer conservator. A Buchholz relay shall be installed in the above pipe. The conservator shall be provided with a prismatic oil level gauge.

- 12.2.4 Oil, in compartments of OLTC, which do not contain the make and break contacts, shall be maintained under conservator head by sloped pipe connections. All gas leaving these compartments shall pass through the Buchholz relay before entering the conservator.
- 12.2.5 Oil filled compartments shall be provided with filling plug, drain valve with plug, air release vent, oil sampling device, inspection opening with gasketed and bolted cover with lifting handles.
- 12.2.6 OLTC driving mechanism and its associated control equipment shall be mounted in an outdoor, weather-proof cabinet, which shall include:
- a) Driving motor (415V, 3-Phase, 50 Hz, AC squirrel cage)
 - b) . Motor starting contactor with thermal overload relays, MPCB of suitable rating.
 - c) Duplicate sources of power supply with automatic changeover from the running source to the standby source and vice versa
 - d) Control switch: Raise/off/lower (spring return to normal type).
 - e) Remote/local selector switch (maintained contact type).
 - f) Mechanical tap position indicator showing rated tap voltage against each position and re- settable maximum and minimum indicators.
 - g) Limit switches to prevent motor over-travel in both direction and final mechanical stops.
 - h) Brake or clutch to permit only one tap change at a time on manual operation.
 - i) Emergency manual operating devices (hand crank or hand wheel).
 - j) A five digit operation counter.
 - k) Electrically interlocked reversing contactors (preferably also mechanically interlocked).
 - l) 240V. 50Hz, AC space heaters with RCBO Protection.
 - m) Interior lighting fixture with lamp door switch and RCBO Protection.
 - n) Gasketed and hinged door with locking arrangements.
 - o) Terminal blocks, internal wiring, earthing terminals and cable glands for power and control cables.
 - p) Necessary relays, contactors, current transformers etc.
- 12.2.7 Control Requirements for OLTC
- The following electrical control features shall be provided:
- a) 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.
 - b) Only one tap change from each tap change impulse even if the control switches or push button is maintained in the operated position.
 - c) Cut-off of electrical control when manual control is resorted to.
 - d) Cut-off of a counter impulse for a reverse tap change until the mechanism comes to rest and resets the circuits for a fresh operation.
 - e) Cut-off of electrical control when it tends to operate the tap beyond its extreme position.
- 12.2.8 Automatic Control of OLTC
- If automatic OLTC control is specified the following items shall be included:
- a) Voltage setting device
 - b) Voltage sensing and voltage regulating devices.

- c) Line drop compensator with adjustable R and X elements.
- d) Timer 5-25 seconds for delaying the operation of the tap changer in the first step for every tap change operation.
- e) Adjustable dead band for voltage variation.

12.2.9 Parallel Operation with other OLTC

When parallel operation is specified, the following shall be included:

- a) CT's of relaying class if paralleling by circulating current method.
- b) Line drop compensator with adjustable X, suitable for reversing, if paralleling by reserve reactance method.

12.2.10 Alarms

The following alarms shall be provided:

- a) A.C supply failure
- b) Drive motor auto tripped
- c) Other protective purpose considered essential by the VENDOR.
- d) Out of step operation on the same tap are operating at different taps.
- e) Tap change delayed

12.2.11 Remote Control Equipment

The OLTC remote control equipment shall be housed in an indoor sheet cubicle to be located in a remote control room. It shall generally be in line with the following:

- a) Control switch: Raise/off/lower (spring return to normal type)
- b) If automatic operation is specified, auto/ manual selector switch (maintained contact type)
- c) If parallel operation specified, master/ follower selector switch (maintained contact type).
- d) Tap position indicator.
- e) Facia type alarm annunciator with "Accept" and "Lamp test" facilities for the conditions.
- f) Digital AVR for automatic tap control.
- g) Necessary auxiliary relays.
- h) Lamp indications for – Tap change in progress, Lower limit reached and Upper limit reached.
- i) Cable glands for power and control cables
- j) 240 V rated panel space heater with ON-OFF switch and 30mA RCBO Protection.
- k) Fluorescent type interior lighting fixture with lamp and door switch.
- l) MCB's as required for the control and power circuits (in place of HRC Fuses).
- m) Terminal blocks.
- n) Internal wiring.
- o) Earthing terminal.

13.0 CONTROL CABINETS

	OLTC remote control Cabinet	OLTC local control cabinet transformer marshalling box & cooler control Cabinet
Execution	Indoor	Outdoor, weather proof
Mounting	Floor mounted	Tank mounted or mounted on a separate foundation
Wiring	All cooler control, alarm and trip circuits shall be wired for auxiliary DC supply as specified	
Special requirements		Bottom of the tank mounted cabin shall be at least 600mm from floor level. Top surface shall be sloped. Indicating lamps & meters shall be covered by a glass window. Gland plates and cable glands as required shall be provided at the bottom

14.0 BUSHINGS:

- 14.1 All porcelain used in bushings shall be homogeneous, non-porous, uniformly glazed to brown colour and free from blisters, burns and other defects.
- 14.2 Stresses due to expansion and contraction in any part of the bushing shall not lead to deterioration.
- 14.3 Bushings shall be designed and tested to comply with the applicable standards specified in Data Sheet-A. If type test certificates are not available, these tests shall also be carried out in addition to the routine tests.
- 14.4 Bushings shall have non-ferrous flanges and hardware.
- 14.5 Liquid / oil filled bushings shall be equipped with liquid level indicators and means for sampling and draining the liquid. The angle of inclination to vertical shall not exceed 30^oC.
- 14.6 Oil in oil filled bushings shall meet the requirements of the transformer oil standards specified in Data Sheet-A.
- 14.7 Fittings made of steel or malleable iron shall be galvanised.
- 14.8 Bushings for 36kV (except for neutral bushings) and above shall be provided with adjustable rod gap. For bushings rated lower than 36kV, the gap shall be of double series type to minimise interference from birds.
- 14.9 The neutral of the star connected winding shall be brought out to a separate bushing terminal. The neutral bushing shall be provided on the tank side to facilitate leading the earth conductor down to the ground level. In addition, tank mounted pin type support insulator shall be provided for supporting the neutral earthing bar of specified section along its run from the neutral bushing to ground level.
- 14.10 Bushings shall be so located on the transformers that full flashover strength will be utilised and minimum clearances as required for the BIL shall be realised between live parts and live parts to earthed structures.
- 14.11 The applicable routine and type tests (if certificates of same are not available), as stated in the specified bushing standards shall be carried out.
- 14.12 Bushing current transformers shall comply with specified standards.
 - a) It shall be possible to remove turret mounted CT's from the transformer tank, without removing the cover.
 - b) All the secondary leads including tappings shall be brought to a weather proof outlet box near the bushing. The VENDOR shall arrange conduit wiring from this outlet box up to the transformer marshalling box or control cabinet.
 - c) Bushing CT name plate shall be mounted on the equipment tank adjacent to the terminal box.

15.0 CABLE BOXES & DISCONNECTING CHAMBERS:

- 15.1 Cable boxes and sealing ends shall be complete with tinned copper lugs to suit the specified cable and all other accessories including compression glands, and armour earthing clamps.
- 15.2 Cable boxes shall be designed to accommodate all cable termination fittings or sealing ends as required, including stress/cones or other approved means for grading voltage stress on the terminal insulation of cables operating at voltage of 6.6 kV and above.
- 15.3 Phase to phase and phase to ground air clearances within the chamber shall be such as to enable either the transformer or each cable to be subjected separately to H.V tests.
- 15.4 When specified in Data Sheet - A, disconnecting chamber shall be provided to enable the transformer to be removed without unsealing the cables or draining oil from the main tank. The disconnecting chamber shall be air insulated and complete with seal-off bushings, removable flexible connectors/links and removable covers.

16.0 MARSHALLING BOX:

- 16.1 All the contacts/ terminals of electrical devices mounted on the transformer shall be marshalled to a marshalling box. It shall be in the VENDOR's scope to provide:
 - a) the interconnecting cabling between the marshalling box and the accessory devices by either PVC insulated wires in GI conduits or PVC insulated armoured cables.
- 16.2 Marshalling box shall be tank mounted, outdoor, weather proof sheet steel enclosed (min. 2mm thick), with hinged door having padlocking facility. All doors, covers and plates shall be fitted with neoprene gaskets. Bottom shall be at least 600mm from the floor level and provided with gland plate and cable glands as required. Top surface shall be sloped.
- 16.3 All contacts for alarm, trip and indication circuits shall each be electrically free, wired for auxiliary D.C supply as specified and brought out to separate terminals at the terminal blocks in the marshalling box. Terminals shall be rated for 10A. Wiring shall be with stranded copper conductors of sizes not smaller than 1.5 sq. mm. for control and CT circuits.

17.0 OIL:

- 17.1 Transformer shall be supplied complete with new transformer oil complying with latest applicable standard. 10% extra oil shall be supplied for topping up at site.

18.0 FITTINGS & ACCESSORIES:

The following fittings and accessories shall be provided:

- 18.1 Inspection covers on the top cover of the transformer.
- 18.2 Terminal marking and rating plates as per the specified standard.
- 18.3 Two earthing terminals. The tank cover, detachable parts such as radiators, marshalling box, cooler control cabinet, cable boxes, motors etc., shall be effectively earthed.
- 18.4 Lifting lugs or eyes for:
 - a) lifting of fully assembled transformer with oil
 - b) lifting core and coils
- 18.5 Drain cum sampling valve with plug or cover plate.
- 18.6 Weather-proof dehydrating breather with silica-gel and oil seal to eliminate constant contact with the atmosphere.
- 18.7 Oil level indicator with minimum marking.

- 18.8 Thermometer pocket.
- 18.9 The conservator of sufficient volume to maintain the oil seal from the minimum ambient temperature of -5° C up to an oil temperature of 100° C, with oil level varying within the minimum and maximum visible levels. The conservator shall be provided with the following accessories:
- a) Filling plug, sump and drain valve of 15 mm size for conservator of size 650 mm and 25 mm size for conservator above 650 mm diameter.
 - b) 150 mm diameter magnetic type oil level gauge with low oil level alarm contacts and/ or a prismatic oil sight gauge, as specified in Data Sheet-A and provided with markings for minimum oil level and oil level at rated temperature rise.
 - c) A bolted cover at one end for cleaning.
 - d) Valve for shutting off oil to the transformer
- 18.10 Jacking lugs, if the transformer filled with oil weighs above 3000kg.
- 18.11 Hauling eyes on each face of the transformer.
- 18.12 The under base provided with channel for fixing on a platform or plinth.
- 18.13 A pressure relief device with contacts for trip and alarm. The device shall be rainproof after operation. An equalizer pipe connecting the pressure relief device to the conservator shall also be supplied.
- 18.14 Dial type thermometer with two contacts for oil temperature “HIGH” and “TOO HIGH” alarms. Each contact shall be electrically independent and brought out to separate terminals, rated 220V DC, minimum 0.5 A.
- 18.15 A double float type Buchholz relay as per specified standard shall be provided. All gas evolved in the transformer shall collect in this relay. The relay shall be provided with a test cock suitable for flexible pipe connection for checking its operation. A 5mm copper pipe shall be connected from the relay test cock to a valve located about 1.25m above ground level to facilitate sampling with the transformer in service. The device shall be provided with two electrically independent ungrounded contacts, one for alarm on gas accumulation and the other for tripping on sudden rise of pressure. These contacts shall be wired up to the transformer marshalling box. The relay shall be provided with shut-off valves on the conservator side as well as the tank side.
- 18.16 Gas sampling device at an accessible height and an air release cock for Buchholz relay.
- 18.17 The following valves shall be provided:
- a) One (1) top filter valve with blanking plate.
 - b) One (1) bottom filter valve with blanking plate.
- 18.18 The Winding temperature indicator, consisting of the following shall be provided:
- a) Temperature sensing element
 - b) Image coil
 - c) Current transformer
 - d) 150mm dia. Local indicating instrument with settable electrically independent contact brought out to separate terminals for winding temperature “HIGH” and “TOO HIGH” alarms. Contacts shall be suitable for 220V DC, rated minimum 0.5 A.
 - e) A pointer to register the highest temperature reached and capable of being reset without tools.
 - f) Calibration device.
 - g) Automatic ambient temperature compensation.
- 18.19 Transformer shall be provided with explosion vent.

19.0 TESTS:

19.1 Routine Tests

19.1.1 All routine tests as per applicable standard shall be carried out on each transformer without any extra charges.

19.1.2 The routine tests shall also include the following:-

- a) Oil leakage test: The main transformer tank and all oil filled compartments necessary for a complete transformer including coolers shall be filled with transformer oil and subjected to a pressure of 0.35kg/ sq cm above the pressure that would attain under normal conditions with full head of oil. The pressure shall be maintained for 12 hours during which time no oil leakage shall occur. When heat run test is specified, the oil pressure test shall be performed immediately after heat run. Otherwise, the test may be performed at ambient temperature.
- b) Magnetic balance test for 3 phase units.
- c) Measurement of $\tan\delta$ and capacitance of each winding to earth (with all other windings connected to earth) and between all windings, connected together, to earth.

19.2 Type Tests

- a) The type tests shall include all tests as per applicable standards. Type test reports not older than 5 years from the date of bidding will be considered for acceptance.
- b) The dielectric tests shall include lightning impulse chopped on the tail.
- c) The type test shall include vacuum withstand test on tank and radiators.

19.3 Special Tests

The bidder shall carry out the following tests:-

- a) Measurement of zero-sequence impedance of three phase transformer.
- b) Short circuit test. (certificate acceptable)
- c) Temperature rise test.
- d) Measurement of harmonics of the no load current.
- e) Measurement of acoustic noise level.
- f) Dielectric Test with Lightning impulse chopped on the tail.

19.4 All auxiliary equipment shall be tested as per the relevant standards. Test certificates shall be submitted for bought out items. High voltage withstand test shall be performed on auxiliary equipment and wiring after complete assembly.

19.5 Test reports

19.5.1 Test results shall be corrected to a reference temperature of 75°C.

19.5.2 Two copies of test results shall be submitted for approval before dispatch of transformer.

20.0 DOCUMENTATION

On award of contract, the following drawings and data shall be furnished in four sets for approval before start of manufacture:

- a) General arrangement (GA) drawings of transformer with plan and elevation and Bills of Material.
- b) Transformer foundation layout drawing.
- c) GA drawings of HV and LV bushings and termination details.

- d) Rating plate diagram.
- e) Valve schedule.
- f) Control schematic and wiring diagram for transformer marshalling box/ cooler control cabinet.
- g) Control schematic and wiring diagram for OLTC.
- h) Erection drawing.
- i) Quality plan for design, manufacture and testing.
- j) O & M manual.

General Technical Particulars

S.No	Description	Unit	TECHNICAL PARAMETERS	TO BE FILLED BY THE BIDDER
1	Voltage ratio (Line-to-Line)	Kv	66/11	
2	Rated Capacity (HV and LV)	MVA	16	
3	No of phases		3 (Three)	
4	Vector group		YNyn0	
5	Type of transformer		Power Transformer	
6	Applicable standard		IEC 60076 / IS 2026	
7	Frequency	Hz	50	
8	Cooling type		ONAN/ONAF	
9	Tap Changer			
i)	Type		On-load tap changer (CFVV)	
ii)	Tap Range and no. of steps		-5% to +15% of HV variation in the step of 1.25%	
iii)	Location of Tap changer		On HV neutral end	
10	HV-LV Impedance at 75°C	%		
	Max. Voltage tap		11.2	
	Principal Tap		10	
	Min. Voltage Tap		9	
11	Tolerance		As per IEC	
12	Service		Outdoor	
13	Duty		Continuous	
14	Overload capacity		IEC 60076-7	
15	Temperature rise over 50°C Ambient Temp			
i)	Top oil measured by thermometer	°C	45	
ii)	Average winding measured by resistance method	°C	50	
16	Winding hot spot rise over yearly weighted temperature of 32 °C	°C	61	
17	Tank Hotspot Temperature	°C	110	
18	Maximum design ambient temperature	°C	50	
19	Windings			
i)	Lightning Impulse withstand Voltage			
	HV	kVp	325	

	LV & LV Neutral	kVp	75	
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S.No	Description	Unit	TECHNICAL PARAMETERS	TO BE FILLED BY THE BIDDER
ii)	Chopped Wave Lightning Impulse Withstand Voltage			
	HV	kVp	358	
	LV & LV Neutral	kVp	83	
iii)	One Minute Power Frequency withstand Voltage			
	HV	kVrms	140	
	LV & LV Neutral	kVrms	28	
iv)	Insulation		Solidly grounded	
	HV		Uniform	
	LV		Uniform	
v)	Tan delta of winding	%	≤0.5	
20	Bushings			
i)	Rated voltage			
	HV	KV	72.5	
	LV & LV Neutral	KV	17.5	
ii)	Rated current			
	HV	A	800	
	LV & LV Neutral	A	2000	
iii)	Lightning Impulse withstand Voltage			
	HV	kVp	325	
	LV & LV Neutral	kVp	95	
iv)	One Minute Power Frequency withstand Voltage			
	HV	kVrms	155	
	LV & LV Neutral	kVrms	42	
v)	Tan delta of bushing at ambient temp.	%	≤0.5	
vi)	Minimum total creepage distances		(Specific creepage distance: 31mm/kV corresponding to the line to line highest system voltage)	
	HV	mm	2248	
	LV & LV Neutral	mm	543	
vii)	Maximum Partial discharge level on HV bushing at Um	pC	10	
21	Maximum Partial discharge level at $1.58 \cdot U_r / \sqrt{3}$	pC	100	
22	Maximum Noise level at rated voltage, at principal tap & no load and all cooling active	dB	70	

S.No	Description	Unit	TECHNICAL PARAMETERS	TO BE FILLED BY THE BIDDER
23	Maximum Permissible Losses of Transformers			
i)	Max. No Load Loss at rated voltage and frequency	Kw	15	
ii)	Max. Load Loss at rated current and frequency and at 75°C, at principal tap position Max. Load Loss at rated current and frequency and at 75°C, at principal tap position	Kw	85	
iii)	Max. I ² R Loss at rated current and frequency and at 75°C, at principal tap position	Kw	70	

B. NIFPS for Transformer

1 CODES AND STANDARDS:

- 1.0 The design, material, construction features, manufacture, inspection, testing and performance of NIFPS shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable standards. Nothing in this specification shall be construed to relieve the VENDOR of this responsibility.
- 1.1 The requirements of the following standards shall be generally applicable:-
 - 1.1.1 IS 1646: Code of practice for fire safety of electrical installation.
 - 1.1.2 IS 3034: Fire Safety of Industrial Buildings.
 - 1.1.3 CBIP Manual no 295 on Transformers.

2 GENERAL DESCRIPTION:

- 2.1 The Nitrogen Injected Fire Protection System shall be provided for each oil filled transformers
- 2.2 Nitrogen Injection Fire Protection System shall prevent tank explosion and the fire during internal faults resulting in an arc and also extinguish the external fires on transformer top cover due to tank explosion and / or external failures like bushing fires, OLTC fires and fire from surrounding equipment. The system shall be fully automatic and shall require minimum maintenance.
- 2.3 The system shall work on the principle of Drain and stir and on activation, shall drain a pre- determined quantity of oil from the tank top through outlet valve to reduce the tank pressure and inject nitrogen gas under pressure from the lower side of the tank creating stirring action and reduce the temperature of top oil surface below flash point to extinguish the fire.
- 2.4 Conservator tank oil shall be isolated during the operation to prevent flow of oil into the tank.

3 SYSTEM OPERATION

- 3.1 The NIFPS system shall be provided with automatic control. The system shall also be provided with electrical control from remote panel and also local manual control.
- 3.2 The general guide lines for system operation are given below. The bidder shall furnish full details of the system offered in the bid.
- 3.3 Prevention of Fire
- 3.4 The System shall be activated by the operation of the following devices:
 - a) Operation of any of the transformer electrical protection relays and
 - b) Operation of any mechanical relay on the transformer.
- 3.5 The activation of the system shall perform the following functions:
 - a) Open the depressurization valve in the control cabinet which is connected to the transformers top outlet valve and drain a predetermined quantity of oil from the tank top to reduce the tank pressure.
 - b) Close the conservator shutter valve which is fitted in the conservator pipe line between the conservator and Buchholz relay. Closure of this valve shall block the oil flow from the conservator to the tank.
 - c) Trip the HV side and LV side circuit breaker of the transformer, if these are not already tripped by the protection relays.
- 3.6 On receipt of signals that the HV and LV side circuit breakers have been opened and other conditions have been

fulfilled, the system shall inject nitrogen under pressure with prefixed rate at the bottom of the transformer tank to create a stirring action there by bringing the temperature of the top oil surface below ignition point.

- 3.7 Extinguishing of Fire
- 3.8 Linear heat detectors or other suitable type of fire detectors shall be provided by the vendor and fitted on the transformer tank.
- 3.9 The system shall be activated by the operation of any protection relay of the transformer and operation of the fire detectors.
- 3.10 On activation, the system shall operate in the same manner as described in para 4.1
- 3.11 The Nitrogen shall be injected continuously for sufficient time to cool the oil to ambient temperature.
- 3.12 In case of fire, even if the HV and/or LV circuit breakers have not tripped, the system shall inject nitrogen when the transformer is live and shall give alarm signal to the operator to manually isolate the circuit breakers.

4 DETAILS OF SYSTEM EQUIPMENT TO BE SUPPLIED

- 4.1 The following equipment shall be supplied for each transformer. The vendor shall supply all equipment and devices as required for the system.
- 4.2 Local Control Cabinet

The Control cabinet shall be cold rolled, sheet steel enclosed, 2.5mm thick, outdoor type with degree of protection IP 55. The control cabinet shall generally include the following:
- 4.2.1 Nitrogen Cylinder – The capacity and N2 pressure shall be as required for the transformer specified in data sheet A
- 4.2.2 Quick depressurisation valve with 4 NO + 4 NC contacts.
- 4.2.3 Nitrogen release device with 4 NO + 4 NC contacts.
- 4.2.4 Manometer with low pressure signal contacts.
- 4.2.5 Non return valve and other valves as required.
- 4.2.6 Signal contacts as required.
- 4.2.7 Oil drain assembly and oil drain pipe for connection to oil pit.
- 4.2.8 Push button for manual activation.
- 4.2.9 Inspection manhole.
- 4.2.10 Heater with humidistat control.
- 4.2.11 Terminal box for electrical connection.
- 4.2.12 All other devices to complete the system.
- 4.3 Remote control Panel

The remote control panel shall be located in the control room and shall generally include the following:
- 4.3.1 Selector switches for:
 - 4.3.1.1 Local / Remote
 - 4.3.1.2 Automatic/Manual
- 4.3.2 Push buttons for:
 - 4.3.2.1 Manual activation
 - 4.3.2.2 LED test

- 4.3.3 Indicating Lamps (LED) for :
 - 4.3.3.1 HV circuit breaker ON/OFF
 - 4.3.3.2 LV circuit breaker ON/OFF
 - 4.3.3.3 Conservator shutter valve CLOSE/OPEN
 - 4.3.3.4 Nitrogen Gas injection valve CLOSE/OPEN
 - 4.3.3.5 Depressurizations valve CLOSE/OPEN
 - 4.3.3.6 System on Auto mode
 - 4.3.3.7 System on Manual Mode
 - 4.3.3.8 Other indicating lamps as considered necessary by the vendor
- 4.3.4 Facia annunciation with accept, test and reset push buttons for:
 - 4.3.4.1 System activated
 - 4.3.4.2 Nitrogen low level/low pressure
 - 4.3.4.3 Shutter line fault
 - 4.3.4.4 Heat detector line fault
 - 4.3.4.5 Heat detectors ON
 - 4.3.4.6 Transformer protection activated
 - 4.3.4.7 PRV activated
 - 4.3.4.8 Other signals as considered necessary by vendor.
- 4.3.5 Auxiliary relays, time delay relays as required for control, interlock, indication and alarm.
- 4.3.6 All other devices as required for the system.
- 4.4 SAS connections
 - 4.4.1 System shall be suitable for activation from SAS.
 - 4.4.2 Potential free contacts shall be provided for input into SAS for
 - 4.4.2.1 All the lamp indications
 - 4.4.2.2 All the alarm signals
- 4.5 Transformer conservator isolation valve with 4 NO + 4 NC contacts to be connected between conservator and Buchholz relay with isolating valves.
- 4.6 Fire detectors – Required type and number of fire detectors rated for heat sensing at temperature recommended by the vendor.
- 4.7 Pipe connections of required type, size and length for connections between transformer and local control box for :-
 - 4.7.1 Top oil drainage
 - 4.7.2 Nitrogen Injection
- 4.8 Cables
 - 4.8.1 All cables required for connections between the transformer and local control cabinet shall be included in vendor's scope.
 - 4.8.2 The cable shall be ERLS PVC insulated, 1100 V grade armoured with stranded copper conductor of 2.5 Sq mm.
 - 4.8.3 Shielded cables shall be supplied, if required.

4.9 Auxiliary Supply

4.9.1 DC supply shall be used for control, indication and alarm circuits. The voltage of the DC supply shall be as indicated in data sheet A.

4.9.2 240 V, single phase AC supply shall be used for space heaters, panel lights etc.,

4.9.3 Under Ground Oil Storage Tank

Transformer unit shall be provided with an underground oil storage tank. The oil storage tank shall have Non Corrosive, water proof, epoxy coated (from Inside) mild steel (minimum thickness 6 mm) to store drained out oil on operation of NIFPS. The tank shall be painted from outside. The total capacity of storage tank shall be at least 10% of transformer tank oil to avoid overflowing of oil considering that drained oil volume shall be around 10% of transformer tank oil. Necessary arrangement shall be made on underground storage tank so as to take out the drained oil from the tank for further processing and use. All the pipe and physical connection from transformer to oil pit shall be in the scope of contractor.

5 TESTS AND TEST REPORTS

5.1 All type tests and routine tests shall be carried out as per relevant standards. Type tests should have been carried out within the last 5 years from the date of offer.

5.2 All test reports shall be submitted for purchaser’s approval.

6 DRAWINGS AND DATA TO BE SUBMITTED WITH THE BID

6.1 Drawings and Data

6.1.1 Technical write up of the system offered.

6.1.2 Schematic drawings of the system.

6.1.3 General arrangement drawings for the local and remote control cabinets.

6.2 Type test reports

6.3 List of recommended spares and special tools.

DATA SHEET - A					
Sl. No.	Description		Unit	Data	
1.0 TRANSFORMER DATA	1.1	Manufacturer			
	1.2	Rating		MVA 16	
	1.3	Rated Voltage	HV	kV	66
			LV	kV	11
	1.4	Quantity of Oil	Tank	Ltrs	Shall be furnished after receipt of transformer vendor drawings
			Conservator	Ltrs	
			OLTC	Ltrs	
			Total	Ltrs	
	1.5	Type of cooling			ONAN
	1.7	Main Tank Dimensions			
		a)	Length	mm	Shall be furnished after receipt of transformer vendor drawings
		b)	Width	mm	
		c)	Height	mm	
	1.8	Arrangement of bushings			Shall be furnished after receipt of transformer vendor drawings
1.9	Provision on transformer for				

		a) Oil drainage valve near the top of the tank		Yes
		b) Nitrogen injection openings		Yes
		c) Brackets for fire detector fixing		To be fixed
		d) Arrangement for fixing conservator isolation valve		Yes
		e) Arrangement for signal box fixing		To be fixed
2.0 CONTROL CABINET	2.1	Applications		Local control cabinet & remote control panel
	2.2	Sheet steel for enclosure, doors, covers	Type	Cold rolled
			Thickness	mm 2.5
	2.3	Degree of enclosure protection	Outdoor	IP55
			Indoor	IP54
	2.4	Colour Finish shade	Interior	Glossy white
			Exterior	631 of IS 5
	2.5	Wiring details		
		a) Material of Conductor		Stranded copper
		b) Size of wires	Sq mm	2.5
		c) Voltage grade	Volts	1100
	d) Type of insulation		FRLS PVC	
	e) Type of terminals		Screw type	
3.0 CABLES	3.1	Application		Connection between transformers and local control cabinet
	3.2	Material of conductor		Stranded copper
	3.3	Size of wire	Sq mm	2.5
	3.4	Voltage grade	Volts	1100
	3.5	Type of insulation		PVC
	3.6	Type of sheath		FRLS PVC
	3.7	Armouring		Shall be provided as per IS
	3.8	Shielded cable		Shall be supplied as required
4.0 AUXILIARY SUPPLY	4.1	DC Voltage for control, interlock, signalling	Volts DC	220V
	4.2	AC voltage for space heater, panel lights	Volts AC	240V, 1 Ph

C. EHV Circuit Breaker

DATA SHEET					
SL.NO	PARTICULARS		UNIT	DATA	
1.0 GENERAL	1.1	Application		Outdoor	
	1.2	Quantity	Set	1	
	1.3	Type of circuit breaker		SF6	
	1.4	Number of Poles		Triple Pole	
2.0 RATING	2.1	Voltage	Rated	KV	66
			Maximum	KV	72.5
	2.2	Frequency		HZ	50
	2.3	Continuous current under site conditions		Amps	1250
	2.4	Short circuit breaking current	rms AC Component	kA	31.5
			% DC Component		≥ 40
	2.5	Short time current Withstands	Current	kA	31.5
			Duration	Sec	3
	2.6	Making capacity	Sec	kA peak	78.75
	2.7	Auto reclosing	1-Pole / 3-Pole		3-pole simultaneously
Time setting					
2.8	Operating duty			0-0.3 Sec-CO-3 min- CO	
2.9	Total break time		Cycles	< 3 Cycles	
2.10	Make time		Cycles	<4 Cycles	
3.0 ADDITIONAL PARTICULARS	3.3	Temperature			
	a	Reference ambient temperature		0C	45
				K	40
	3.4	Insulation withstand test voltages			
	a	1.2/50 μS impulse +ve & -ve		kV peak	325
				kV peak	Not Applicable
				kV	140
	3.5	Air Clearances			
	a	Phase to phase (min.)		mm	630
				mm	630
	c	Ground Clearance		mm	4900 (to bay bus bottom line)
	3.6	Phase Spacing		mm	2000
	3.8	Auxiliary Control Voltages			
	a	Voltage for close and Trip Coils, Interlocks, Indicating Lamps etc.		Volts	220
				AC/ DC	DC
	b	Applicable Variation in Supply voltage			
i) For closing coils and associated devices				70-110 %	
ii) For trip coil and associated devices				70-110 %	
3.9	Number of trip coils to be provided		Nos	2	

4.0 OPERATING MECHANISM	4.1	Type		
	a)	Motor compressed spring	Yes / No	Yes
	4.2	Fixed trip / trip free		Trip Free
	4.3	Spring Charging/ Unit Compressor Motor		
	a)	Voltage		240 Volt AC
	b)	Variation in supply voltage		-15% to +10%
	c)	Mode of Starting		Direct on line
	d)	Degree of Protection		IP 55
	4.5	IP class of control cubicle		IP 55
	4.6	External finish of control cubicle		Shade 632 of IS 5
4.7	Internal finish of control cubicle		Glossy white enamel paint	

DATA SHEET A1			
SL.NO	PARTICULARS	UNIT	DATA

5.0 MISCELLANEOUS		SF6 Gas pressure monitor with fault contacts as follows:-		Required	
		a) Gas pressure low alarm.			
		b) Gas pressure low, stage II for close lock out and alarm.			
		c) Gas pressure very low trip lock out and alarm.			
	5.4	Earthing Conductor	Material		GS
			Size		50 x 10 mm
	5.5	Mounting structure included in vendor's scope of supply	Yes/No.		Yes
	5.6	Clamps & Connectors	Takeoff- Hor/Vert/Other		Horizontal
			Conductor size		As per site requirement
			Conducting material		Aluminium
			Clamp material		Aluminium Alloy
	5.7	Support structure for circuit breaker & control cubicle			Hot dip galvanised MS
	5.8	Control accessories required	CB Control switch		1 No for each CB
			Local/ Remote selector switch		1 No for each CB
CB ON/ OFF/ Spring charged indicating lamps				1 set for each CB	
Anti-pumping relay				1 set for each CB	

Note: The Ratings mentioned above are the minimum ratings required, however the bidder can quote based on the minimum ratings mentioned in IS standard.

DATA SHEET A2		
APPLICABLE STANDARDS		
1 Circuit breakers	IS 13118	IEC 62271-100
2. Common specifications for high-voltage switchgear and control gear standards		IEC 60694
3 Bushings	IS 2099 BS 223 IS 10314, 5621 13134	IEC 60137
4 Large hollow porcelains	IS 5621	
5 Bushings CT	IS 2705	
6 Clamps & connectors	IS 5561	IEC 60305
7 Hot dip galvanising	IS 2629	
8. Specification and acceptance of new sulphur hexafluoride		IEC 60376
9. Degrees of protection provided by enclosures (IP code)		IEC 60529
10. High-voltage switchgear and control gear – Use and handling of sulphur hexafluoride (SF6) in high-voltage switchgear and Control gear		IEC 61634

D. EHV Isolator-Data Sheets

DATA SHEET- A1					
SL. NO.	PARTICULARS		UNIT	DATA	
1.0 RATINGS	1.1	Application		Transformer isolation	
	1.2	Quantity			
	a	Isolator without earth switch		Set 1	
	b	Isolator with ES on one side		Set 1	
	1.3	Voltage.	Rated	kV	66
			Maximum	kV	72.5
	1.4	Frequency.		Hz 50	
	1.5	No. of Phases		3	
	1.6	Rated current for site conditions		A 1250	
	1.8	Short circuit withstand	Current	kA	31.5
			Duration	Sec	
1.9	Dynamic rated peak short circuit Current		kAp 78.75		
1.10	One minute power frequency withstand Voltage		kV (rms)	To earth & between poles	Across isolating distance
				140	160
1.11	1.2/50 μ s impulse withstand Voltage		kVp	325 375	
2.0 DESIGN REQUIREMENTS	2.1	Reference ambient temperature.		$^{\circ}$ C 50	
	2.2	Seismic Zone		G Zone-IV	
	2.3	Insulation level		Full/reduced Full	
	2.4	Phase spacing		mm 2000	
	2.5	Earthing switch required		Yes / No Yes	
3.0 INSULATOR	2.6	Type of break		Double Break	
	2.7	Type of mounting		Upright	
	2.8	Height of mounting above GL		mm 4900 (To bay bus Bottom Line)	
	2.9	Operating device	For isolator		Manual / Motorised
			For earthing switch		Manual
	2.10	Aux. Voltage for operating motor		240V AC	
2.11	Orientation of operating mechanism box w.r.t isolator		Facility to mount on any side of isolator		
3.0 INSULATOR	3.1	Rated voltage	kV	66	
	3.2	Creep age distance.	Total	mm 1812.5	
			Protected	mm 906.25	
	3.3	Minimum strength	Torsional	kg	Shall meet design requirements
Cantilever			kg m		

DATA SHEET- A1					
SL. NO.	PARTICULARS			UNIT	DATA
4.0 MISCELLANEOUS	4.1	Aux. Supply for Control	V & Hz /AC / V. DC		240V & 50Hz / 220V DC
	4.2	Clamps & Connectors.	Take off		Horizontal
			Size and material		As per site requirement
	4.3	Interlocks with circuit breaker	Electrical	Type	220V DC Solenoid Switch
				Quantity	1 Each main and Earth Switch
				Code engraving	At contract Stage
			Mechanical	Type	Castle/ Kirk/ Yale
				Quantity	Vendor to furnish
				Code engraving	Vendor to furnish
	4.4	Interlock between Isolator and earth switches.	Mechanical	Type	Castle/ Kirk/ Yale
	5	Accessories			
	5.1	Isolator Control Switch (trip neutral close)	Quantity		1No.
5.2	Local/ Remote Electric switch	Quantity		1No.	
5.3	Mechanical position indicator for Isolator			Required	
5.4	Mechanical Position indicator for earth switch			Required	
5.0 TESTS	WHETHER TYPE TESTS ARE TO BE CARRIED OUT			VALID TEST REPORTS ARE ACCEPTABLE IN LIEU OF TYPE TESTING	

Note:

The Rating mentioned above is the minimum rating required, however the bidder can quote based on minimum ratings mentioned in IS standard.

DATA SHEET A2		
APPLICABLE STANDARDS		
1 Isolators	IS 1818, IS 9921	IEC 60129
2 Insulators	IS 2544	IEC 60168
3 Bushings	IS 2099,10314, 5621, 13134	IEC 60137
4 Large hollow porcelains	IS 5621	
5 Clamps & connectors	IS 5561	IEC 60305
6 Hot dip galvanising	IS 2629 IS 2633	

E. EHV CT

DATA SHEET – A (CT)				
SL. No	Description		Data	
1.0 GENERAL	1.1	Designation	Current Transformer	
	1.2	Type	Porcelain Clad, Oil filled, Live tank design	
	1.3	Quantity	Refer Electrical BOQ	
	1.4	Nominal system voltage & frequency (kV & Hz)	66 & 50	
	1.5	Highest system voltage (kV)	72.5	
	1.6	System neutral earthing	a) Type	Solidly earthed
			b) Co.eff of earthing	≤0.8
1.7	Number of cores	4		
2.0 PRIMARY CURRENT RATING	2.1	Primary current (A)	600A	
	2.2	Extended primary current rating (clause 4 of IS 2705 Part-II) (A)	As per IS	
	2.3	Short time thermal rating	Current (kA)	31.5
			Duration (Sec.)	1
2.4	Dynamic rating (kA peak)	78.75		
3.0 INSULATION	3.1	Class of insulation	Oil filled	
	3.2	Maximum temperature rise of winding	Ambient (°C)	50
			Temp. Rise (°C)	45
	3.3	1.2/50 μ sec. impulse withstand +ve & -ve (kVpeak)	325	
3.4	One min. power frequency withstand (kVrms)	140		
4.0 TEST		Whether type tests to be carried out Yes/No	Test cert. of similar CT is acceptable.	
	4.1			
5.0 MISCELLANEOUS	5.1	Creepage distance Total / Protected (mm)	1812.5 / 906.25	
	5.2	Secondary cable / conduit size	Up to 10 Sq.mm Copper Conductor	
	5.3	Earthing conductor	Material	GS
			Size mm	50x10
	5.4	Design seismic Zone	Zone IV	
	5.5	Whether arcing horns on bushing required Yes/No	NA	
	5.6	Whether pressure relief valve required Yes/No	Yes	
5.7	Special requirement if any	CT's shall be hermetically sealed and nitrogen cushion shall be provided.		

VI. DESIGN DETAILS												
Item No.	Core No.	Application	Current Ratio (A/A)	Rated external burden (VA)	Accuracy class as per IS:2705 or IEC 185	Accuracy limit factor	Instrument security factor	Min. knee point	Max. CT sec. wdg. ratio (ohms)	Max. exciting current (MA) at voltage (volts)	Over voltage protective device across secondary (as per clause 3.9)	Quantity (Nos)
Transformer Bay CT	As Per BOQ.											

Note: - For multi ratio CT core, the ratio to be used is underlined. All parameters specified shall be applicable for the underlined ratio.

DATA SHEET – A3 APPLICABLE STANDARDS			
1.	Current transformers	IS 2705 BS 3938	IEC 60185
2.	Voltage transformers	IS 3156 BS 3941	IEC 60186
3.	Capacitor Voltage Transformer	IS 9348 & IS: 3156 (part IV) IEC	
4.	Insulating Oil	IS 335	BS 148 IEC 60296
5.	Bushings	IS 2099 BS 223	IEC 60137
6.	Large hollow porcelains	IS 5621 BS	IEC
7.	Insulators	IS 2544 BS 3297	IEC 60168
8.	Hot dip galvanising	IS 2629 BS 729	IEC
		IS 2633	

F. Lightning Arrestor Datasheets

DATA SHEET - A1				
SL. No.	DESCRIPTION		UNIT	DATA
1.0 GENERAL	1.1	Designation		Gapless ZnO, Lightning Arrestor
	1.2	Quantity	Nos	3
	1.3	Installation		Outdoor
	1.4	Class		Station Class
	1.5	Type of Connection		Phase to earth
	1.6	Applicable standard		IEC 60099
R A	2.1	Rated arrestor voltage	kV	60

DATA SHEET - A1				
SL. No.	DESCRIPTION		UNIT	DATA
	2.2	Rated frequency	Hz	50
	2.3	Nominal discharge current of 8/20 micro sec. wave shape	kA (peak)	10
3.0 PERFORMANCE DATA	3.1	High current impulse withstand (4/10 μ S wave).	kA(peak)	100
	3.2	Minimum switching surge spark over voltage	kV(peak)	160
	3.3	Maximum switching surge (30/60 μ S) residual voltage at 1kA peak	kV(peak)	136
	3.4	Maximum leakage current at rated operating voltage	mA	Resistive < 0.4 Capacitive < 1.5
	3.5	Maximum residual voltage at rated nominal discharge current	kV _{peak}	168
4.0 DESIGN DATA	4.1	Discharge class (as per IEC - 60099)		III
	4.2	Min. discharge capability of arrestor	kJ/kV	7.5
	4.3	Maximum continuous operating voltage (MCOV)	kV _{rms}	51
	4.4	Temporary overvoltage withstand capacity at 1.0 sec	kV _{peak}	102
	4.5	Seismic Zone	g	Zone IV as per IS 1893
	4.6	Wind velocity	m/ sec	
5.0 INSULATION	5.1	Withstand test voltages a) One minute power frequency dry & wet b) 1.2/50 S Impulse	kV(rms) kV(peak)	140 325
	5.2	Min creepage Distance a) Total b) protected	mm mm	1812.5 906.25

6.0 ADDITIONAL	6.1	Min. cantilever strength of arrester assembly	KG	As per manufacturer's standard
	6.2	Max. radio interference voltage (as per NEMA-LA1, 1962)	□V	NA
	6.3	No visual discharge up to a voltage of	kV	NA
	6.4	Pressure relief class (as per IEC-60099) / IS 3070		A
	6.5	Current for pressure relief test	kA	40

DATA SHEET - A1				
SL. No.	DESCRIPTION		UNIT	DATA
	6.7	Accessories Required Yes/No	a) Discharge counter	Yes
			b) Leakage current monitor	Yes
			d) Clamps & connectors on arrester terminals	Yes
	6.8	Purchaser's conductor sizes	a) Line side terminal	As per site requirement
b) Earth side terminal			50 x 10 GS	
7.0 TESTS	7.1	Test certificates in addition to those specified in IS:3070(Part I)	a) Type test	As per IEC to be submitted with the bid
			b) Acceptance tests	As per IEC

DATA SHEET A2				
APPLICABLE STANDARDS				
1.	Lightning Arrester	IS 3070		IEC 60099
2.	Bushings	IS 2099 IS 10314, 5621 13134	BS 223	IEC 60137
3.	Hot dip galvanising	IS 2629	BS 729	IEC IS 2633

G. 11 KV APFC CAPACITOR BANKS

1. GENERAL

- 1.1 This specification covers design, engineering manufacture, testing at manufactures works, supply and delivery, erection, testing and commissioning of 3000kVAR at 12.1 KV 3 phase capacitor banks at site for Indoor installation in cubicle along with necessary equipment's in all respect.

The specification covers 3 phase, 50 Hz, Indoor type APFC capacitor bank intended for installation at 11 KV side of 33/11 KV power transformers in sub-stations. The equipment covered in this specification comprises of Capacitor banks in steps, 0.2 % Series reactors, Isolator, HT Fuses, etc.

All major equipment like Capacitor, Reactor, VC, APFC relay should be single make only. Principle or Its authorize partner should have minimum 10 years of experience of manufacturing MV Capacitor Panels. In case of license partner valid authorization certificate need to be submit at the time of order negotiation.

2. Applicable Standard

The equipment shall conform (for performance and testing thereof) in all respects to the relevant Indian/International Standards specifications with latest amendments thereto.

ISS NO.	Title
3925:1998	Specification for H.T. shunt Capacitor
IS 9921 -1985	Isolator
IS 3070	Lighting Arrestor
IS 5553	Series Reactor

The other components such as VCB panel & other auxiliary equipment's shall comply with the latest version of latest Indian/International standards.

3. Capacitor banks:

The capacitor banks are for use in a 3 phase 50 Hz 11 KV system with consideration of 10% Over Voltage and 3000KVAR at 12.1KV. Capacitor bank shall consists of small units of capacitor cells series/parallel combination per phase.

Each capacitor unit should be provided with HRC fuse 12 KV class and suitable current rating. Capacitor shall meet following specifications:

3.3 Temperature Category:

The capacitor shall be suitable for upper limit of temperature category 50 Deg. C as per IS: 13925.

3.4. Rated Voltage:

The rated voltage of 3 phase capacitor banks shall be 12.1 KV (Line to Line).

3.5. Permissible Overloads:

For capacitor covered in this specification, the maximum permissible overloads with regard to voltage, current and reactive output shall not exceed the limits specified in IS:13925.

3.6 Construction Of Capacitor Unit Container:

The container shall be built from stainless steel of sufficient thickness (not less than 1.6 mm) to avoid damages to the tank in case of internal fault. It shall be of fabricated construction with all joints properly welded and designed to withstand rough handling and should be hydraulically tested before assembling the internal elements. It shall be adequately epoxy pointed. The lid of container shall be properly welded to the container.

3.7 Bushings:

Bushing shall be of porcelain or polycrystalline and shall be jointed to the case by welding method (Weldable type bushing) to ensure adequate and permanent seal. Leads shall be brought out through one-piece bushing and welded to the terminal stud to make a strong and positive electrical contact. Bushing terminal shall be of stainless steel.

3.8 Power Loss:

The power loss in capacitors shall not exceed 0.45 watt / KVAR (Subject to tolerance of + 10%).

3.9 Discharge device:

Suitable discharge device shall be connected across the capacitor unit in accordance with IS: 13925. The discharge device shall reduce the residual voltage from the crest value of the rated voltage to 50 V or less within 10 Minutes after the capacitor is disconnected from the source supply.

3.10 Earthing Connections:

The container of each capacitor unit shall be provided with suitable earthing terminal clearly marked with Earth symbol.

3.11 Protective Fuses:

The capacitor units shall be provided with HRC fuses together with fixing accessories.

3.12 Construction:

The capacitor shall be of non-PCB type, using polypropylene film as the dielectric. Complete mounting brackets supporting insulators and all other components for formation of capacitor banks racks shall be supplied along with the capacitor units. Necessary foundation bolts I nuts shall also be supplied. The outside of the capacitor container and other structures should have smooth and tidy look and should be coated with the weather proof, corrosion-resistant paint of white or light grey.

3.13 Marking:

The capacitor unit shall be provided with a rating plate and terminal markings as stipulated in IS: 13925. The bidder shall submit the type test report along with the bid.

3.14 TESTS:

Capacitors shall be subjected to all the type, routine and acceptance test in accordance with IS: 13925. Capacitors to be tested for cyclic Over voltage and 3 G test for mechanical shock & vibration , and these tests shall be routine test for each lot of capacitors, bidder has to clarify / confirm these points in GTP

4. AUTOMATIC CONTROL UNIT:

Microprocessor based APFC relay (Intelligent VAr controller) should have dual sensing so that on Transformer and Generator supply it can suitably switch to desired power factor shall sense the PF in the system and automatically switch ON / OFF the capacitor unit or stage to achieve the preset target PF. The controller shall have the following features:

- Intelligent and high-speed capacitor switching control.
- Self-optimizing control capability by ARM micro-processor
- Wide range of auxiliary power supply with AC or DC input (90V to 485V L-L / 100V to 550Vdc)
- Large measuring voltage range
- Extension of steps Capacity by usage of two units (32 steps, master slave function)
- Four-quadrant operation (e.g. stand by generator / solar co- gen)
- Phase sequence of measurement voltage
- Dual PF control setting possible (DG and EB)
- Minimum current sensing 5mA
- Storage of maximum values, maximum demand, Energy values
- Storage of switching operations and time + Capacitor utilization
- Monitoring of capacitor Kvar
- Measurement methods like 3 wattmeter / 2 wattmeter / balanced quadrature / balanced in-phase External temperature monitoring.
- Capacitor Current monitoring protection for Neutral / Earth current monitoring and harmonics
- Measurement Odd & Even harmonics up to 31st for Supply Voltage (LL, LN), Current, Capacitor current
- External temperature monitoring facility via PT100 sensor (RTD)
- IOT enable with GPRS real time data (thro' external modem) / MODBUS connectivity.
- RS485 port / RS232 port connectivity
- Internal Data logging, history of fault detection, load pattern, time storage parameters
- Mono-phase and balanced capacitor through controlling single phase & three phase TSC modules.
- CE marking, RoHS compliance, Environmental compliance

AUXILARY EQUIPMENTS

5. Isolator:

- 5.1 The Isolator shall be Indoor type, 11 KV, 400 Amp, Single throw, Double break, off load type, triple pole, Horizontal gang operated with earth switch.
- 5.2 Tests: The Isolator shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 1818-1972.

6. Lightning Arrestor:

- 6.1 The specification covers the supply, delivery, erection, testing & commissioning of 9 KV, 10 KA, Station class heavy duty, gapless, metal (zinc) oxide surge arrestors complete along with clamps, complete fitting and accessories for installation on Indoor type 11 KV switchgear, transmission lines, transformers etc.
- 6.2 Tests: The Lightning Arrestors shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 3070.
- 6.3 The bidder shall submit guaranteed technical particulars along with their bid.

7. HRC Fuses:

- 7.1 Suitable Indoor type 11 KV HRC fuses along with the mounting insulators etc. to provide proper protection for the capacitor unit shall form part of the equipment to be supplied.

8. Series Reactors:

- 8.1 0.2 % Series reactor per phase per step of capacitor rating for inrush current restriction to be connected on neutral end as per IS: 5553. The rated voltage shall be 12 KV. The reactor shall be dry type single phase reactors, and designed to carry 130 % of rated current continuously without exceeding the temperature rise & shall be applicable for thermal class of insulation used. The reactor shall be mounted on structure.
- 8.2 Tests: The series reactor shall be type tested and shall be subjected to routine and acceptance test in accordance with IS: 5553.

9. Capacitor Bank Cubicle:

Capacitor bank shall be Indoor type, each individual step along with required current limiting reactors, LA, Isolator etc... Shall be assembled in Cubicle, each capacitor unit shall be provided with an HRC fuses.

Bank shall be complete with necessary 11 KV class post insulator, aluminum bus bar etc.

10. SUBMISSION AND APPROVAL OF DRAWINGS:

Following drawings and technical documents shall be submitted along with the bid.

- Technical data sheet
- GA drawings.
- Bill of Material.

11. INSTALLATION OPERATION AND MAINTAINANCE:

The supplier shall provide:

- a) Necessary manual on installation, operation and maintenance as also the schedule for the routine testing or check ups of all the equipment covered by the installation.
- b) List of recommended spares indicating prices and specialized test equipment required for the routine testing of the system.

12. GUIDANCE FOR PROCUREMENT:

The entire equipment covered under this specification shall be covered as a single package to avoid the problem of mismatching for maintenance etc.

13. WARRANTY:

The supplier shall guarantee satisfactory performance of the complete capacitor bank installation for a period of 18 months from the date of supply or 12 months from the date of commissioning, whichever is earlier. During the warranty period all repairs/replacements shall be carried out free of cost.

14. INSPECTION:

All tests and inspection shall be made at the place of the manufacturer unless otherwise especially agreed upon by the manufacturer and the purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser, all reasonable facilities, without charge, to satisfy him that the material being supplied is in accordance with the specification.

The purchaser has the right to get the tests carried out at his own cost from an independent agency, whenever there is a dispute regarding the quality of the supply.

H. Transformer bay Control Relay Panel with BCU

1. General Requirements:

- **Scope:**

- Supply, installation, testing, and commissioning of Intelligent Electronic Device (IED)-based transformer control relay panel integrated with Bay Control Unit (BCU) for protection, monitoring, and control of transformers.

- **Standards Compliance:**

- IEC 61850 for communication protocols and interoperability.
- IEC 60255 for protection relays.
- IEC 60870-5-103/104 and DNP3 for telecontrol and data transmission.
- IEC 61000 for electromagnetic compatibility.
- IS 3231 and IEC 60076 for electrical protection and transformers.

- **Environmental Conditions:**

- Operating temperature: -10°C to +55°C.
- Humidity: 95% non-condensing.
- Altitude: Up to 1000 meters above sea level without derating.

- **Type of Installation:**

- Indoor, dust-proof, vermin-proof, and IP42-protected enclosures.

2. Functional Requirements:

2.1 Protection Functions (IED):

- Differential Protection (87T).
- Overcurrent Protection (50/51).
- Earth Fault Protection (50N/51N).
- Restricted Earth Fault Protection (87N).
- Over-flux Protection (24).
- Thermal Overload Protection (49).
- Under/Overvoltage Protection (27/59).
- Frequency Protection (81).
- Breaker Failure Protection (50BF).

2.2 Control Functions (BCU):

- Control of circuit breakers, isolators, earth switches, and tap changers.
- Local/Remote operation and command priority with interlocking logic.
- Synchronization check and auto-reclosing feature.

2.3 2.3 Monitoring Functions:

- Transformer oil and winding temperature monitoring.
- Buchholz relay and PRD trip/alarm indications.
- Cooling system (fans/pumps) status monitoring.
- Measurement of voltage, current, power factor, and energy.

2.4 2.4 Data Logging and Synchronization:

- Event logging with 1 ms time stamping.
- Sequence of Events (SoE) recorder.
- Fault recording with waveform capture.
- Time synchronization via SNTP/NTP or IRIG-B.

3. **Communication Requirements:**
 - **Communication Protocols:**
 - IEC 61850 Edition 2 for seamless integration with Substation Automation Systems (SAS).
 - IEC 60870-5-103/104, Modbus RTU/TCP, and DNP3 support.
 - **Interfaces:**
 - Ethernet ports (RJ45/Fiber Optic) with redundancy.
 - RS485 and RS232 communication ports.
 - GOOSE messaging for real-time data exchange.
 - **SCADA Compatibility:**
 - Must integrate with SCADA/EMS for remote monitoring and control.
4. **Construction Features:**
 - **Panel Enclosure:**
 - Modular, powder-coated CRCA steel construction
 - IP42 protection or higher for indoor installation.
 - **Display and Indicators:**
 - LCD/Graphical display with LED indicators for alarms and statuses.
 - **Wiring and Terminals:**
 - Flexible copper wires with ferruling and color coding.
 - Spring-loaded or screw-type terminals with proper labeling.
 - **Cable Entry:**
 - Bottom/top entry with removable gland plates.
5. **Testing and Commissioning Requirements:**
 - **Factory Acceptance Test (FAT):**
 - Hardware, software, and communication tests at the manufacturer's premises.
 - **Site Acceptance Test (SAT):**
 - Functional and communication testing, interlocks, and SCADA integration.
 - **Final Inspection:**
 - Verification of installation, calibration, and readiness for operation.
6. **Documentation and Training:**
 - **Documentation:**
 - Operation and maintenance manuals.
 - As-built drawings and wiring diagrams.
 - Test certificates and calibration reports.
 - **Training:**
 - Hands-on training for operation and maintenance personnel.
7. **Metering and Display Features:**
 - **Measurement Capabilities:**
 - Voltage, current, frequency, power factor, active/reactive power.
 - Energy metering with Class 0.2S/0.5 accuracy.
 - **Local Interface:**
 - Graphical LCD with keypad interface and LED indicators.

I. Substation Automation System

1. Scope of Work

1.1 General Description:

- Supply, installation, testing, and commissioning of Substation **Automation System (SAS)** based on IEC 61850 standards.
- Integration of protection, control, monitoring, and communication functions.

1.2 Standards and Compliance:

- The system must comply with **IEC 61850** for communication and interoperability.
- Compliance with **IEEE 1588** for time synchronization.
- Conformance to cyber security standards such as **IEC 62351** or **NERC CIP**.

2. System Architecture

2.1 Functional Requirements:

- Decentralized architecture with distributed IEDs (Intelligent Electronic Devices).
- Dual redundant Ethernet communication network for high availability.
- Seamless communication between bay-level and station-level equipment.

2.2 Communication Protocols:

- Support for **MMS**, **GOOSE**, and **Sampled Values** for real-time data exchange.
- Interoperability with third-party devices based on IEC 61850.

2.3 Time Synchronization:

- Use of **IEEE 1588 Precision Time Protocol (PTP)** or **SNTP** for accurate time stamping.

3. Hardware Requirements

3.1 Intelligent Electronic Devices (IEDs):

- Protection relays, bay controllers, and meters with IEC 61850 compliance.
- Capability to handle **event recording**, disturbance recording, and fault analysis.

3.2 Human-Machine Interface (HMI):

- Ergonomic operator workstation with **SCADA-based visualization** tools.
- Display of alarms, trends, event logs, and diagnostic information.
- HMI, Redundant HMI and Engineer work space.

3.3 Server and Gateway:

- Redundant servers for SCADA and data processing.
- Gateways for protocol conversion to integrate legacy systems.

4. Software Requirements

- Configuration and engineering tools for SAS design.
- Cyber security features such as **firewalls, encryption, and access control.**
- Logging and reporting functionalities for audits and compliance.

5. Performance Criteria

- **Data Acquisition Rate:** Minimum 1 ms for protection data.
- **Reliability:** 99.99% system uptime with redundant components.
- **Scalability:** Ability to expand for future bay additions.

6. Testing and Commissioning

- Pre-installation factory acceptance testing (FAT).
- Site acceptance testing (SAT) and commissioning as per IEC 61850-10.
- End-to-end validation of GOOSE messages and trip times.

7. Documentation and Training

- **Drawings and Schematics:** System layout, wiring diagrams, and communication architecture.
- **Operation Manual:** User guides and maintenance procedures.
- **Training Programs:** Hands-on training for operators and engineers.

8. Basic Monitoring requirements

- Switchgear status indication
- Measurements (U, I, P, Q, f)
- Event
- Alarm
- Oil & Winding temperature of transformer & reactor individual units
- ambient temperature
- Status and display of 415V LT system, 220V DC system
- Status of display of Fire protection system and Air conditioning system.
- Acquisition of alarm and fault record from protection relays
- Disturbance records
- Monitoring the state of batteries by displaying DC voltage, charging current and load current etc.

- Tap-position of Power Transformer
- Temperature measured with Optical Temperature sensor (being provided by Transformer/Reactor manufacturer)
- Dissolved Hydrogen / multi-gas & Moisture Content monitor of Transformer
- Status and display of VCB panels its associated parameter.
- Status and display of LT transformer & its associated switchgear for station auxiliary supply

8.1 List of Inputs

The list of input for typical bays is as below:-

8.1.1 Analogue inputs

- i) For Each line Current
- ii) For each transformer
WTI (Winding Wise), OTI, Tap position, Multi-gas DGA parameters
- a) Voltage for Bus-I, Bus-II
R-Y phase , Y-B phase B-R phase
- b) Frequency for Bus-I and Bus-II
- c) Ambient temperature (switchyard)
- d) Switchyard Panel Room Temperature.
- e) LT system
 - i) Voltage R-Y, Y-B, B-R of Main Switch Board section-I
 - ii) Voltage R-Y, Y-B, B-R of Main Switch Board section-II
 - iii) Voltage R-Y, Y-B, B-R of Diesel Generator
 - iv) Current from LT transformer-I
 - v) Current from LT transformer-II
 - vi) Current from Diesel Generator
 - vii) Voltage of 220V DCDB-I
 - viii) Voltage of 220V DCDB-II
 - ix) Current from 220V Battery set-I
 - x) Current from 220V Battery set-II
 - xi) Current from 220V Battery charger-I
 - xii) Current from 220V Battery charger-II

8.1.2 Digital Inputs

The list of input for various bays/SYSTEM is as follows:

- a) Transformer bays (HV Side)
 - i) Status of each pole of CB,
 - ii) Status of Isolator, Earth switch
 - iii) CB trouble
 - iv) CB operation/closing lockout
 - v) Pole discrepancy optd
 - vi) Trip coil faulty
 - vii) LBB optd

- viii) Bus bar protn trip relay optd
- ix) REF OPTD
- x) DIF OPTD (Phase Wise)
- xi) OVERFLUX ALARM (MV)
- xii) OVERFLUX TRIP (MV)
- xiii) OVERFLUX ALARM (HV)
- xiv) OVERFLUX TRIP (HV)
- xv) HV BUS CVT ½ FUSE FAIL
- xvi) MV BUS CVT ½ FUSE FAIL
- xvii) OTI ALARM/TRIP
- xviii) PRD OPTD (each PRD)
- xix) OVERLOAD ALARM
- xx) BUCHOLZ TRIP
- xxi) BUCHOLZ ALARM
- xxii) OLTC BUCHOLZ ALARM
- xxiii) OLTC BUCHOLZ TRIP
- xxiv) OIL LOW ALARM
- xxv) back-up O/C (HV) optd
- xxvi) back-up E/F (HV) optd
- xxvii) 220V DC-I/II source fail
- xxviii) TAP MISMATCH
- xxix) GR-A PROTN OPTD
- xxx) GR-B PROTN OPTD
- xxxii) back-up O/C (MV) optd
- xxxii) back-up E/F (MV)optd
- xxxiii) Healthiness of each Protection Relay through watchdog contact.

b) Transformer bays (MV Side)

- i) Status of each pole of CB, Isolator, Earth switch
- ii) CB trouble
- iii) CB operation/closing lockout
- iv) Pole discrepancy optd
- v) Trip coil faulty
- vi) LBB optd
- vii) Bus bar protn trip relay optd
- viii) Back-up impedance relay
- ix) 220V DC-I/II source fail
- x) GR-A PROTN OPTD
- xi) GR-B PROTN OPTD

c) 11KV bays

- i) VCB position
- ii) VCB status
- iii) Trip signal
- iv) Close signal
- v) Alarm signal
- vi) Fedder protection
- vii) Master relay optd
- viii) 50,51,50N,51N OPTD
- ix) FUSE FAIL
- x) AC supply-I/II source fail
- xi) 220V DC-I/II source fail
- xii) GR PROTN OPTD
- xiii) GR-B PROTN OPTD

- d) Bus bar Protection
 - i) Bus bar main-I trip
 - ii) Bus bar main-II trip
 - iii) Bus bar zone-I CT open
 - iv) Bus bar zone-II CT open
 - v) Bus transfer CT sup. Optd
 - vi) Bus transfer bus bar protn optd
 - vii) Bus protection relay fail

- e) Auxiliary system
 - i) Incomer-I On/Off
 - ii) Incomer-II On/Off
 - iii) 415V Bus-I/II U/V
 - iv) 415v bus coupler breaker on/off
 - v) DG set bkr on/off
 - vi) Alarm/trip signals as listed in Section: DG set
 - vii) LT transformer-I Bunchholz Alarm & trip
 - viii) LT transformer-II Buchloz Alarm & trip
 - ix) LT transformer-I WTI Alarm & trip
 - x) LT transformer-II WTI Alarm & trip
 - xi) LT transformer-I OTI Alarm & trip
 - xii) LT transformer-II OTI Alarm & trip
 - xiii) Time sync. Signal absent
 - xiv) Alarm/trip signals as listed in Section: Battery and Battery charger
 - xv) 220v DC-I earth fault
 - xvi) 220v DC-II earth fault
 - xvii) Alarm/trip signals as listed in Section: Fire protection system

- f) Switchyard Panel Room:
 - i) AC Compressor 1 ON/OFF
 - ii) AC Compressor 2 ON/OFF
 - iii) Fire Detection 1 ON/OFF
 - iv) Fire Detection 2 On/OFF
 - v) Switchyard Panel Room Temperature High Alarm

The exact number and description of digital inputs shall be as per detailed engineering requirement. Apart from the above mentioned digital inputs, minimum of 200 inputs shall be kept for employer's use in future for new substations. For extension substations, minimum 04 nos. digital inputs per bay shall be kept for future use.

Note:

1. The redundant managed bus (station LAN) shall be realized by high speed optical bus using industrial grade components and shall be as per IEC 61850.
2. Inside the sub-station, all connections shall be realized as per IEC 61850 protocol.
3. The printer as required shall be connected to station bus directly and can be managed either from station HMI, HMI view node or disturbance recorder work station.
4. The above layout is typical. However if any contractor offers slightly modified architecture based on their standard practice without compromising the working, the same shall be subject to approval during detailed engineering.

J. VALVE REGULATED LEAD ACID BATTERY & CHARGER

1. SCOPE :

- 1.1. This specification covers the design, manufacture, assembly, testing at the manufacturer's works of 220 V D.C. Maintenance free Valve regulated Lead Acid Battery and associated battery charger with provisions of both float and boost charging of battery along with necessary accessories, fittings etc.
- 1.2. Each battery shall have sufficient capacity considering continuous emergency and intermittent loads for the periods specified below and for all bays with the charger out of service :
 - a) Continuous DC load for protection, control, indications, alarms and interlock for 10 hours.
 - b) Emergency lighting loads for 10 hours.
 - c) Intermittent DC load for closing and tripping operation of Circuit Breakers, Isolators and Earth Switches. This load shall be determined considering simultaneous tripping of breakers on bus-bar protection. Duration of intermittent load shall be considered as one minute. Battery shall have 20% spare capacity. Supplier shall furnish characteristic curve for satisfactory operation and maintenance of battery under service condition.
- 1.3. Bidder shall select number of cells, float & boost voltage to achieve following system requirement:

System Voltage	Maximum Voltage during Float operation	Minimum Voltage available when no charger working and battery fully discharged upto 1.85V per cell
220V	242V	198V

Bidder shall furnish calculation in support of selection of capacity as well as number of Cells, Float & Boost charger current / Voltages.

2. RATING OF BATTERY AND FUNCTION OF CHARGER :

D.C. Power Supply shall comprise a set of Battery (220V) of desired capacity, a Float charger and a Float cum Boost Battery Charger (minimum 60A) in parallel operation. In this mode the charger shall be required not only to continuously feed a variable load but also deliver trickle/boost charging current for the battery. Charger shall have 20% spare capacity. Battery will be capable of feeding the DC load requirement of the Sub-station in case of failure of the charger. Ampere-hour capacity of the battery shall be designed considering the current load and expected future load due to extension of the Sub-Station . A detailed design calculation for both battery & charger are to be submitted for approval.

3. TRICKLE / BOOST CHARGE VOLTAGE :

The trickle and Boost charge voltage per cell shall be as follows :

- i) TRICKLE CHARGE : Per Cell Voltage 2.2 V to 2.25±0.02 V
- ii) Boost charge voltage should vary between 2.23 to 2.3V/cell.

4. VOLTAGE / CURRENT REGULATION OF CHARGER:

Output voltage for float charging from battery charger shall be auto controlled by adjusting the firing angle of thyristor for float charger to keep the voltage variation within ± 1% from no load to full load and AC supply voltage variation of ±10% and frequency variation of ± 3% of 50 Hz. Manual control of output voltage shall also be possible through Auto/Manual selector switch.

The Boost / Quick charger shall be similar type as Float / Trickle charging equipment, but shall be provided with control arrangement for 'auto/manual' current regulation features, necessary for quick charging. An automatic VOLTAGE controller for boost charging shall control the output VOLTAGE WITH CURRENT LIMIT AS LIMITED FOR RESPECTIVE BATTERY CAPACITY by adjusting the firing angle of the thyristor.

5. CLIMATIC CONDITIONS:

The equipment to be supplied against the specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

Max. Ambient Air Temperature	50°C
Max. Daily Average Ambient Temperature	45°C
Max. Yearly Weighted Ambient Temperature	35°C
Min. Air Temperature	(-) 5°C
Max. Humidity	100%
Min. Relative Humidity	26%
Average Number of Thunder Storm days per annum	40
Average Annual Rain Fall	15-100cm
Number of Months during which Tropical Monsoon Conditions prevail	4months (Jun-Sep)
Altitude above MSL	As per location of Substation
Average Number of Rainy days per Annum	120days
Seismic Level (Horizontal Acceleration)	0.3g
Degree of Pollution	Heavy
Intensity of Solar Radiation	1.0 kW/sq.m.
Max Wind Load	195 kg/sq.m.

6. DESCRIPTION OF BATTERY :

6.1. Type :

The DC batteries shall be VRLA (Valve regulated Lead Acid) type & shall be Normal Discharge type and shall conform to IS 15549:2004/ IEC 60896-21 & 22:2004/ BS 6290-PART IV/ IEEE-1188 standard. These batteries are to be factory-filled, charged & shall be suitable for a long life under continuous float operations & occasional discharges. The 220V DC system is unearthed system. The offered battery shall be compact and shall require no maintenance. All safety equipment required for installation shall be provided by the manufacturer.

6.2. Constructional requirements:

The design of battery shall be as per field proven practices. Partial plating of cells is not permitted. Paralleling of cells externally for enhancement of capacity is not permitted. Protective transparent front covers with each module shall be provided to prevent accidental contact with live module/ electrical connections.

6.3. Plates:

Positive plates shall be made pasted type using high purity corrosion resistant alloy for deep discharge, durability, maintenance free, long life both in cyclic as well as in float applications. The Grids are of Semi Radial Squarish grid to reduce internal resistance and travel current in shorter time. Negative plates shall be heavy duty, durable flat pasted plate using lead alloy pasted Semi Negative Squarish Grid. Negative plates shall be designed to match the life of Positive plates & combination of positive & negative plates shall ensure long life, durability & trouble free operation of battery.

6.4. Containers:

The container material shall have chemical & electro-chemical compatibility & shall be acid resistant and shall conform to UL-94/ ASTM-D-2863 standard. The material shall meet all the requirements of VRLA batteries and be consistent with the life of battery. The container shall be fire retardant. The porosity of the container shall be such as not to allow any gases to escape except from the regulation valve. The tensile strength of the material of the container shall be such as to handle the internal cell pressure of the cells in the worst working condition. Cell shall not show any deformity of bulge on the sides under all working conditions. The container shall be capable of withstanding the rigorous of transport, storage and handling. The containers shall be enclosed in a steel tray. For identification, each cell/module shall be marked in a permanent manner to indicate the following information:

- (i) Cell Serial Number
- (ii) Positive & Negative, embossed on the cover
- (iii) Month & Year of Manufacturing

6.5. Cell Covers:

The cell covers shall be made of suitable material compatible with the container material and permanently fixed with the container by Hermetic Heat Sealing technique. It shall be capable to withstand internal pressure without bulging or cracking. It shall also be fire retardant. Fixing of Pressure Regulation Valve & terminal posts in the cover shall be such that the seepage of electrolyte, gas escapes and entry of electro-static spark are prevented.

6.6. Separators :

The separators used in manufacturing of battery cells, shall be of glass mat or synthetic material having high acid absorption capability, resistant to sulphuric acid & shall have good insulating properties. Sufficient separator overlap & PVC shield protection

in bottom edges of the plates is to be provided to prevent short circuit formation between the edges of adjacent plates. The design of separators shall ensure that there is no misalignment during normal operation & handling.

6.7. Pressure Regulation Valve:

Each cell shall be provided with a pressure regulation valve. The valve shall be self re-sealable. The vent plug shall be made with suitable grade of fire retardant plastic material. Each valve opening shall be covered with flame barrier capable of preventing the ingress of flame into the cell interior, when the valve opens & hydrogen/ oxygen gas mixture is released. The valve unit shall be such that it cannot be opened without a proper tool. The valve shall be capable to withstand the internal cell pressure specified by the manufacturer.

6.8. Terminal Posts:

Both the +ve & -ve terminals of the cells shall be capable of proper termination & shall ensure its consistency with the life of the battery. The terminals shall have lead plated adequate solid copper/ brass core cross-section to avoid overheating at maximum current load. The surface of the terminal post extending above the cell cover including bolt hole shall be coated with an acid resistant & corrosion retarding material. Terminal posts or any other metal part which is in contact with the electrolyte shall be made of the same alloy as that of the plates or of a proven material that does not have any harmful effect on cell performance. Both +ve & -ve posts shall be clearly and unambiguously identifiable.

6.9. Connectors, Nuts & Bolts, Heat Shrinkable Sleeves:

Where it is not possible to bolt the cell terminals directly to assemble a battery, separate non- corroding lead coated copper connectors of suitable size shall be provided to enable connection of the cells. Copper connections shall be suitably lead coated to withstand corrosion due to sulphuric acid/fumes at a very high rate of charge or discharge.

Nuts & bolts for connecting the cells shall be made of copper, brass or stainless steel. Copper or brass nuts & bolts shall be effectively lead coated to prevent corrosion. Stainless steel bolts & nuts can be used without lead coating.

All inter cell connectors shall be protected with heat shrinkable sleeves for reducing the environmental impact including a corrosive environment.

More than one cable may be required to be connected to the battery terminals. Suitable arrangement for termination of multiple cables shall be provided so as to avoid extra load on the battery terminals.

6.10. Necessary insulating supports for termination of these cables on batteries shall also be supplied by the bidder. All connectors shall be capable of continuously carrying the 30 min. discharge current of the respective batteries and shall be capable to carry 4KA for 1 sec.

6.11. Flame Arrestors:

Each cell shall be equipped with a Flame Arrestor to defuse the Hydrogen gas escaped during charge & discharge. Material of the flame arrestor shall not affect the performance of the cell.

6.12. Battery Bank Stand:

All batteries shall be mounted in a suitable metallic stand/ frame. The frame shall be properly painted with the acid resistive paint & should have protection against harmful effects due to tropical environment. The suitable insulation shall be provided between

stand/ frame and floor to avoid the grounding of the frame/ stand. The jointing of the frames should not leave crevices and ensure proper and tight fit. Numbering tags for each cell shall be attached to the racks. Provision for clamping outgoing cables shall be kept.

7. CAPACITY REQUIREMENTS:

When the battery is discharged at 10 hour rate, it shall deliver 80% of Rated Capacity (corrected at 27°C) before any of the cells in the battery bank reaches 1.85 V/cell.

The battery shall be capable of being recharged from the fully exhausted condition (1.75 V/cell) within 10hrs upto 90% state of charge. All the cells in a battery shall be designed for continuous float operation at the specified float voltage throughout the life.

The capacity (corrected at 27°C) shall also not be less than Rated capacity & not more than 120% of Rated capacity before any cell in the battery bank reaches 1.75 V/cell. The battery voltage shall not be less than the following values, when a fully charged battery is put to discharge at a rate of 1/10th of the Rated Capacity:

- (a) After SIX minutes of discharge: 1.98V/cell
- (b) After SIX hours of discharge: 1.92V/cell
- (c) After EIGHT hours of discharge: 1.85V/cell
- (d) After TEN hours of discharge: 1.75V/cell

Loss in capacity during storage at an average ambient temperature of 35°C for a period of 6 months shall not be more than 60% and the cell/battery shall achieve 85% of its rated capacity within 3 charge/discharge cycles and full rated capacity within 5 cycles, after the storage period of 6 months. Voltage of each cell in the battery set shall be within 0.05V of the average voltage throughout the storage period. Ampere hour efficiency shall be better than 90% and watt-hour efficiency shall be better than 80%.

8. EXPECTED BATTERY LIFE

The battery shall be capable of giving 1200 or more charge/discharge cycles at 80% Depth of Discharge at an average temperature of 27°C. Depth of Discharge is defined as the ratio of the quantity of electricity (in Ampere Hour) removed from a cell or battery on discharge to its rated capacity. The battery sets shall have a minimum expected life of 20years at Float operation.

9. ASSOCIATED EQUIPMENTS & ACCESSORIES (For each set of battery) :

- a) Best quality metallic stand/frame as per Clause 9.12.
- b) Stand insulators +5% extra
- c) Inter row connectors Appropriate quantity
- d) Inter tier connectors
- e) Centre-zero (3-0-3) volts DC Voltmeter : 1 No
- f) Torque wrench/ Spanners : 1 No
- g) Connection hardware, such

- as strips, bolts, nuts(with 5% extra)
- h) Cable clamps with hardware
- i) Cell numbering tags with fixing arrangement
- j) Two sets of special tools and tackles for connecting terminals of the battery
- k) Any other accessories not specified but required for satisfactory operation.

10. TYPE TEST OF BATTERY:

The Bidder/ Supplier shall supply type tested battery as per IS 15549:2004/ IEC 60896-21 & 22 over the range of at least one capacity per design. The Bidder/ Supplier shall submit necessary evidences enclosed during detailed engineering.

Sr. No.	DESCRIPTION
1	Gas Emission
2	High Current Tolerance
3	Short Circuit Current & DC Internal resistance
4	Protection against Internal Ignition from External Spark source
5	Protection against Ground Short Propensity
6	Content & Durability of required marking
7	Material Identification
8	Valve Operation
9	Flammability Rating of Material
10	Intercell Connector Performance
11	Discharge Capacity
12	Charge Retention during Storage
13	Float Service with Daily Discharge for reliable mains power
14	Recharge behavior
15	Service Life at an operating temperature of 40°C for brief duration exposure time
16	Impact of Stress Temperature of 60°C for brief duration exposure time with 3hrs discharge test
17	Abusive Over Discharge
18	Thermal Runaway Sensitivity
19	Low Temperature Sensitivity
20	Dimensional Sensitivity at Elevated Internal Pressure & Temperature
21	Stability against Mechanical abuse of units during installation

10.1 ROUTINE TEST OF BATTERY:

- (i) Physical Examination Test
- (ii) Visual Inspection
- (iii) Dimensions, Mass & Layout
- (iv) Marking & Packing

10.2 ACCEPTANCE TEST OF BATTERY

- (v) Polarity Marking
- (vi) Verification of Dimensions
- (vii) Test of AH Capacity

10.3 LIST OF FACTORY & SITE TESTS FOR BATTERY

Sr. No.	TEST	FACTORY TESTS	SITE TESTS
1	Physical Verification	YES	YES
2	Capacity Test on the cell at 1/10 th of Rated Capacity, corrected at 27°C	YES	
3	8hrs Charge & 15mins Discharge Test at Full Rated Load		YES

11. PACKING :

All equipment shall have to be dispatched suitably and securely, packed in wooden crates, suitable for handling during transit by road indicating Name of the Consignee Officer, Name of the Purchaser, LOA No., Destination Station, Crate Sl.No. etc.

12. BATTERY CHARGER

The DC system for 220V DC is unearthed. The Battery Chargers as well as their automatic regulators shall be of static type and shall be compatible with VRLA batteries. All battery chargers shall be capable of continuous operation at the respective rated load in float charging mode while supplying the DC load. The chargers shall also be capable of Boost charging the associated DC battery at the desired rate.

Under normal operating conditions the charger should give a D.C. output equal to the steady demand load for signal lamps, auxiliary relays etc. plus an output to trip coils and closing coils of the circuit breakers and relays as and when required as well as float charging current of the battery. Charger shall have 20% spare capability.

- a) The battery chargers shall be provided with facility for both automatic and manual control of output voltage and current. A selector switch shall be provided for selecting the mode of output voltage/current control, whether automatic or manual. When on automatic control mode during float charging, the chargers output voltage shall remain within + 1% of the set value, for AC input voltage variation of + 10%, frequency variation of + 5% a combined voltage and frequency variation of + 10% and a DC load variation from zero to full load.
- b) The battery chargers shall have constant voltage characteristics throughout the range (from zero to full load) at the floating value of the voltage so as to keep the battery fully charged but without harmful overcharge.
- c) The chargers shall have load limiters having drooping characteristics, which shall cause, when the voltage control is in automatic mode, a gradual lowering of the output voltage when the DC load current exceeds the Load limiter setting of the Charger. The Load-limiter characteristics shall be such that any sustained overload or short circuit in DC system shall not damage the Charger nor shall it cause blowing of any of the Charger fuses. The Charger shall not trip on overload or external short circuit.
- d) Uniform and step less adjustments of voltage setting (in both manual and automatic modes) shall be provided on the front of the Charger panel covering the entire float charging output range specified. Step less adjustments of the Load-limiter setting shall also be possible from 80% to 100% of the rated output current for charging mode.
- e) During Boost Charging, the Battery Charger shall operate on constant voltage with current limit mode (when automatic regulator is in service) to restrict battery charging current as specified. After completion of boost charging this float cum boost converter section either goes standby mode or float mode as desired by the system.

- f) The Charger manufacturer may offer an arrangement in which the voltage setting device for Float charging mode is also used as output voltage limit setting device for Boost charging mode and the Load-limiter of Float charging mode is used as current setting device in boost charging mode for Float cum Boost Converter section. For Float charger section shall provide separate arrangement.
- g) Suitable filter circuits shall be provided in all the chargers to limit the ripple content (Peak to Peak) in the output voltage to 1% irrespective of the DC load level, when they are not connected to a battery.
- h) **MCCB**
All Battery Chargers shall have sufficient MCCBs on the input side to receive cables from two sources. Mechanical interlock should be provided such that only one source shall be closed at a time. It shall be of P2 duty and suitable for continuous duty with breaking capacity minimum 25KA at 415V AC. MCCB's should have auxiliary contacts for annunciation.
- i) **Rectifier Transformer**
The rectifier transformer shall be continuously rated, dry air cooled (A.N) and of class F insulation type. The rating of the rectifier transformer shall have 10% overload capacity. The transformer shall be of suitable rating to comply with maximum output with minimum input voltage.
- j) **Rectifier Assembly**
The rectifier assembly shall be fully/half controlled bridge type and shall be designed to meet the duty as required by the respective charger. The rectifier shall be provided with heat sink having their own heat dissipation arrangements with natural air cooling. Necessary surge protection devices and rectifier type test acting HRC fuses shall be provided in each arm of the rectifier connections.
- k) **Instruments**
One AC voltmeter and one AC ammeter along with selector switches shall be provided for all chargers. One DC voltmeter and DC ammeter (with shunt) shall be provided for all chargers. The instruments shall be of 96 mm X 96 mm square dial & shall be flush type, dust proof and moisture resistant. The instruments shall have easily accessible means for zero adjustment. The instruments shall be of 1.5 accuracy class. In addition to the above a centre zero voltmeter with selector switch shall also be provided for 220 V Chargers for testing purpose.
- l) **Air Break Switches**
One DC output switch shall be provided in all chargers. They shall be air break type suitable for 500 Volts AC/ 250 V DC. The contacts of the switches shall open and close with a snap action. The operating handle of the switch shall be fully insulated from circuit. 'ON' and 'OFF' position on the switch shall be clearly indicated. Rating of switches shall be suitable for their continuous load. Alternatively, MCCB's of suitable ratings shall also be acceptable in place of Air Break Switch.
- m) **Fuses**
All fuses shall be HRC Link type. Fuses shall be mounted on fuse carriers which are inturn mounted on fuse bases. Wherever it is not possible to mount fuses on carriers, fuses shall be directly mounted on plug-in type base. In such case one insulated fuse pulling handle shall be supplied for each charger. Fuse rating shall be chosen by the Bidder depending on the circuit requirement. All fuses in the chargers shall be monitored. Fuse failure annunciation shall be provided on the failure of any fuse.

- n) **Blocking Diode**
Blocking diode shall be provided in the positive pole of the output circuit of each charger to prevent current flow from the DC battery into the charger. All the semiconductor devices shall be protected with power transient suppressor circuit.
- o) **Annunciation System**
Audio-visual indications through bright LEDs shall be provided in all Chargers for the following abnormalities:-
- (i) AC Power failure.
 - (ii) Rectifier/chargers fuse blown (separate for Float & Float cum boost).
 - (iii) Over voltage across the battery when boost charging.
 - (iv) Abnormal DC Bus voltage (High/Low)
 - (v) Any other annunciation if required
- Potential free NO contacts of above abnormal conditions shall also be provided for common remote indication "CHARGER TROUBLE" in Employer's Control Board. Indication for charger in float mode and boost mode through indication lamps shall be provided for chargers. A Potential free contact for float/boost mode shall be provided for external interlocks.
- p) **Name Plates and Marking**
The name plates shall be white with black engraved letters. On top of each Charger, on front as well as rear sides, larger and bold name plates shall be provided to identify the Charger. Name plates with full and clear inscriptions shall also be provided on and inside of the panels for identification of the various equipment and ease of operation and maintenance.

13. Charger Construction

The Chargers shall be indoor, floor-mounted, self-supporting sheet metal enclosed cubicle type. The Contractor shall supply all necessary base frames, anchor bolts and hardware. The Chargers shall be fabricated from 2.0mm cold rolled sheet steel and shall have folded type of construction. Removable gland plates for all cables and lugs for power cables shall be supplied by the Contractor. The lugs for power cables shall be made of electrolytic copper with tin coat. Power cable sizes shall be advised to the Contractor at a later date for provision of suitable lugs and drilling of gland plates. The Charger shall be tropicalised and vermin proof. Ventilation louvers, if provided shall be backed with screens. All doors and covers shall be fitted with synthetic rubber gaskets. The chargers shall have hinged double leaf doors provided on front and on backside for adequate access to the Charger's internals. All the charger cubicle doors shall be properly earthed. The degree of protection of enclosure shall be at least IP-42 as per IS: 13947 Part-1.

- (i) All indicating instruments, control switches and indicating lamps shall be mounted on the front side of the Charger.
- (ii) Each Charger shall be furnished completely wired upto power cable lugs and terminal blocks and ready for external connections. The control wiring shall be carried out with PVC insulated, 1.5 sq.mm. stranded copper wires. Control terminals shall be suitable for connecting two wires, with 2.5 sq.mm stranded copper conductors. Each wire shall be continuous from end to end and shall not have any joint within itself. The insulation grade of the wiring shall be 1100 V grade. The colour of 3 Phase, 4 Wire AC. supply shall be red, yellow, blue and black for phases and neutral. The D.C. wiring shall be of the colour other than the above (preferably grey) with the +ve and -ve marking in the ferrule. All terminals shall be numbered for ease of connections and identification. Each wire shall bare a ferrule or tag on each end for identification. At least 20% spare terminals shall be provided for control circuits.

The insulation of all circuits, except the low voltage electronic circuits shall withstand test voltage of 2 KV AC for one minute. An air clearance of at least ten (10) mm shall be maintained throughout for such circuits, right up to the terminal lugs. Whenever this clearance is not available, the live parts shall be insulated or shrouded.

14. Painting of Charger

The Panels shall be pre-treated using 7-Tank process and then Epoxy Powder Coated with Paint shade of RAL 7032.

The inside of the chargers shall be glossy white. Each coat of finishing synthetic enamel paint shall be properly staved. The paint thickness shall not be less than fifty (50) microns.

15. TESTS ON CHARGER

Battery Chargers shall conform to all type tests as per relevant Indian Standard. Performance test on the Chargers shall also be carried out on each charger as per specification. Rectifier transformer shall conform to all type tests in IS: 4540 and short circuit test as per IS: 2026. Following type tests shall be carried out for compliance of specification requirements:-

- (i) Voltage regulation test.
- (ii) Load limiter characteristics test
- (iii) Efficiency tests
- (iv) High voltage tests
- (v) Temperature rise test
- (vi) Short circuit test at no load and full load at rated voltage for sustained short-circuit.
- (vii) Degree of protection test
- (viii) Measurement of ripple by oscilloscope.
- (ix) Temperature compensation feature demonstration

The contractor may be required to demonstrate to the EMPLOYER that the chargers conform to the specification particularly regarding continuous rating, ripple free output, voltage regulation and load limiting characteristic, before despatch as well as after installation at site. At site the following tests shall be carried out:-

- (i) Insulation resistance test
- (ii) Checking of proper annunciation system operation

If a Charger fails to meet the specified requirements, the Contractor shall replace the same with appropriate Charger without affecting the commissioning schedule of the Sub-Station, and without any extra cost to the PGI.

The Contractor shall present for inspection, the type and routine test certificates for the following components whenever required by the PGI.

- (i) Switches
- (ii) Relays/MCCBs
- (iii) Instruments
- (iv) DC fuses
- (v) SCR
- (vi) Diodes
- (vii) Condensers
- (viii) Potentiometers

- (ix) Semiconductor
- (x) Annunciator
- (xi) Control wiring
- (xii) Push buttons and contactors

Makes of above equipment shall be subject to approval of the Engineer Incharge..

16. DOCUMENTATION

The successful bidder shall submit Six sets of drawings for approval.

The following drawing shall be supplied with the tender: -

- (i) Outline drawings of all apparatus showing sufficient details to enable the purchaser to determine whether the design proposed can be installed satisfactorily or not.
- (ii) Wiring diagram of battery charger.

GENERAL TECHNICAL REQUIREMENTS

Electrical Switchgear and General

IEC 50	-	International Electro Technical Vocabulary
IEC 56	-	High-Voltage alternating current circuit-breakers
IEC 60	-	High Voltage test techniques (All Parts)
IEC 71	-	Insulation Coordination (All Parts)
IEC-99-4	-	Standard on Metal Oxide Surge Arresters
IEC 129	-	Alternating current disconnectors and earthing Switches
IEC 137/ IS 2099	-	Bushings for alternative Voltages above 1000V.
IEC 185/IS 2705	-	Current transformers
IEC 186/IS 3156	-	Voltage transformers
IEC 60076/IS 2026	-	Power transformers
IS 3639	-	Fitting & Accessories for Power transformers
IEC 60354/IS 6600	-	Guide for Loading of oil immersed transformers
IEC 60144/IS 2147	-	Degree of protection
IS 335/IEC60296	-	Insulating Oil.
IS 3637	-	Buchholz relay
IEC 60214/IS 8468	-	On load tap changer
IEC 60542/IS 8478	-	Application Guide for OLTC
IEC 267	-	Guide to the testing of circuit breakers with Respect to our of Phase switching.
IEC 376	-	Specification and acceptance of new Sulphur Hexafluoride.
IEC 427	-	Report on synthetic testing of high voltage alternating current breakers
IEC 470	-	High voltage alternating current contactors
IEC 480	-	Guide to the checking of Sulphur hexafluoride
IEC 517	-	High voltage metal-enclosed switchgear for rated Voltage of 72.5 KV & above.
IEC 518	-	Dimensional Standardization of terminals for High voltage Switchgear & control gear.
IEC 694	-	Common clauses for high voltage switchgear and Control gear standards
IS 325/IEC 34	-	Three phase induction motors.
IS 375	-	Marking and arrangement for switchgear bus bars, main Connections and Auxiliary wiring.
RAL standard 7032	-	Colors for ready mix paints.
IEC 144	-	Degree of protection provided by enclosures for low voltage

IS 2147	-	Switchgear and control gear.
IS 3203	-	Code of practice for climatic proofing of Electrical equipment.
IS 2959	-	AC Contractors for Voltages Not Exceeding 1000
IS 4064		Air Break switches, air break disconnections fuse combination Unites for voltage not exceeding 1000V AC or 1200 V DC.
IS 3231	-	Electrical relays for power system protection
IS 3842	-	Electrical relay for AC systems.
IS 1248	-	Indicating Instruments.
IS 2208	-	HRC Fuses.
IS 10028	-	Code of Practices for selection, Installation and maintenance of Transformer.
IS 2208	-	HRC Fuses.

Indian Electricity Rules as amended up to date Indian Electricity Act.

Galvanizing

IS 209	Purity of Zinc
IS 2629	Code of practice for hot dip galvanizing of iron & steel.
IS 2633	Methods of testing weight, thickness and uniformity of Coating on hot dipped galvanized articles

Fire Protections

Fire protection manual issued by Advisory Committee of India. NFPA National Fire Protection Association

Steel Structures

IS 226	Structural steel
IS 228	Method of chemical analysis of pig iron and plain carbon & low alloy steel.
IS 802	Code of practice for use of steel in transmission towers.
IS 806	Code of practice for use of steel in general building construction.
IS 808	Rolled steel beam, channel and angle sections.
IS 814	Covered electrode for use of metal arc welding for general construction in mid steel.
IS 816	Code of practice for training and testing of metal arc welding for General construction in mid steel.
IS 817	Code of practice for steel training and testing of metal are welders.

IS 1161	Specifications for steel tubes for structural purpose.
IS 1182	Recommended practice for radiographic examination of fusion welded butt joints in steel plates.
IS 1599	Method of bend tests for steel products.
IS 1893	Recommendations for earthquake resistant design structures. .
IS 2062	Specification for structural steel: fusion welding quality.
IS 2595	Code of practice for Geographic testing.
IS 7205	Safety code for electrical structural steel work.
IS 2074	Ready mixed paint, air drying, red oxide-zinc chrome priming.
IS 6005	Code of practice for phosphating of iron and steel.

Piping & Pressure Vessels

IS 1239	Mild steel tubes, lubrications other wrought steel pipe fittings.
IS 3589	Electrically welded steel pipe for water, gas & sewage.
IS 6392	Steel pipe flanges.
ASME	Boiler & pressure vessel code.

Battery Chargers

IS: 3895	Mono-crystalline semiconductor Rectifier Cells and Stacks.
IS: 4540	Mono-crystalline semiconductor Rectifier Assemblies and Equipment.
IS 6619	Safety code for Semiconductor Rectifier Equipment

Battery

IS 1651	Stationary Cells and Batteries, Lead Acid Type (with Tubular Positive Plates)
IS 1652	Stationary Cells and Batteries, Lead Acid Type (with Plante Positive Plates)
IS 1146	Rubber and Plastic Containers for Lead Acid Storage Batteries
IS 6071	Synthetic Separator for Lead-Acid Batteries. Cells and
IS 266	Specification for Sulfuric Acid
IS 1069	Specification of Water for Lead Acid Storage Batteries
IS 3116	Specification for sealing compound for Lead-Acid Batteries.

Power & Control Cables

IS 7098	Cross-linked polyethylene insulated PVC sheathed cable for working voltage (Part-1) including 1100 Volts.
IS 8130	Conductors for insulation of Electrical cables and flexible cords.


IS 1753	Aluminum conductors for insulated cables.
IS 5831	PVC insulation and sheath of electrical cables.
IS 3975	Mild steel wires, strips and tapes for armoring of cables.
IS 1554	PVC insulated (heavy duty) electric cables for working voltage Upto and (Part I) including 1100V.
IS 2982	Copper conductors in insulated cables and cords.
IEC-754-1	
ASTMD-2843	
IEEE-383	
IEC 502	Extruded solid dielectric insulated cable.
IEC 228	Conductor of insulated cable.
IEC 229	Tested on cable over sheath.
IEC 840	Test on Power Cable.
IEC 287	Calculation of continuous current rating of cables.

Relays, C&R Panels

- BS : 37
- IEC : 251
- IEC : 37
- IEC : 337-1
- IEC: 255 (part 5 & 6)

2.00.1 The full names of the codes and standards mentioned in abbreviations under various equipment heads are as follows:

BS	British Standards
IEC/CISPR	International Electro-Technical
Commission IS	Bureau of Indian Standards
NEMA	National Electric Manufactures Association

SECTION-XII	FORMS	
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FORM-A**PROFORMA OF ANNUAL FINANCIAL TURNOVER FROM CHARTERED ACCOUNTANT**

Sr. No.	F.Y.	Turnover (in Rs.)
1	202-23	
2	2023-24	
3	2024-25	
	Net Average Annual Turnover	

Signature of Chartered Accountant

Name of Chartered Accountant

Membership No. ICAI

Date and Seal

FORM-B

**PROFORMA OF PROFIT & LOSS STATEMENT FROM CHARTERED
ACCOUNTANT**

It is certified that M/s _____ have not incurred any loss
in more than two years during the last five years ending 31st March 2025

Signature of Chartered Accountant

Name of Chartered Accountant

Membership No. ICAI

Date and Seal

FORM-C

BANKERS CERTIFICATE FROM A SCHEDULED BANK

“This is to certify that to the best of our knowledge and information that M/s Sh. _____ having marginally noted address, as a customer of our bank are / is respectable and can be treated as good for any engagement upto a limit of Rs. _____ (Rupees _____)
This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature) for the Bank

NOTE:-

1. Bankers Certificates should be on letter head of the Bank, addressed to tendering authority.
2. In case of Partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM-D

CERTIFICATE OF NET WORTH FROM CHARTERED ACCOUNT

“It is to certify that as per audited balance sheet and profit & loss account during the Financial year 2024-25, the Net worth of M/s _____ (Name& registered address of individual/ firm/ company), as on _____(the relevant date) is Rs. _____ after considering all liabilities. It is further that Net worth of the company has not eroded by more than 30% in the last three years ending on (the relevant date)”.

Signature of Chartered Accountant

Name of Chartered Accountant

Membership No. ICAI

Date and Seal

FORM-E**CALCULATION OF BIDDING CAPACITY****DETAILS OF EXISTING COMMITMENTS AND ONGOING WORKS.**

S. No.	Name of work/ project and location	Owner or sponsoring organization	Contract value in crores of rupees	Date of commencement as per contract	Stipulated date of completion	Upto date percentage progress of work	Remaining work in percentage (100- column 7)	Existing commitment Column 4 x Column 8 /100	Name and address/ telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10	11

Total (B) =

Maximum turnover in last seven years = Rs.....

Updated value of turnover (A) = Rs.....


No. of years (N) =

Bidding Capacity= {[AxNx1.5]-B} =

Certificate:

I certify that all the awarded and ongoing works have been included in the above list.

(Signature of Bidder(s))

SECTION-XIII	LIST OF APPROVED MAKES AND SCHEDULE OF QUANTITIES (ELECTRICAL WORK)	
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S.No.	Details of equipment/ material	Make/Manufacturer
1	Oil Type Power Transformer	CGL/Hitachi/Schnieder/Siemens/BHEL/Voltamp
2	EHV Lightning Arrestor	Schnieder/Hitachi/ Alstom/ CGL / Mehru/ Pragati / Toshiba/Siemens/Lamco/Oblum
3	EHV Current Transformer/NCT	Schnieder/Hitachi/ Alstom/ CGL / Mehru/ Pragati / Toshiba/Siemens
4	EHV Isolator	CGL/Hitachi/Schnieder/Siemens/Alstom/GE/GR power
5	66kV SF-6 Circuit Breaker	CGL/Hitachi/Schnieder/Siemens/Alstom/GE
6	11kV APFC Panel	TDK/Hitachi/Schnieder/GE/CTR
7	Control and relay panel	ABB/Siemens/Hitachi/GE/Schnieder/CTR
8	Substation automation system(SCADA)	ABB/Siemens/Hitachi/GE/Schnieder/CTR
9	Batteries	Amar Raja/Exide/Global
10	Battery Charger /DCDB	Amaraja / Statcon /Chhabi Electricals/Joshi Electricals / Packard
11	11kV VCB Panel	ABB(OEM)/ Siemens(OEM)/ Schnieder(OEM)
12	Nitrogen Injected Fire Protection System	CTR/Vendere/Tectonicus/
13	HT & LT Cables	KEI/ Havells/ Polycab
14	Cable Jointing/Termination Kit	Raychem/ M-seal/ 3M
15	Bus bar-Cu/Al	Jindal/ Hindalco/ Sterlite/ Valco
16	Conductor ACSR Zebra (Z)	Apar/Cabcon India/ Hind Aluminium/ Hindustan Vidyut Product Ltd
17	Gantry & Equipment Support Structures	Jyoti Structures/KEC/Associated Transrail Structures/ECI Infra./NEXO Structures
18	Porcelain/Polymer Disc Type Insulators	Aditya Birla Insulators/Allied Ceramics/WSI/Allied Ceramics/BHEL
19	VCB Numerical Relay (IEC-61850)	ABB/Siemens/Hitachi/GE/Schnieder
20	Hot and Cold Split Type AC	Hitachi/Diakin/Carrier/Mitsubishi

S.No.	Details of equipment/ material	Make/Manufacturer
21	Alarm Annumciators/ Auxiliary relays compatible with PLC etc.	Siemens/ Lauritz Knudsen/ ABB/ Schnieder
22	MCCB/MCBs / RCCB/Isolators / RCBO / Change over switch/ Time Switch	Hager / Legrand / Schneider / Siemens / L&T
23	Capacitor Banks	Lauritz Knudsen/ Siemens / Schneider/ ABB/ Neptune/ Meher/ TDK
24	Current Transformer/ Potential Transformer	AE/ KAPPA/C&S/ECS/SCHNEIDER/PRAGATI
25	Measuring Instruments & Indicating Lamps	Lauritz Knudsen/ AE/ MECO/ Rishabh/ Schnieder/ Secure / HPL / Conzerv/ Legrand/ ABB
26	Relays /Contactors/Timers/ Single Phase Preventer/ Starters	Siemens/ Schneider/ ABB/ Legrand/ CG
27	Selector Switch / Push Buttons	Siemens/ Lauritz Knudsen/ ABB /Schnieder/ Legrand
28	Fiber Optical Cable/ Cat 6/Cat 6 A/Patch Cords / Patch Panel	Legrand/ Schneider(Actassi)/ Beldon/ Systimax/ Pandnit/ Molex
29	Glands and Lugs / Thimbles Long Barrel	Dowell's (Biller India)/Hax Brass (Copper Alloy India)/3D
30	DWC (Double Walled Corrugated)/ HDPE Pipe with accessories	Gemini / Astral / berlia/ Duraline/ Jain/ Duraplast
31	Diesel operated Power Generating Engine	CUMMINS INDIA / CATERPILLAR / KIRLOSKAR/ MITSUBISHI / PERKINS
32	Alternator	STAMFORD/CATERPILLAR/LEROY SOMER / KIRLOSKAR / CROMPTON GREAVES
33	Accoustic Enclosure & Mannual control panel (DG set)	DESIGNED & MANUFACTURED BY DG SET OEM

Note:

1. The contractor will use one of the approved makes as mentioned above with prior approval in writing from Engineer-in-charge. The technical submittal for the same shall be submitted for approval.
2. In case of different quality / pattern of same make, the pattern/ quality shall be approved Engineer incharge.
3. For materials/equipment/ to be used in items of work for which approved makes are not given herein above, the makes & models of such materials /equipment shall be as approved by Engineer –in-charge.
4. The DG Set and AMF panel of specified makes must procured from OEM/ OEA only. Inspection and testing of DG set and AMF panel before dispatch will be carried out in the work shop of OEM/OEA only

**Augmentation and Up-gradation of 66/11 KV Grid Substation at PGIMER,
Chandigarh.**

SCHEDULE OF QUANTITY

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Part A : Electrical work				
	OIL FILLED POWER TRANSFORMER:				
	Design, Supply, Installation / Erection, Testing & Commissioning of 66/11kV, Star/Star, Outdoor type, 16MVA Power Transformer suitable for 3-Phase, 50Hz AC supply. The transformer shall be copper wound transformer (Electrolytic grade 99.9% pure copper, Core made of first grade Cold Rolled Grain Oriented (CRGO) Core grade MOH or better having oil & air cooled system. The Vector group shall be YNyn0. Winding Insulation level (kV/peak) on HV side 140 and LV side 28. The losses of transformer at ONAF rating (at full load at 75 deg. C) shall be No load losses 15KW(Max), load losses 85KW(Max) and Auxiliary Losses 2KW(Max). Rated short time withstand current (kArms) for 5 Seconds 31.5 . The impedance of transformer shall be max 10% on 16MVA base without negative tolerance. On Load tap changing arrangements on HV side. The OLTC gear shall be designed to complete successfully tap changes for the maximum current to which transformer can be loaded i.e., 150% of the rated current.				
	The tap changer shall be provided for variation of HV voltage with a tap setting of (+) 5% and (-) 15% at 66kV side of each 1.25% steps which shall be operated from either OLTC or Remote control equipment. OLTC shall have AVR and master slave relay for parallel operation. The remote control equipment shall be enclosed in an indoor sheet cubicle to be located in control room. Complete with all accessories and safety provisions as per relevant IS Code including first filling of filtered dehydrated oil, i/c supplying and grouting of suitable M.S. Channel with all accessories and transformer shall be confirming to IS : 2026 (Part 1 to Part 5), IS : 1180 and duly ISI Marked and as per CPWD specifications complete in all respects etc as required at site.				
	The maximum flux density in any part of the core and yoke at rated voltage and frequency shall be such that the flux density with + 12.5 percent combined voltage and frequency variation from rated voltage and frequency does not exceed 1.9 Tesla. Inside of tank shall be painted with varnish or liquid resistant paint. For external surfaces one coat of thermo setting powder paint or one coat of epoxy primer followed by two coats of polyurethane base paint shall be used. IS: 1180 (Part 3) shall be referred to for paint thickness for normal to medium corrosive atmosphere. For highly polluted atmosphere and special application external paint work shall be as per direction of Engineer-in-Charge. Design ambient condition : a) air temperature 50 deg C, b) Relative Humidity 90 % Max, c) Seismic Zone IV.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Noise level Shall not exceed limits as per NEMA TR-1 with all accessories running measured as per IEC 551 / NEMA standard. The transformer should have QR code which should contain drawing, test report OEM manual, Geo- Tag of manufacturing location etc. The transformer shall be suitable for continuous rating for full load. The temperature rise shall not exceed 45°C in oil and 50°C by resistance in winding. Transformer shall operate under naturally cooled (ONAN) condition up to 12.5 MVA, beyond this it shall be operated though forced cooling (ONAF). The cooler units shall be 2x50% capacity and each 50% cooler shall have one standby fan & one extra radiator. The cooler control cabinet shall have two sections. One section shall have the control equipment exclusively meant for cooler control The other section shall house the temperature indicators, auxiliary CT's and the terminal boards meant for termination of various alarm and trip contacts as well as various CT secondaries.				
	Marking Each transformer shall be provided with rating plate made of anodized aluminum/ stainless steel material securely fixed on the outer body, easily accessible, as per IS: 1180 Part-3. The entries on the rating plate shall be indelibly marked. The Transformer shall be provided with suitable devices to monitor temperature & pressure. Automatic operation control (Switching in and out) of fans/ pumps shall be provided (with temperature change) from contacts of winding temperature indicator. The supplier shall recommend the setting of WTI for automatic changeover of cooler control from ONAN to ONAF. The setting shall be such that hunting i.e., frequent start stop operations for small temperature differential do not occur. Suitable manual control facility for cooler fans and oil pumps with manual / automatic selector switches and push buttons shall be provided. The transformer shall be suitable for controlling & monitoring from OLTC / RTCC / SCADA.				
	Fitting and Accessories :				
	The following fittings shall be provided:- Two earthing terminals with the earthing symbol ,Oil level gauge indicating oil level at minimum, 30°C and maximum operating temperature, Rating and terminal marking plates, Silica gel breather, Drain-cum-sampling valve (¾" nominal size thread, IS 554) preferably steel with plug for three phase transformers, Thermometer pocket with cap, Oil filling holes having (1¼" nominal size thread), Lifting lugs for the complete transformer as well as for core and winding assembly, Pressure relief device or explosion vent, One filter valve on the upper side of the tank , Unidirectional flat rollers, Inspection hole HV side neutral grounding strip (where one of the HV bushing terminal is connected to earth),Buchholz relay, Bird guard, Oil temperature indicator and winding temperature indicators with suitable tripping mechanism above permissible limit, Jacking pads, Additional Neutral separately brought out on bushing for earthing, Magnetic oil level gauge with				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	low oil level alarm contact, Non return valve (for conducting pressure test), Monogram Plate, Inspection cover, Detachable type radiators with top and bottom shutoff valve, Oil Conservator with Oil level indicator, minimum level marking and drain plug, Necessary hardware, clamps, lugs etc. for termination on HV/MV etc. for all transformers. Unloading from trailer on to the plinth. Complete as per technical requirements and as directed by EIC. NOTE: Transformer cost shall include filtration and testing of oil at the time of installation and testing and commissioning of transformer.	Nos.	1	17230948	17230948.00
2	Supply, installation, testing and commissioning of outdoor type 60 kV, 10KA Lightning Surge Arrestor (1 Phase) complete in everyway with outdoor junction boxes suitable, connectors, hardware, accessories, terminals for LV wiring complete in everyway.	Nos.	3	37260.00	111780.00
3	Supply, Installation, testing and Commissioning of Current Transformer outdoor type 72.5 KV , oil cooled, Hermetically sealed, Wound Primary Type, FOUR Core live tank Type Current Transformer of Ratio 600-300/1-1-1-1 Amps Core 1 : Class-0.2, Burden : 30VA(Metering) Core 2 : Class-5P20, Burden : 30VA(Protection) Core 3 : Class-PS(Differential) Core 4 : Class-PS (REF) complete in everyway with outdoor junction boxes, terminals for LV wiring, connectors, hardware, accessories complete in every way.	Nos.	3	128282	384846.00
4	Supply, installation, testing and commissioning of outdoor type 66kV (3 Phase) double Break Isolator				
i	66kV, 1250A, 31.5kA double break three pole Gang operated manual & motorised Isolators with earth switch with support insulators and bimetallic terminal connectors etc as required.	Nos.	1	271302	271302.00
ii	Supply, Installation, Testing & Commissioning Isolator 66kV, 1250A, 31.5kA double break three pole Gang operated manual & motorised Isolators without earth switch with support insulators and bimetallic terminal connectors etc as required.	Nos.	1	233411	233411.00
5	Supply, installation, testing and commissioning of outdoor type 66kV SF6 Circuit Breaker (3 phase)				
i	72.5kV, 3 Ph, 1250A, 31.5kA/3 sec SF6 Circuit breaker gang operated with operating kiosk, complete pedestal and mounting supports, terminals for LV wiring inside kiosk, suitable connectors, hardware, accessories complete in every way.	Nos.	1	632114	632114.00
6	Supply, Installation, Testing & Commissioning of NEUTRAL CURRENT TRANSFORMER (NCT) outdoor 12.5 KV , oil cooled, Hermetically sealed, Wound Primary Type, TWO Core live tank Type Current Transformer of Ratio 1200-600/1-1 Amps Core 1 : Class-PS, Core 2 : Class-PS	Nos.	1	37891	37891.00

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
7	Supply, Installation, Testing & Commissioning of NEUTRAL CURRENT TRANSFORMER(NCT) outdoor 72.5 KV , oil cooled, Hermetically sealed, Wound Primary Type, TWO Core live tank Type Current Transformer of Ratio 300-150/1-1 Amps Core-1: Class-PS, Core-2 : Class-PS	Nos.	1	42944	42944.00
8	APFC Panel: Automatic MV Capacitor panel : [Outdoor Type]				
	Supply, Erection, Testing and Commissioning of 11 kV 2500kVAR ,0.2% reactor , with 10% Over voltage 5 Steps APFC Panel with Electrical parameters KWH, KVAH, PF, Hz .Capacitor Bank Rating: 3000 kVAR, 12.1kV in 6 steps of (300x2 + 600x2 + 1200x1), 3 phase capacitor Panel (IP-5X) in star configuration along with cast resin/resin impregnated air cooled series reactors, cast resin CT,1-Phase 2 Bushing Capacitor, RVT, Surge Capacitor..etc in a closed container detailed as per technical specification.				
	Incoming				
	01 No. 11KV,630 Amp, 3Pole single break type off-load isolator with earth switch.				
	01 No. 11KV, Indoor type Residual voltage transformer (RVT) with Resin cast, 3Phase, BIL-28/75KV. Ratio: 11KV/110-190V, Class:1,3Pole, Burden-100VA				
	11KV,0.1MFD,3Phase,RC-type -Surge Capacitor Unit				
	APFC Relay -HT , BR5600 8-Step				
	03 -Nos. 11KV,Indoor type CT,Resin Cast, 1Phase,wound Primary. Ratio:700/1-1A, Class:1 5P10, Burden-15VA.				
	Digital type Ammeter & Voltmeter -Each				
	Outgoings				
	2 sets 12.1 KV ,300Kvar- Capacitor Bank -External Star (Each consist)				
	03 Nos. Cap Unit -7KV ,100Kavr,1-Phase,CRCA, 2-bushing,external fuse, BIL: 28/75KV				
	3No .2% Series Reactor- 1 Phase class F				
	Vacuum Contactor-11KV ,400A ,3P Solenoid type, 220V AC.				
	03 Nos HRC Fuses- 12 KV				
	2 Sets 12.1 KV ,600Kvar- Capacitor Bank -External Star (Each consist)				
	3 Nos. Cap Unit -7KV ,200Kavr,1-Phase,CRCA, 2-bushing,external fuse, BIL: 28/75KV				
	3 Nos .2% Series Reactor- 1 Phase class F				
	01 No. Vaccume Contactor-11KV ,400A ,3P Solenoid type, 220V AC.				
	03 Nos. HRC Fuses- 12 KV				
	12.1 KV ,1200Kvar- Capacitor Bank -External Star (Each consist)				
	3 Nos Cap Unit -7KV ,400Kavr,1-Phase,CRCA, 2-bushing,external fuse, BIL: 28/75KV				
	3 Nos .2% Series Reactor- 1 Phase class F				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Vacuum Contactor-11KV ,400A ,3P Solenoid type, 220V AC.				
	3 Nos HRC Fuses- 12 KV				
	Other Accessories				
	IP-54 CRCA enclosure with Non load bearing member- 1.6mm, Load bearing member -2mm & Glant Plate - 3mm. Paint shade-RAL 9003, Cable Entry- Top /Bottom. Doors(Front, side & Rear Access)- Bolted design doors with glass window.				
	EPOXY Insulator				
	NVDR Relay				
	Control wiring & accessories (MCB, AUX Contactor, Time Delay) with Auto Manual Switch, ON/ OFF Including Lamps & Push Button.				
	Main AI Busbar- (50x6)X2 mm Aluminium Busbar.				
	Interconnecting Busbar- (50x3)mm Aluminium Busbar.				
	Earthing Busbar- (25x3)mm Aluminium Busbar.				
	Above MV Capacitor Panel-	Set	1	1987511	1987511.00
9	Design, supply, installation/ erection, testing and commissioning of 66kV relay control panel .				
i	SITC of 3Nos. Transformer CRP Panel				
	SITC of 3-Nos. conventional IED based 66kV Control Relay Panel for Transformer bay. The CRP shall be floor mounting type suitable for indoor installation. Panels shall be completely metal enclosed, and shall provide degree of protection not less than IP 31 in accordance with IS 12063/1987. The panels shall be cubicle type panel board fabricated out of 3mm thick CRCA sheet steel of totally enclosed dust and vermin proof finished with two coats of powder coat painting over a coat of good etched primer and fully segregated compartment ensuring no arc or foreign body can travel from or to the compartment. Each simplex panel shall have suitable hinged doors at the back. The lockable type hinged doors shall be provided with 3-point locks operated by suitable handle.				
	Bottom plates of the panels shall be fitted with removable gland plates to allow cable entries from the bottom. Gland plates shall be suitable for fixing the cable glands at an elevated height of at least 100 mm above the ground level. Terminal Connectors and Test terminal blocks for cables shall be fixed at an elevated height of at least 200 mm above the Bottom plate.				
	Bay Control Unit with built in under voltage, synchro check, on IEC 61850 communication protocol.				
	Numerical 2winding transformer protection with built in over flux, over load, DR, EL, on IEC61850 Communication protocol.				
	Numerical, Directional 3O/C+1E/F Relay built in feature of LBB protection on IEC61850 communication protocol.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Numerical, Restricted earth fault relay for HV & LV on IEC61850 communication protocol.				
	Trip circuit supervision relay.				
	DC supply supervision relay.				
	Aux relay for transformer supervision.				
	LED Indicating lamp, Push button for trip relay reset, Breaker Control switch, 10ways etc as required				
	The following protection provided in transformer bay differential, REF,OLTC,PRV,WTI/OTI Etc. The IEDs shall provide all station level functions regarding control, monitoring and protection, inputs for status indication and outputs for commands. As per technical requirements & drawings and as directed by EIC. This IED based relay compatible with IEC-61850 SAS system. The Differential protection IED shall have the facility to record the following external digital channel signals associated with transformer which shall be wired to differential relay apart from the digital signals pertaining to differential relay.				
ii	SITC of 2 Nos. Line protection CRP Panel				
	2-Nos. conventional IED based 66kV Control Relay Panel for line bay. The CRP shall be floor mounting type suitable for indoor installation. Panels shall be completely metal enclosed, and shall provide degree of protection not less than IP 31 in accordance with IS 12063/1987. The panels shall be cubicle type panel board fabricated out of 3mm thick CRCA sheet steel of totally enclosed dust and vermin proof finished with two coats of powder coat painting over a coat of good etched primer and fully segregated compartment ensuring no arc or foreign body can travel from or to the compartment. Each simplex panel shall have suitable hinged doors at the back. The lockable type hinged doors shall be provided with 3-point locks operated by suitable handle.				
	Bay Control Unit with built in under voltage, synchro check, on IEC 61850 communication protocol				
	Numerical, Directional 3O/C+1E/F Relay built in feature of non dir. OCEF, over load, on IEC61850 communication protocol				
	LED Indicating lamp, Push button for trip relay reset ,Breaker Control switch, 10ways etc as required				
	Aux relay for Under Voltage relay for bus isolator & Line Isolator				
	Trip circuit supervision relay				
	Overload alarm scheme				
	DC supply supervision relay				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	The IEDs shall provide all station level functions regarding control, monitoring and protection, inputs for status indication and outputs for commands. As per technical requirements & drawings and as directed by EIC. This IED based relay compatible with IEC-61850 SAS system.				
	As above	Job	1	3989155	3989155.00
10	Supplying, installation, testing & commissioning of Local Industrial PC based Substation Automation system having integrated HMI & gateway consisting of following:				
	a) Industrial PC having Intel i7 processor, 1TB HDD, 16GB RAM, Windows 10 operating system with pre-installed runtime software, Keyboard and Mouse with 32" Full HD Monitor as HMI ,redundant HMI and EWS. Single auxiliary supply: 230VAC 5kVA UPS included. b) Application Software which includes IEC 61850 Client/Master including IEC 60870-5-104 gateway functionality The HMI interface will allow monitoring of power distribution. The HMI will display the network as an easy-to-follow Single Line Diagram (SLD) that includes current/voltages, switchgear status and visible indication of live parts via dynamic topology coloring. A Bay Visualization, control dialogue box, Chronological Events & Alarms and are visible on the SLD as blinking red indications on the affected bay. All alarms shall be displayed in compliance with IEC 61850.				
	c) GPS Receiver with Antenna & Antenna Cable . d) A4 colour laser printer e) Operator Console to mount the server PC, Ethernet switches, Modbus Serial to TCP/IP converter etc..Cat6 cable and other required accessories for successful commissioning- To be installed and supplied from respective supplier upto computer.				
	The HMI must include a historical alarm and event list with precise time stamps generated in the protection relays and transmitted in compliance with IEC 61850. The historian should include sorting and filters options for event/alarm text, bay, period of time and event/alarm class. The Sub –Station online monitoring system should be able to generate display as per requirement on the following matters: Transformer status like Load, PF, OTI and WTI etc. Protection data and Relay configuration. Fault records. DR records. Event Records. Interruption data (interruption >10 mins – The time interval selection data shall be site configurable). Energy data like (kWh, kVA, PF, three phase Voltage and Currents etc.)				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	The interface will allow full control over the switchgear in compliance with IEC 61850 to operators with sufficient credentials. Control elements such as switching buttons must only be visible to users with the appropriate authorization levels.				
	The control system must support the "Select before Operate" function of IEC 61850 and the user interface must include two-stage commands. All open/close commands must be fully interlocked with any alarms/trips and in compliance with IEC 61850. All command actions must be protooled in the event list with an indication of the logged-in user account. The control system will fully integrate downstream protection relays via IEC 61850 over the LAN. Numerical Relays and Smart HMI Software must be for same make for integration , coordination and better life cycle optimization. RTU based solution are any envisaged. As per technical specification Substation SCADA as described above for 11KV Complete switchboard (existing & new) distribution panel. Make of Nuerical relay & Scada must be same for smooth integration.				
i	05-Nos. Complete Substation automation system for 66kV bay as per Technical specification.				
ii	25-Nos. Complete Substation automation system for 11kV bay as per Technical specification.				
iii	01 No. Complete Substation automation system for controlling and monitoring auxiliary system including BCU as per Technical specification.				
	As above mention	Set	1	4857241	4857241.00
11	BATTERY & BATTERY CHARGER				
i	Supply, assembling, installation DC batteries shall be VRLA (Valve regulated Lead Acid) type & shall be Normal Discharge type and shall conform to IS 15549:2004/ IEC 60896-21 & 22:2004/ BS 6290-PART IV/ IEEE-1188 standard. These batteries are to be factory-filled, charged & shall be suitable for a long life under continuous float operations & occasional discharges. The 220V DC system is unearthed system. The offered battery shall be compact and shall require no maintenance. All safety equipment required for installation shall be provided by the manufacturer.				
	The rated voltage output equals to 220V DC consisting of required number of lead acid cell of 2V each with specific gravity tester.				
	Capacity will be 125 Amp hours.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
ii	Supply, installation, testing and commissioning of float cum boost battery charger having the following features as per technical specification.				
	Input supply 415V AC Three phase, 50Hz				
	Output suitable to charge VRLA battery bank of 220V D.C.				
	Maximum current output will be 50 Amps trickle charge.				
	All necessary indication				
	Digital ammeter and voltmeter				
	Indicating light for power On, battery undercharging and trickle charging etc.				
	The charger to be housed in sheet steel enclosure with louvers and cooling fans				
iii	DCDB panel 1 incomer + 1 Bus coupler and 15 O/G ,16A DB MCB.				
	Supply, Installation, testing and commissioning 220V DCDB. The DCDB shall be housed in a sheet steel cubicle and it should be vermin proof as far as possible which applies to both charging equipment & DCDB. The DCDB shall have one incomer and one bus coupler. The DCDB shall match with the battery charging equipment and should be complete with bus bars of suitable capacity, wiring, rating plates, glands and fixing bolts. DCDB shall be provided with MCCB for incomer & MCB outgoing control. Switchgear shall be provided with two bus bars for positive and negative. Bus bars shall be of uniform cross section throughout the length of the switchgear and up to the incoming terminals of feeder circuit breaker/switch.				
	Switchgear shall be designed in such as way that all component equipment operate satisfactorily without exceeding their respective maximum permissible temperature rises under temperature conditions prevailing within the switchgear cubicles and shall meet the technical requirements & drawings complete and as directed by EIC.				
	As above mention	Set	1	1009139	1009139.00
12	11 kV Air Insulated Indoor Panel (1 Incomer, 1 Bus Coupler and 8 Outgoing Feeder & 1 Capacitor Feeder , with provision for future extension).				
	Supplying, Installation, Testing & Commissioning indoor type panels shall be constructed from CRCA/ Aluminium Zinc coated steel sheet of 2 mm thickness, floor mounted metal enclosed, 11 KV VCB panel, totally enclosed and fully interlocked, horizontal draw out, horizontal isolation type breaker as per IEC-62271-1,100,200, as amended up to date and additional Specifications, having capacities as mentioned below, single break, trip free mechanism, manually charged and manually closing breaker suitable for use on 11 KV, 3				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	phase, 50 Hz A.C. supply with short circuit fault level of Minimum 25KA for 3 sec , Panel shall be full internal arc tested i.e. in all three chambers at Minimum 25KA for 1 sec for safety purpose (AFLR). Compete with self contained, fully interlocked, rack in and rack out mechanism, air insulated HT sleeved (PVC sleeve is not accepted) self supported copper bus bars of 1250 amps capacity, breaker featured with mechanical ON/ OFF indicator with hand trip coil and auxiliary switch of 4 NO+4NC and equipped with following switchgears and accessories. Make of Vacuum interrupter, circuit breaker, Panel, relays & meters shall be same. Cable compartment suitable for 2RX3C x 300 sq. mm XLPE 11 KV cable (Cable entry from bottom) end termination with heat shrinkable jointing material etc as reqd. There must be a viewing window on VCB chamber door and same must be as per Internal arc test report. The basic insulation level of entire panel shall be 28KV(RMS) / 75KV(Peak).				
	There must be one Ethernet Switch of minimum 16 nos. Ethernet copper port and 1 nos. Serial to TCP Converter, Modbus RS485 to Modbus TCP/IP for energy meter access to be mounted on bus-copper/raise panel for hooking up all the numerical relays of new panels for substation automation purpose. Note (Only OEM panel are acceptable.)				
12.1	Incomer Feeder:				
	(a)SITC of 11kV, 1250A, Minimum 25KA for 3 sec with spring charging motor rated for 230V AC, tripping coil and closing coil at 220V DC.				
	b) 11 KV / 110 Volts PT Class 0.5 accuracy and 50 VA burden with 1 No. Voltmeter(0-15 KV), digital type selector switch for voltmeter and protection fuses / MCB for HT metering upto 12 KV on incomer. (0-50-100A) comply with IS 3156. PT must not be on the top of the panel. -1 Set.				
	c)Epoxy cast wound current transformer (CT),12KV of ratio 600-1200 /5+5+5 A, 5P10/0.5s, 5 VA burden with metering and protection core including necessary control wiring - 3 Nos				
	d) MFM Meter (Modbus complaint with RS485 port) and Digital type Ammeter & Voltmeter - 1 No.				
	e) Flush mounted type Microprocessor based numerical IDMT relay with O/L, E/L , S/C, U/V, O/V communicable on IEC 61850 protocol for communication & drawout type. The relay shall include an LCD matrix display which supports mimic (e.g. single line diagram can be drawn) and at least 8 LEDs at the front . The PCB cards of the device shall be conformal coated. The relay shall be type tested as per IEC60068-2-60 for harsh environment , The device shall have USB communication port in the front for the setting software use and at the rear there shall be 2xRJ-45 Ethernet port. Relay shall support RSTP redundancy. The IEC 61850 communication has to support peer to peer communication, The device shall be provided with at least 16 digital inputs, 8 digital outputs and a watchdog contact. Both digital input and output shall be freely programmable				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	f) Control: (i)TNC (Trip, Neutral & Close) breaker control switch with indicating arrangement, (ii) Local/Remote selector switch for breaker open/close operations.				
	g) R,Y,B ON, OFF, Trip Indication with Control MCB - 1 Set				
	h) Annunciator -8 Window- 1Set				
	i)Complete with Master Trip/ Anti pumping relay ,Emergency trip.				
12.2	01 Nos. Bus coupler with Bus Riser Feeder				
	a)01 Nos. SITC of 11kV, 1250A, Minimum 25KA for 3 sec with spring charging motor rated for 230V AC, tripping coil and closing coil at 220V DC.				
	(b)Epoxy cast wound current transformer (CT),12KV of ratio 600-1200/5+5+5 A, 5P10/0.5s, 15 VA burden with metering and protection core including necessary control wiring.				
	c)Digital Multifunction Meter with RS485 port and Digital type Ammeter - 1 No.				
	d)Flush mounted type Microprocessor based numerical IDMT relay with O/L, E/L , S/C, U/V, O/V communicable on IEC 61850 protocol for communication & drawout type. The relay shall include an LCD matrix display which supports mimic (e.g. single line diagram can be drawn) and at least 8 LEDs at the front . The PCB cards of the device shall be conformal coated. The relay shall be type tested as per IEC60068-2-60 for harsh environment , The device shall have USB communication port in the front for the setting software use and at the rear there shall be 2xRJ-45 Ethernet port. Relay shall support RSTP redundancy. The IEC 61850 communication has to support peer to peer communication, The device shall be provided with at least 16 digital inputs, 8 digital outputs and a watchdog contact. Both digital input and output shall be freely programmable				
	e) Control: (i)TNC (Trip, Neutral & Close) breaker control switch with indicating arrangement, (ii) Local/Remote selector switch for breaker open/close operations.				
	f) R,Y,B ON, OFF, Trip Indication with Control MCB - 1 Set				
	g) Annunciator -8 Window- 1Set				
	h)Complete with Master Trip/ Anti pumping relay ,Emergency trip.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
12.3	Outgoing - 7 No- 630 Amp VCB panels and each shall be consisting of				
	a)01 Nos. SITC of 11kV, 630A, Minimum 25KA for 3 sec with spring charging motor rated for 230V AC, tripping coil and closing coil at 220V DC.				
	(b)Epoxy cast wound current transformer (CT),12KV of ratio 150-300/5+5+5 A, 5P10/0.5s, 15 VA burden with metering and protection core including necessary control wiring.				
	c)Digital Multifunction Meter with RS485 port and Digital type Ammeter - 1 No.				
	d)Flush mounted type Microprocessor based numerical IDMT relay with O/L, E/L , S/C, U/V, O/V communicable on IEC 61850 protocol for communication & drawout type. The relay shall include an LCD matrix display which supports mimic (e.g. single line diagram can be drawn) and at least 8 LEDs at the front . The PCB cards of the device shall be conformal coated. The relay shall be type tested as per IEC60068-2-60 for harsh environment , The device shall have USB communication port in the front for the setting software use and at the rear there shall be 2xRJ-45 Ethernet port. Relay shall support RSTP redundancy. The IEC 61850 communication has to support peer to peer communication, The device shall be provided with at least 16 digital inputs, 8 digital outputs and a watchdog contact. Both digital input and output shall be freely programmable				
	e) Control: (i)TNC (Trip, Neutral & Close) breaker control switch with indicating arrangement, (ii) Local/Remote selector switch for breaker open/close operations.				
	f) R,Y,B ON, OFF, Trip Indication with Control MCB - 1 Set				
	g) Annunciator -8 Window- 1Set				
	h)Complete with Master Trip/ Anti pumping relay ,Emergency trip.				
12.4	Outgoing Capacitor feeder- 1 No- 630 Amp VCB panels and each shall be consisting of				
	a)01 Nos. SITC of 11kV, 630A, Minimum 25KA for 3 sec with spring charging motor rated for 230V AC, tripping coil and closing coil at 220V DC.				
	(b)Epoxy cast wound current transformer (CT),12KV of ratio 150-300/5+5+5 A, 5P10/0.5s, 15 VA burden with metering and protection core including necessary control wiring.				
	c)Digital Multifunction Meter with RS485 port and Digital type Ammeter - 1 No.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	d) Flush mounted type Microprocessor based numerical IDMT relay with O/L, E/L, S/C, U/V, O/V communicable on IEC 61850 protocol for communication & drawout type. The relay shall include an LCD matrix display which supports mimic (e.g. single line diagram can be drawn) and at least 8 LEDs at the front. The PCB cards of the device shall be conformal coated. The relay shall be type tested as per IEC60068-2-60 for harsh environment, The device shall have USB communication port in the front for the setting software use and at the rear there shall be 2xRJ-45 Ethernet port. Relay shall support RSTP redundancy. The IEC 61850 communication has to support peer to peer communication, The device shall be provided with at least 16 digital inputs, 8 digital outputs and a watchdog contact. Both digital input and output shall be freely programmable				
	e) Control: (i)TNC (Trip, Neutral & Close) breaker control switch with indicating arrangement, (ii) Local/Remote selector switch for breaker open/close operations.				
	f) R,Y,B ON, OFF, Trip Indication with Control MCB - 1 Set				
	g) Annunciator -8 Window- 1Set				
	h) Complete with Master Trip/ Anti pumping relay, Emergency trip.				
	As above mention	Set	1	8391929	8391929.00
13	Supplying of following size of XLPE insulated, PVC sheathed cable of 11kV grade, aluminium conductor, individual core screwed, flat steel strip armoured, conforming to IS: 7098 (Part 2) with upto date amendment complete as required.	Mtr	250	3029	757250.00
14	Supplying and making indoor cable end termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for following size of 3 core, XLPE aluminium conductor cable of 11 kV grade as required.				
i	3C X 300 sq. mm	Nos.	12	16249	194988.00
15	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 11 KV grade of following size in the existing RCC/ HUME/ METAL pipe as required.				
i	Above 120 sq. mm and upto 400 sq. mm	Mtr	180	134	24120.00
16	Nitrogen Injected Fire Protection System				
i	Supply, Installation, Testing and Commissioning of N2 Fire Suppression System for 66/11kV, 16 MVA, Outdoor type Power Transformer complete with Fire Extinguishing cubicle, N2 gas cylinder, local control box, remote control panel, signal box, heat detectors, TCIV, and all other accessories as per specification suitable for the above transformer.	Set	1	1087951	1087951.00

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
17	Supplying of following sizes of 1.1 kV grade PVC insulated copper conductor armoured stranded Control Cable conforming to IS :1554 complete as required and as per specifications.				
(i)	2 core, 2.5 Sq.mm.	Mtr.	500	153	76500.00
(ii)	5 core, 2.5 Sq.mm.	Mtr.	500	295	147500.00
(iii)	7 core, 2.5 Sq.mm.	Mtr.	300	397	119100.00
(iv)	16 core, 2.5 Sq.mm.	Mtr.	300	845	253500.00
(v)	2core, 4 Sq.mm.	Mtr.	300	208	62400.00
(vi)	4 core, 4 Sq.mm.	Mtr.	300	356	106800.00
18	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL pipe as required.				
(i)	Upto 35 sq. mm	Mtr.	1900	37	70300.00
19	Supplying and making end termination with double brass compression gland and Copper lugs for following size of PVC sheathed copper conductor armoured control cable of 1.1 kV grand as required.				
(i)	2 core, 2.5 Sq.mm.	Set	20	282	5640.00
(ii)	5 core, 2.5 Sq.mm.	Set	20	289	5780.00
(iii)	7 core, 2.5 Sq.mm.	Set	20	317	6340.00
(iv)	12 core, 2.5 Sq.mm.	Set	20	393	7860.00
(v)	2core, 4 Sq.mm.	Set	30	286	8580.00
(vi)	4 core, 4 Sq.mm.	Set	30	294	8820.00
20	Supply and erection of Lattice type galvanized steel structure and hardware including nut bold and foundation bolts switch yard fabricated from steel confirming to IS: 2062 for TOWER, 66KV LA, 66KV CT, NCT, 66KV ISOLATOR, Etc. as required	MT	2.5	101909	254772.50
	MISCELLANEOUS EUIPMENTS :				
21	Supply and Erection of the following items for 66kV bay extension work.				
i	HARDWARE FITTING WITH COMPLETE STRINGS OF DISC INSULATOR	Nos	60		
ii	ACSR Conductor 0.4"(Zebra)	Mtr	100		
iii	T Clamp	Nos	15		
iv	Pad Clamp for Isolator	Nos	12		
v	Pad Clamp for SF6	Nos	6		
vi	Pad Clamp for LV Busing	Nos	9		
vii	66kv CT Clamp	Nos	6		
viii	66kv NCT Clamp	Nos	2		
ix	11kv NCT Clamp	Nos	2		

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
x	66kv Transformer HV Busing Clamp	Nos	3		
xi	Suspension Clamp Complete Fitting for Zebra Conductor	Nos	6		
xii	Tension Clamp Complete Fitting for Zebra Conductor	Nos	6		
	As above mention	Job	1	396620	396620.00
22	Earthing with G.I. earth pipe 4.5 metre long, 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal/ coke and salt as required	Set	24	6855	164520.00
23	Providing and fixing earth bus of 50 mm X 5 mm copper strip on surface for connections etc. as required.	Mtr	200	2113	422600.00
24	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. direct in ground (75 cm below ground level) including excavation and refilling the trench but excluding sand cushioning and protective covering etc., complete as required.				
i	160 mm dia (OD-160 mm & ID-135 mm nominal)	Mtr	165	481	79365.00
25	SITC of 20kVA Diesel Generator CPCB-IV				
	Supplying, loading, Installation, testing & commissioning of Diesel Generating set having Prime Power Rating as detailed , Radiator Cooled without cooling tower, with Acoustic Enclosure with Hospital Type silencer, 415 Volts at 1500 RPM, 0.8 lagging power factor suitable for 50 Hz, 3 phase system and as per latest CPCB-IV. The DG Sets shall be suitable for being overloaded upto 10% of the rated capacity for 1 hour in every 12 hours and consisting of the followings: The DG set shall be suitable for above 0.85 loading factor with net output shall be as detailed KVA as per site conditions.				
	The job involves dismantling the existing DG sets and SITC of new DG sets at the same location, along with the termination of existing cables ensuring that the new DG sets are properly connected to the existing AMF (Automatic Main Failure) with control wiring and existing accessories such as exhaust pipes, earthing systems, fuel pipes, and any other necessary components as required.				
	A. DIESEL ENGINE:				
	Diesel Engine 4 stroke Radiator cooled, electric start, of suitable BHP at 1500 RPM suitable for above output of alternator at 50 Degree C, 50% RH & at 1000 MSL and conforming to BS 5514, BS 649, IS 10000, capable of taking 10% over loading for one hour after 12 hours of continuous operation. The engine will be fitted complete with all the required accessories.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Type: Radiator Cooled without Cooling Tower				
	Fuel injection: As per manufacturer				
	Engine Starting : Battery Starting.				
	Starting position : Universal. Auto/Manual				
	The Engines shall include: <ul style="list-style-type: none"> • Flywheel with guard. • Flexible connection. • Bellow / expansion joints • Air Cleaner • Blower fan • Electronic governor with electronic fuel injection system • Fuel and lube oil filters and pumps • Day Fuel tank with visual level indicators etc. • Silencer as per latest amendments of MOEF/CPCB • Safety controls • Instrument panel 				
	B. ALTERNATOR:				
	Synchronous alternator rated as detailed KVA, 415 volts at 1500 RPM, 3 phase 50 HZ, AC supply with 0.8 lagging power factor at 50 Degree C, 50% RH & at 1000 Meter MSL. The alternator shall be having SPDP enclosure, brushless, continuous duty, self excited & self-regulated through AVR conforming to IS:4722/BS 2613 suitable for tropical condition and with Class-H insulation.				
	Type : Brushless.				
	Actual Power As detailed KVA at 20 deg C.				
	Frequency : 50 Cycles/sec.				
	Supply System: 3 phases & neutral				
	Connection : Star.				
	Rated RPM. : 1500 RPM				
	Casing protection : As per IP-23				
	Insulation : Class 'H'.				
	Power Factor : 0.8.				
	Controller : The DG sets should be suitable for Auto Synchronization & Auto Load Sharing with micro process based Synchronization controllers like Woodward/PCC (Power Command Control) or equivalent including providing of Engine Control Panel as per OEM.				
	C. ACCESSORIES:				
	The Diesel Engine shall be equipped with minimum following/ as indicated in the specifications, devices/ accessories built-in type including all standard fittings.				
	Fuel supply pump with manual venting pump.				

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
	Turbo charger with air filter (dry/oil bath type) and damper.				
	Charge air cooler.				
	Suction fuel filter				
	Lube oil filter.				
	Hour meter and RPM indicator.				
	Battery Starting Mechanism.				
	Instrument/Indication panel complete with the followings;				
	a) Starting Switch with key.				
	b) Lub. Oil Temp. gauge.				
	c) Lub. Oil Pressure Gauge.				
	d) Water Temp. gauge.				
	Control devices for safety and monitoring along with indicators.				
	Common base/foundation frame.				
	Daily service fuel tank inbuilt/ External Day tank of min 200 liters capacity(as per manufacturers) fabricated out of CRCA 2 mm thick MS sheet complete with all standard accessories and fuel piping between fuel tank and diesel engine with MS Class C pipe of suitable dia. complete with valves, level indication, flow switch & twin fuel filters with fuel injectors and accessories as required as per specifications.				
	Anti vibration pads				
	24 V DC Starting system comprising of starter motors: Voltage regulator and arrangement for initial excitation complete with suitable nos. of Maintenance free batteries as per manufacturer standards for minimum 6 no. consecutive starts as required as per specifications.				
	The cost of initial charge of lubricants, coolant etc.				
	Base Frame & Foundation:				
	Both the engine and alternator shall be mounted on suitable base frame made of M.S Channel shall be installed on cement concrete foundation and vibration isolation arrangement.				
	Acoustic and weather proof enclosure with arrangement for fresh air intake for cooling of the engine & alternator, extraction, discharging hot air in to the atmosphere as per norms of CPCB-IV sound proofing done with help of high quality rock wool is further covered with fiberglass sheet and perforated powder coated sheet or as per OEM Standard design				
	The DG Sets shall include the cost of all accessories, fittings, protections, instruments, safety controls, alarms, indications etc. complete as per specifications, as required				
	Diesel Generating Set (20 KVA) as described above.	Set	1	577932.00	577932.00

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
26	Supplying, installation, testing & commissioning of Hot and Cold, Minimum 3 star rating 2 ton Split Type AC unit operating on cooling mode ambient temperature upto 45 Degree Celsius and Heating mode ambient temperature upto -10 degree Celsius having 100 % Copper Condensing Coils, & cooling coils energy Efficient rotary/swing Compressor in Outdoor Units, first charged R32/R410 refrigerant Gas i/c Providing copper conductor refrigerant pipes and polymer braded PVC 3.0mm thick drainage pipe without joint with 6.0 mm nitrile rubber insulation and interconnection wire b/w indoor and outdoor upto 4.0 mtr, connection of wires etc complete as required	Each	6	65357	392142.00
27	Excavation for cable trench in soft soil, dept upto 1.2M including dressing of side lift upto 1.5M, Including getting out the excavation soil, refilling with sand and or good soil after laying of cables/pipes etc. in layers of 20cm, ramming, watering and disposal of surplus of excavated soil as directed within lead of 50 meter.	Cum	64	654	41856.00
	Sub Total				44453447.50
	Add GST Difference @ 6.33 % (MF=0.0633)				2813903.23
	Total-I				47267350.73
28	Less Rebate on following materials after de termination and dismantling from existing Relay panel and DG set including transportation from PGI.				
i	66 KV CRP Panel	Set	4	50000	200000.00
ii	62.5 KVA DG set	Set	1	130000	130000.00
	Total-II				330000.00
	Total-A (I-II): Electrical work)				46937350.73
	Part B : Civil work				
	Foundation for outdoor switchgear i.e. Tower, CT, NCT, Isolator, LA, Transformer, NIFPS, Existing trench repaired etc.				
29	Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.				
	All kinds of soil.	Cum	98.23	260.30	25569.27
30	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :				
	1:5:10 (1 cement : 5 coarse sand (zone-III) derived from natural sources : 10 graded stone aggregate 40 mm nominal size derived from natural sources)	Cum	10.61	6518.60	69162.35
31	Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level :				
	1:1.5:3 (1 cement : 1.5 coarse sand (zone-III): 3 graded stone aggregate 20 mm nominal size)	cum	72.66	9045.75	657264.20

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
32	Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. above plinth level up to floor five level, excluding cost of centering, shuttering, finishing and reinforcement :				
	1:1.5:3 (1 cement : 1.5 coarse sand(zone-III) derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources)	cum	26.62	10852.95	288905.53
33	Centering and shuttering including strutting, propping etc. and removal of form for :				
i)	Foundations, footings, bases of columns, etc. for mass concrete	sqm	454.15	392.15	178094.92
ii)	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	sqm	42.72	842.50	35991.60
34	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.	kg	3194.40	107.85	344516.04
35	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.				
	Thermo-Mechanically Treated bars of grade Fe-500D or more.	kg	2119.20	107.85	228555.72
36	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)	Cum	23	7132.25	164041.75
37	Structural steel work in single section for rail gauge fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete				
	90 lbs / yard	Kg	625.10	93.05	58165.56
38	12 mm cement plaster of mix :				
	1:6 (1 cement: 6 fine sand)	sqm	225	333.35	75003.75
39	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :				
	Two coats	Sqm	200	155.90	31180.00
40	Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.				
	Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix)	Cum.	15	1503.60	22554.00

S.No	DESCRIPTION	Unit	Qty	Rate	Amount
41	Steel work welded in built up sections/ framed work including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.				
i	In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete	Kg.	281	123.60	34731.60
ii	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	Kg	272	172.60	46947.20
	Sub Total: B (Civil work)				2260683.48
	Total A + B (Electrical + Civil work)				49198034.20

Percentage to be quoted by the agency:	(In Figures)
	(In Words)
Amount worked out by as per percentage quoted:	(In Figures)
	(In Words)

- Note:**
- 1. This is a percentage rate tender, therefore, percentage is only to be quoted by the agency in figures on the amount mentioned in Schedule of quantity.**
 - 2. The percentage quoted should be inclusive of all taxes including GST etc. and nothing extra shall be paid on this account**
 - 3. The Power Transformer, 66 KV switchgears, APFC panels, Control relay panel, substation automation system, VCB panel, shall be got installed from the OEM / Channel partner of the OEM and commissioning report of the same shall be submitted by contractor.**
 - 4. Shop drawing & GAD of all proposed equipments shall be prepared by the contractor and got approved by the Engineer-in-Charge prior to execution of the work**