

E- TENDER DOCUMENT

for

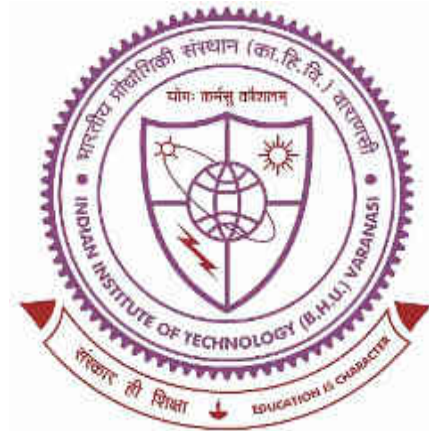
Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT (BHU), Varanasi.

Tender No.:-IIT(BHU)/IWD/ET/15/2018-19/987

Tender Date: 18.07.2018

Last Date of Submission of bids: 08.08.2018

Tender Opening date: 09.08.2018



**Indian Institute of Technology
(Banaras Hindu University)
Varanasi-221005**

E-mail: office.iwd@iitbhu.ac.in

ABSTRACT OF COST

NAME OF WORK:- Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT (BHU), Varanasi.

Sl. No.	Details of Sub-Head	Amount (in ₹)
1	Electrical work	83,86,580.00
	Say ₹	83,86,580.00

This NIT containing pages 87 as per Index amounting to Rs. 83,86,580.00 is hereby approved.

Sd-
Member Secretary
IWC, Indian Institute of Technology(BHU), Varanasi

E-TENDER

are invited

for

SUPPLY, INSTALLATION, TESTING & COMMISSIONING (SITC) OF 11/0.433 kV, 1 MVA INDOOR DISTRIBUTION SUB STATION IN IIT(BHU), VARANASI

Tender No.:-IIT(BHU)/IWD/ET/15/2018-19/987

Tender Date: 18.07.2018

Last Date of Submission: 08.08.2018

Technical Bid Opening: 09.08.2018



**Indian Institute of Technology
(Banaras Hindu University)
Varanasi-221005**

E-mail: office.iwd@iitbhu.ac.in



TENDER DOCUMENT FOR

SUPPLY, INSTALLATION, TESTING & COMMISSIONING (SITC) OF 11/0.433 kV, 1 MVA INDOOR DISTRIBUTION SUB-STATION IN IIT (BHU), VARANASI

CRITICAL DATA SHEET

Name of Organization	Indian Institute of Technology (Banaras Hindu University)
Tender Type (Open/Limited/EOI/Auction/Single)	Open
Tender Category (Services/Goods/works)	Works
Type/Form of Contract (Work/Supply/ Auction/ Service/ Buy/ Empanelment/ Sell)	Works
Product Category (Civil Works/Electrical Works/Fleet Management/ Computer Systems)	Electrical Work
Date of Issue/Publishing Original Tender	19.07.2018 (10:00 Hrs)
Date of Pre Bid Meeting	28.07.2018 (14:30 Hrs)
Document Download Start Date	19.07.2018 (10:00 Hrs)
Document Download End Date	08.08.2018 (15:00 Hrs)
Last Date and Time for Uploading of Bids	08.08.2018 (15:00 Hrs)
Date and Time of Opening of Technical Bids	09.08.2018 (15:30 Hrs)
Tender Processing Fee	Rs. 2000/- (For Tender Processing Fee)
EMD	Rs. 4,19,000/- (For EMD) (To be paid through RTGS/NEFT) as per the following details: Name of Account - Registrar, IIT(BHU) Name of the Bank - State Bank of India Name of Branch - IT, BHU, Varanasi Account No. - 32778803937 IFSC Code - SBIN0011445 The proof of payment must be enclosed with Technical Bid.
No. of Covers (1/2/3/4)	02
Place of Pre Bid Meeting	Committee Room, Ground Floor, Director office, IIT (BHU), Varanasi
Bid Validity days (180/120/90/60/30)	120 days (From date of opening of tender)
Address for Communication	The Chairman, IWC, Indian Institute of Technology (Banaras Hindu University), Varanasi – 221005, U.P.
Email Address	office.iwd@iitbhu.ac.in , aelectrical.iwd@iitbhu.ac.in



SUPPLY, INSTALLATION, TESTING & COMMISSIONING (SITC) OF 11/0.433 kV, 1 MVA INDOOR DISTRIBUTION SUB-STATION IN IIT (BHU), VARANASI

INVITATION FOR BIDS

1. Online bids are invited from manufactures or their authorized dealers, who submit/letter /certificate in original from the manufactures that they have been authorized to bid in response to this NIT for the following electrical work:-

S. No.	Tender no.	Specifications & quantity of the item	Earnest Money Deposit (EMD)
1.	IIT(BHU)/IWD/ET/15/2018-19/987 Dated: 18.07.2018	Name of the Project:-Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT (BHU), Varanasi. Estimated Cost Rs. 83,86,580.00 1. Technical Bid (Eligibility Criteria) 2. Price Bid	Rs. 4,19,000/-

1. Interested eligible Bidders may obtain further information from IIT (BHU) website: www.iitbhu.ac.in/iitnotifications/purchase_enquiries/ or from Central Public Procurement Portal (CPPP) <https://eprocure.gov.in/eprocure/app>.
2. Intending bidders are advised to visit IIT (BHU) website www.iitbhu.ac.in/iitnotifications/purchase_enquiries/ and CPPP website <https://eprocure.gov.in/eprocure/app> regularly till closing date of BID submission of tender for any corrigendum / addendum/ amendment.
3. Tender processing fee and Earnest Money Deposit is to be deposited electronically by RTGS/NEFT in the account of Registrar, IIT (BHU) in the Bank details mentioned above. Bidders are required to submit the scan copy of payment receipt details of Tender fees and EMD payment at the time of Bid Preparation.
4. This Tender Document contains the following:
- Instructions for Online Bid Submission
 - INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR e-TENDERING FORMING PART OF BID DOCUMENT
 - NOTICE INVITING TENDER
 - General conditions of contract (GCC)
 - Additional Conditions For Sub-Station
 - Special Condition of Contract
 - Check-list for Bid/Tender submission
 - Technical specifications
 - Single Line Diagram
 - BoQ

SECTION A: - INSTRUCTION FOR ONLINE BID SUBMISSION

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

More information useful for submitting online bids on the CPP Portal may be obtained at: <http://eprocure.gov.in/eprocure/app>.

1. Registration

1. Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal ([URL:http://eprocure.gov.in/eprocure/app](http://eprocure.gov.in/eprocure/app)) by clicking on the link "Click here to Enroll". Enrolment on the CPP Portal is free of charge.
2. As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
3. Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
4. Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.
5. Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.
6. Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken.

2. Searching for Tender Documents

1. There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.
2. Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3. The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

3. Preparation of Bids

1. Bidder should take into account any corrigendum published on the tender document before submitting their bids.
2. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
3. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.
4. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

5. Submission of Bids

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

2. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3. Bidder has to select the payment option as “on-line” to pay the tender fee / EMD as applicable and enter details of the instrument. Whenever, EMD / Tender fees is sought, bidders need to pay the tender fee and EMD separately on-line through RTGS.
4. A standard BoQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.
5. The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
6. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.
7. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
8. Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.
9. Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

5. Assistance to Bidders

1. Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.
2. Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 233 7315

6. General Instructions to the Bidders

1. The tenders will be received online through portal <http://eprocure.gov.in/eprocure/app> . In the Technical Bids, the bidders are required to upload all the documents in **.pdf format**.
2. Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through <https://eprocure.gov.in/eprocure/app>. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site <https://eprocure.gov.in/eprocure/app> under the link “Information about DSC”.
3. Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at <https://eprocure.gov.in/eprocure/app>.

SECTION –B:- INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR
e-TENDERING FORMING PART OF BID DOCUMENT

Online bids are invited from manufactures or their authorized dealers, who submit/letter /certificate in original from the manufactures that they have been authorized to bid in response to this NIT for the following electrical work:-

S.NO	Description	
1	NIT No.	IIT(BHU)/IWD/ET/15/2018-19/987 Dated 18.07.2018
2	Name of Works & Location	Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT (BHU), Varanasi.
3	Total Estimated cost put to tender	Rs. 83,86,580.00 (Rupees Eighty Three Lacs Eighty Six Thousand Five Hundred Eighty only)
4	Earnest Money	Rs. 4,19,000.00
5	Period of Completion	90 Days
6	Last Date & Time of Submission of Technical and Financial Bids	08.08.2018 (15:00 PM)
7	Date of opening of technical bid	09.08.2018 (15:30 PM)

1. Contractors who full fill the following requirements shall be eligible to apply. Joint ventures are not accepted.
 - (a) Should have satisfactorily completed the similar Job as mentioned below during the last seven years ending 31st March, 2018: -
 - (i) Three similar works each costing not less than Rs. 33.55 lacs or two similar works each costing not less than Rs. 50.32 lacs or one similar work costing not less than Rs. 67.10 lacs. **(Scanned copy of successful work completion certificate to be uploaded in cover-1)**
Similar job shall mean “**Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station**”. The value of executed job shall be brought to the current costing level by enhancing the actual value of job at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of applications for bids.
 - (ii) Bidder should be the manufacturer of transformer and/or other equipment quoted in the tender or should be authorized dealer of OEM who submit/letter /certificate in original from the manufactures that they have been authorized to bid in response to this NIT. **(Scanned copy of certificate from CA to be uploaded in cover-1. OEM need not submit authorized dealer certificate)**

- (b) Should have had average annual financial turnover of Rs. 41.93 Lacs on similar works during the last three consecutive financial years ending 31st March 2018 **(scanned copy of certificate from CA to be uploaded in cover-1)**
- (c) Should have a solvency certificate of at least Rs. 33.55 Lacs issued by Bank during the last six months
(Scanned copy of original solvency certificate to be uploaded in cover-1)
2. The intending bidder must read the terms and conditions carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required. The agency should also enclose along with the documents a separate annexure showing the details of the works which he intends to be considered for deciding his fulfilment of eligibility criteria as per the requirements of the NIT provisions.
 3. Information and Instructions for bidders posted on website shall form part 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 website www.eprocure.gov.in or www.iitbhu.ac.in free of cost.
 5. But the bid can only be submitted after giving the details of the mandatory documents such as UTR No. payment of tender processing fee and EMD in favor of Registrar, IIT(BHU), Varanasi and other scanned documents as specified.
 6. Those contractors not registered on www.eprocure.gov.in website, 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 bidders must have valid Class-III digital signature to submit the bid.
 8. On opening date of the financial bid, 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 PDF format.
 10. Contractor must ensure to quote rate of each item.
In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as “0”.
Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as “0” (ZERO).
 11. The department reserves the right to reject any prospective bid application without assigning any reason whatsoever and to restrict the list of qualified contractors to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.

Sd-
INSTITUTE WORKS DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY(BHU)
VARANASI

SECTION-C: NOTICE INVITING TENDER

1. Online bids are invited from manufactures or their authorized dealers, who submit/letter /certificate in originals from the manufactures that they have been authorized to bid in response to this NIT for the following electrical work:-

“Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT(BHU), Varanasi.”

- 1.1 The works is estimated to cost Rs. 83,86,580.00 inclusive of taxes & duties. This estimate, however, is given merely as a rough guide.
- 1.1.1 The competent authority to approve NIT for the combined cost and belonging to the major discipline will consolidate NITs for calling the tenders.
- 1.2 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 jobs of magnitude specified below:-
- 1.2.1 Criteria of eligibility for submission of bid documents:
Joint ventures are not accepted.

(a) Should have satisfactorily completed the jobs as mentioned below during last seven years ending 31th March, 2018:

(i) Three similar works each costing not less than Rs. 33.55 lacs or two similar works each costing not less than Rs. 50.32 lacs or one similar work costing not less than Rs. 67.10 lacs. **(Scanned copy of successful work completion certificate to be uploaded in cover-1)**

Similar job shall mean **“Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station”**. The value of executed job shall be brought to the current costing level by enhancing the actual value of job at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of applications for bids.

(ii) Bidder should be the manufacturer of transformer and/or other equipment quoted in the tender or should be authorized dealer of OEM who submit/letter /certificate in original from the manufactures that they have been authorized to bid in response to this NIT. **(Scanned copy of certificate from CA to be uploaded in cover-1. OEM need not submit authorized dealer certificate)**

(b) Should have had average annual financial turnover of Rs. 41.93 lacs on similar works during the last three consecutive financial years ending 31st March, 2018 **(Scanned copy of certificate from CA to be uploaded in cover-1)**. This should be duly audited by a Chartered Accountant. The year in which no turnover is shown would also be considered for working out the average.

(c) Should have a solvency certificate of `Rs. 33.55 Lacs issued by Bank during the last six months. **(Scanned copy of original solvency certificate to be uploaded in cover-1)**.

- 1.2.2 To become eligible for tender, the contractor shall have to furnish an affidavit on a non judicial stamp paper of Rs. 100.00 as under:-

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 tendering in IIT (BHU) 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/ **(Scanned copy to be uploaded at the time of submission of bid)**.

2. Award of work contract/ order shall be placed on the successful tenderer on prescribed Format.
3. The time allowed for carrying out the work will be 90 days 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 tender documents.
4. The site for the work is available.
5. The tender document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen from website www.eprocure.gov.in or www.iitbhu.ac.in free of cost.
6. After submission of the tender the contractor can re-submit revised tender any number of times but before last time and date of submission of tender as notified.
7. While submitting the revised bid, contractor can revise the bid price, but before last time & date of submission of tender as notified.
8. The quoted base price shall remain FIRM till the completion of work.
9. a) Earnest Money Rs. 4,19,000.00 shall be paid online in favour of Registrar, IIT(BHU), Varanasi as mentioned in critical data sheet and UTR No. (Transaction detail) shall be scanned and uploaded to the e-tendering website within the period of tender submission.
b) Tender processing fee Rs. 2,000.00 shall be paid online in favour of Registrar, IIT(BHU), Varanasi as mentioned in critical data sheet and UTR No. (Transaction detail) shall be scanned and uploaded to the e-tendering website within the period of tender submission.
10. Details of online submission of tender fee & EMD, Copy of certificate of work experience, copy of category/ enlistment order, Audited Balance Sheet, Bank Solvency Certificate and other documents mentioned in the PQ Document shall be scanned and uploaded to the e-tendering website within the period of tender submission and certified copy of each shall be deposited in a separate envelope marked as "Eligibility Documents" with due mention of Name of work/ job and due date of opening of tenders and to be submitted in the office of Chairman, IWC, IIT(BHU), Varanasi before last date & time of submission of bid. ***Documents submitted by intending bidders shall be considered only for those bidders, whose tender processing fee and Earnest Money deposit and other documents placed in the envelope are found in order.***
11. The bid submitted shall become invalid and cost of bid & e-Tender processing fee shall not be refunded if:
 - (i) The bidders is found ineligible.
 - (ii) The bidders does not upload all the documents (including GST & IT registration) 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 in the office of tender opening authority.
12. The Earnest Money of the successful bidder shall be retained as performance guarantee/ security deposit till the completion of work.
13. Intending bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent upon any misunderstanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer 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 Institute does not bind itself to accept the lowest tender or any other tender and reserves to itself the authority to reject any or all the tenders received without assigning any reason whatsoever. All tenders in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the tenderer shall be summarily rejected.
15. Canvassing whether directly or indirectly, in connection with tenderers is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
16. The competent authority on behalf of Institute 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 tender for works/job in the IWD IIT (BHU), if his near relative is posted as an officer in any capacity between the grades of Registrar and Assistant Engineer (both inclusive).. 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 of gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the previous permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.
19. The bid for the works shall remain open for acceptance for a period of (120) one hundred twenty days from the date of opening of financial bids. If any bidder withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, then the Government 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 re-bidding process of the work.
20. This notice inviting bid shall form a part of the contract document. The successful bidder/contractor, on acceptance of his bid by the Accepting Authority shall within 15 days from the stipulated date of start of the work, sign contract/ work order consisting of: -
 - a) The Notice Inviting bid, all the documents including Special Conditions, General Specifications/ Particular Specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto.
 - b) Standard IWD,IIT (BHU) Contract/ work order and/ or other Standard IWD,IIT (BHU) form.
21. The tenderers shall quote price for each item strictly as per price schedule (BOQ). Any discount to be considered by the tenderers shall be included in the basic price in the price schedule (BOQ). Hence basic price shall be determined by the tenderers after considering the discount if any.
22. For Composite Tenders
 - 22.1.1 The Assistant Registrar will call bids for the composite work. The cost of bid document and Earnest Money will be fixed with respect to the combined estimated cost put to tender for the composite tender.
 - 22.1.2 The bid document will include following four components:
Part A:-IWD,IIT(BHU) e-TENDER , IWD,IIT(BHU) FORM-1 including schedule A to F for the major component of the work, Standard General Conditions of Contract for IWD,IIT(BHU) as amended upto date.

Part B:- General / specific conditions, specifications

Part C: Schedule A to F for minor component of the work. (Executive Engineer of major component shall also be competent authority under clause 2 and clause 5 as mentioned in schedule A to F for major components)

Part D:- schedule of quantities applicable to AOMC work.

22.1.3 The bidders must associate with himself, agencies of the appropriate class worked with IWD, IIT(BHU) and eligible to bid for each of the minor component individually.

22.1.4 The eligible bidders shall quote rates for all items of major component as well as for all items of minor components of the bid.

22.1.5 After acceptance of the bid by competent authority, the Assistant Registrar/ executive engineer shall issue the letter of intent/contract order on behalf of the Institute.

22.1.6 Entire work under the scope of composite tender including major and all minor components shall be executed under the contract order.

22.1.7 The Earnest Money of the successful bidder shall be retained as performance guarantee/ security deposit till the completion of work.

22.1.8 The main contractor has to associate agency(s) for minor component(s) conforming to eligibility criteria as defined in the tender document and has to submit detail of such agency(s) to Engineer-in-charge of minor component(s) within prescribed time. Name of the agency(s) to be associated shall be approved by Engineer-in-charge of minor component(s).

22.1.9 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 respective Engineer-in-charge/ DDH of the agreement. The new agency/ agencies shall also have to satisfy the laid down eligibility criteria. In case Engineer-in-charge of respective discipline 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.

22.1.10 The composite work shall be treated as complete when all the components of the work are complete. The completion certificate of the composite work shall be recorded by Engineer-in-charge of major component after record of completion certificate of all other components.

22.1.11 Final or running bill of the work / job shall be finalized by IWD, IIT (BHU). No advance payment shall be made in any form.

However, payment along with all applicable taxes shall be made on monthly running bill basis.

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

Sd-
INSTITUTE WORK DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY IIT(BHU)
VARANASI

**INSTITUTE WORKS DEPARTMENT,
IIT(BHU), Varanasi**

ITEM RATE TENDER & CONTRACT FOR AOMC WORK

(A) Tender for the work of:

**Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor
Distribution Sub-Station in IIT(BHU), Varanasi**

To be submitted 08.08.2018 (15:00 hrs.) in the office of Chairman, IWC, IIT(BHU),
Varanasi.

(i) To be opened in presence of tenderers who may be present at 15:30 hrs. on 09.08.2018 in
the Administrative Building, Ground Floor, Committee Room, IIT(BHU), Varanasi

I/We have read and examined the notice inviting tender, schedule, A, B, C, D, E & F
Specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of
Contract, clauses of contract, Special conditions, Schedule of Rate & other documents and Rules
referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work/job specified for the President of India
within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect
with the specifications, designs, drawing 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 respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for 120 (one hundred twenty) days from the due date of its
opening and not to make any modification in its terms and conditions.

A sum of Rs. **4,19,000.00** is hereby deposited online as earnest money. If I/We, fail to furnish
the prescribed performance guarantee within prescribed period. I/We agree that the Institute has to
right to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as
specified, I/We agree that the Institute has to right to forfeit the said performance guarantee
absolutely. The said performance guarantee shall be a guarantee to execute all the works referred to
in the tender documents upon the terms and conditions contained or referred to those in excess of
that limit at the rates to be determined in accordance with the provision contained in Clause 12.2
and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money or
Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-tendering
process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed
through another 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 IWD,IIT(BHU) 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.

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

Dated:

Signature of Contractor

Witness:

Postal Address

Address: Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me on behalf of the Registrar, IIT (BHU) for a sum of Rupees.....).

The letters referred to below shall form part of this contract / work order

- (a)
- (b)
- (c)

For & on behalf of Registrar, IIT(BHU)

.....

Dated:

Designation

PROFORMA OF SCHEDULES

(Separate Performa for Civil, Elect. & Hort. Works in case of Composite Tenders) (Operative Schedules to be supplied separately to each intending tenderer)

SCHEDULE 'A'

Schedule of Electrical work.

SCHEDULE 'B'

Schedule of materials to be issued to the contractor on returnable basis

S.No.	Description of item	Quantity	Rates at which the material will be charged to the contractor in case of non-return.	Place of issue
1	2	3	4	5
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-

SCHEDULE 'C'

Tools and plants to be hired to the contractor

S. No.	Description	Hire charges per day	Place of Issue
1	2	3	4
-----NIL-----			

SCHEDULE 'D'

Extra schedule for specific requirements/ document for the work, if any. As attached in tender form any

SCHEDULE 'E'

Reference to General Conditions of contract.

Name of Work: Supply, Installation, Testing & Commissioning (SITC) of 11/0.433 kV, 1 MVA Indoor Distribution Sub-Station in IIT(BHU), Varanasi	
Estimated cost of the work:	Rs. 83,86,580.00
Earnest money	Rs. 4,19,000.00 (To be retained only for successful tenderer till the Completion of the work)

SCHEDULE 'F'

GENERAL RULES & DIRECTIONS:

Officer inviting tender	Assistant Registrar, IIT(BHU), Varanasi	IWC,
-------------------------	--	------

Definitions:

2(v)	Engineer-in-Charge	
	For Electrical items of work	Assistant Engineer IWD, IIT(BHU), Varanasi.
2(vii)	Accepting Authority	Chairman, IWC, IIT(BHU)
2(x)	Percentage on cost of materials & labor to cover all overheads and profits	NA
2(xi)	Standard Schedule of Rates:	
	Electrical Items of Work:	As per previously executed contract order.
2(xii)	Department:	IWD, IIT, IIT (BHU)
Clause 1		
Clause 2	i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance	NA
	Number of days from the date of issue of letter of acceptance for reckoning date of start	NA

Milestone/Bar Chart(s)-

Work completion period 90 days

Authority to decide

Extension of time Engineer-in-Charge

Rescheduling of mile stone Engineer-in-Charge

Shifting of date of start in case of delay in handing over of site Engineer-in-Charge

Clause 3 Specification to be followed for execution of work:

For Electrical items of work Best practice of power corporation & power grid and other Indian electricity rule and as per latest IS standards.

Clause 4	Competent Authority for Deciding reduced rates:	
	For Electrical items of work	Chairman, IWC IIT (BHU), Varanasi.
Clause 5	Mandatory machinery tools & plants to be deployed by the contractor at site.	As per standard practices.

Clause 6

Constitution of Dispute Redressal Committee(DRC)	Competent Authority to appoint DRC
DRC shall constitute one Chairman and two members	The Director, IIT(BHU), Varanasi.

SECTION -D: - GENERAL CONDITIONS OF CONTRACT (GCC)

(EQUIPMENT SUPPLY AND SERVICES)

Article 1: Scope

The scope of work is restricted to supply, packing, forwarding, transportation, erection, testing and commissioning of Equipments as per BOQ, drawings and technical specifications. This specified scope shall be completed within agreed timelines and in accordance with other provisions and obligations of each Party. Unless specifically agreed, no other supply or services shall be considered as part of scope/ deliverable.

Article 2: Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purpose of interpretation, the priority of the documents shall be in accordance with the following sequence:

- a) The Contract Agreement
- b) The Letter of Award
- c) Minutes of Meeting
- d) Contractor/Supplier's Offer

If any ambiguity or discrepancy arises in the documents regarding the technical specifications, the same shall be mutually resolved between the parties and shall form part of the contract agreement.

Article 3: Drawings / Dimension Sheets

All drawings, data sheets, specifications and other documents submitted for Client's [IIT (BHU)] approval shall get approved within 21 days. All such document shall form an integral part of the Contract and same shall be binding upon Parties. The agreed documents, drawings and data sheet shall be duly signed and stamped so as to ascertain the authenticity and correctness.

It is agreed between the Parties that basic Single Line Diagram (SLD) and Layout will be submitted within one week of Contract coming into Force. The Contractor/Supplier shall submit General Arrangement (GA) drawings, SLD and Guaranteed Technical Particulars (GTP) to the Client for its approval.

Article 4: Coming into Force

The Contract shall come into force the day when all the following conditions are met:

- Agreement / Contract document duly signed by the authorized representatives of both the Parties;
- Full access and possession granted to Contractor/Supplier for site activities.
- A kick-off meeting between Client & Contractor/Supplier held and minutes of meeting distributed

On fulfillment of above conditions, Client shall issue a Notice to Proceed ("NTP") to the Contractor/Supplier, which shall be the Work Starting Date and be construed as Zero (0) date of the agreed schedule. NTP shall be issued only after the completion date of the last conditions (of milestone) from the above conditions. However, the coming into force shall occur within one month of the effective date of the Contract.

Article 5: Offer Validity

Contractor/Supplier's Offer is valid for 120 days from the due date of submission of Offer.

Article 6: Contract Price

Contract Price is based on scope, specifications, drawing, layout, technical specifications and provisions of the Contract agreed between the Parties. Price is inclusive of freight upto Site for Supplies of Equipment and material. The Contract Price is excluding of taxes and duties, which shall be to the Contract on actual as per prevailing Government norms.

Applicable road permit / e-way bill, any other applicable permit/ form in Project Site shall be provided by Client, prior to readiness of Equipment / material / goods.

The Client shall make all payment in Indian Rupees (INR), unless otherwise agreed between the Parties.

Article 6: Transfer of Risk and Title

Ownership and title to the Products sold under the Contract shall be retained by Contractor/Supplier until the entire purchase price and all other sums due under the Contract have been fully paid.

Article 7 Firm Price

The Contract Price / Rates shall be Firm till completion of entire scope.

Article 8 Taxes, Duties and Statutory Variations

Taxes and duties of Contractor/Supplier quoted Price shall be as per the Contractor/Supplier's price offer.

Contract Price does not include Entry Tax, Octroi, Labour Cess etc. which shall be charged extra at actual wherever applicable.

All sort of statutory variation including change, addition, deletion, abolition, repeal or reclassification due to change in Law and/ or directive of authorized agency shall be Client's account.

Article 9: Terms of Payment

The Client shall release all due payments to the Contractor/Supplier on pro-rata basis within 21 days from date of receipt of relevant documents as per following Terms of Payment: -

- Seventy Percent (70%) with 100% duties and taxes against supply within 30 days.
- 20% of the contract price shall be released after erection of material against submission of RA bills.
- 10% of the contract price shall be released after commissioning, handing over & Submission of Performance Bank Guarantee (PBG) of equivalent amount valid for a period of minimum 14 months (425 days).

Article 10: Variation/Change Management

Either Party shall have the right to propose changes to the other Party that are considered necessary or desirable to improve the quality, efficiency or safety of the works agreed under the Contract. Such proposal may cover, including but not limited to, scope, design, specification, calculations, makes, sizes, quantity,

Deliverables, milestones, schedule or documents etc, during the performance of the contract to make any changes, variations, modifications, additions or omissions to, in or from the works (Change).

The requesting Party shall prepare the change requirement or request for change (RFC) describing affected item, purpose, justification, impact and effective timelines of such Change.

The requesting Party shall submit the RFC to other Party for analysis and review. The receiving Party, if required, may seek further details, clarifications or information prior to conveying its decision to the requesting party. However, receiving Party shall convey its decision to the requesting party within 7 (seven) calendar days.

On converging to the need for change, the Client shall amend the related document within 7 (seven) calendar days including purchase order, agreement, schedules, statement of work or any other necessary document.

Any change up to +/- 10% of the Contract Price may be considered at the agreed Price/ Rates with necessary time extension.

For any additional or new work/ requirement, Contractor/Supplier shall evaluate the physical, technical schedule and cost impacts before giving acceptance to the same. However, such work shall be carried out on Cost plus basis.

The change shall be binding upon mutual acceptance by both the Parties in writing.

Article 11: Testing Charges/ Inspection

Parties agree that the Contractor/Supplier shall be responsible for regular routine / acceptance test as per relevant IS (Indian Standards) for the final Equipment. However, if the Client desires to witness the routine tests, it shall be mutually agreed between the Parties.

Heat run test for one 1000KVA Transformer shall be witnessed by client. Contractor/Supplier should consider the price in the bid. The Contractor/Supplier shall provide 15 (Fifteen) days prior intimation to the Client. However, the Contractor/Supplier shall arrange the permission to carry out the inspection. Soon after clearance of inspection, the Client shall provide the Dispatch Authorization within 2 days enabling to ship the Equipment. It is agreed between the Parties that Client shall carry out the inspection only for Transformers and HT/ LT Panels at manufacturer works.

Equipment Erection, functional testing and commissioning shall be carried out in accordance with the User and Maintenance Manual at site.

Article 12: Goods Receipts and Storage Parties agree that all material delivered at designated stores of Contractor/Supplier. The certificate for goods arrival at site shall be issued by the Client within 3 days. It is also hereby agreed between the Parties that all measurements of works shall be certified by Client within 7 days, so that correct and complete invoices are raised timely.

Article 13: Completion Period

It is agreed between the Parties that Contractor/Supplier shall complete its scope of work within **90 days** from the date of placement of firm order or as extended by the Client. The contractor/supplier shall submit a CPM/PERT chart before the start of work. The NTP shall be considered the Work Starting Date of Delivery period. During the delivery period, the Contractor/Supplier shall be entitled to supply the material/ services in partial or entire lots and corresponding payment shall be released by the Client.

The Completion period shall be duly extended on occurrence of any of the following conditions:-

- Due payment are not received by the Contractor/Supplier on time.
- Changes in Scope or terms of the Contract agreed between the Parties.
- Force Majeure conditions beyond reasonable Control of Party.

Once the cause of delay is removed, new delivery schedule shall be submitted taking into account the then prevailing conditions. The PERT/CPM chart shall be modified accordingly.

Article 14: Overall Limitation to Liability

Notwithstanding anything in the Contract to the contrary and to the extent permitted by applicable law, (a) in no event shall either Party, its officers, directors, or employees be liable for any form of incidental, consequential, indirect, special or punitive damages of any kind, or for loss of revenue or profits, loss of business, loss of information or data, or

other financial loss, whether such damages arise in contract, tort or otherwise, irrespective of fault, negligence or strict liability or whether such Party has been advised in advance of the possibility of such damages; and (b) the maximum liability of the Contractor/Supplier for any and all claims, losses, damages, costs and expenses arising from or on connection with this Contract shall not exceed the amounts actually received by the Contractor/Supplier under this Contract.

Article 15: Warranty

The warranty period for the Products will be twelve (12) months from the date of commissioning but no longer than eighteen (18) months from the date of delivery of the products to the Client.

Products

During warranty for the Products, the Contractor/Supplier undertakes to repair and/or replace any part found to be faulty due to errors in design or manufacture, or to be made of faulty materials. Complaints of defects in Products

delivered shall be made in writing, and without any delay, as soon as the defect is discovered. Products or parts may only be returned after prior agreement in writing.

The warranty will only be honoured, when repairs have been carried out by the Contractor/Supplier or its authorized agents with the Contractor/Supplier genuine parts. The defective parts shall be forwarded to the Contractor/Supplier, carriage paid for repair or replacement. The defective parts remain the property of the Contractor/Supplier. For goods supplied by the Contractor/Supplier's subcontractor, the Contractor/Supplier will ensure that all such goods that carry a manufacturer's warranty are registered with the manufacturer in Client's name. If the Contractor/Supplier performs repairs on Client's site, the warranty shall cover only the material.

This warranty does not cover damage or defect caused to the extent of the Client's misuse, improper application, wrong or inadequate electrical current or connection, inadequate water or drain services, negligence, inappropriate on-site operating conditions, corrosive atmosphere, repair by non designated personnel, accident in transit, tampering, alterations, a change in location or operating use, exposure to the elements, force majeure events, theft or installation contrary to Contractor/Supplier's recommendations or specifications, or in any event if the Contractor/Supplier serial number has been altered, defaced or removed.

Services

All Services performed shall be in a professional workman-like manner in accordance to industry standards. In the event any deficiencies are discovered in the Services resulting from the Contractor/Supplier's failure to comply with the above standards and the Client promptly notifies the Contractor/Supplier thereof in writing within thirty (30) days following completion of the Services, the Contractor/Supplier shall provide remedial Services at no cost to the Client to correct such deficiencies. The warranties set forth in this clause constitute the Contractor/Supplier's sole liability.

Article 16: Obligations

During the entire duration of the Contract, both Parties shall ensure to fulfillment their obligations in the manner described in the Contract.

Unless specifically agreed between the Parties otherwise, the electricity and water required for construction purposes (connection and consumption) shall be provided by the Client on chargeable basis during the entire performance of the Contract.

Only land for site office, storage for Equipment & material shall be provided by the Client free of cost during the entire performance of the Contract. Contractor/Supplier shall construct temporary stores, office & security arrangement at their end.

Article 17: Assignment and Sub-Contract

Either Party shall not assign the Contract (part or whole) or any of its obligations without prior written consent of the other Party, even if this entity belongs to the same group of companies.

The Contractor/Supplier shall not be permitted to sub-contract of the work to any third party sub-contractor and also cannot execute through channel partner.

Article 18: Intellectual Property

Any drawings, designs, technical documents, know-how and confidential information whether patented or not submitted or furnished to the other Party prior or after the effective date of the Contract, shall remain the exclusive property of respective Party.

Article 20: Penalty for late execution

If the Contractor/Supplier fails to meet Completion Schedule as mutually agreed, the Client shall have the right to recover or deduct from the Contractor/Supplier's due claims an amount equivalent to 1% of the unexecuted portion of the Contract value per week or part thereof until the equipment is delivered or activity is performed, subject to a maximum ceiling of 10% of the unexecuted portion of contract value. Such penalty shall be the sole remedy

available to the Client against the Contractor/Supplier against said delay in achievement of overall completion period. The said penalty shall be applicable only in case the delays are solely attributable to the Contractor/Supplier. Further Penalty will be the sole and exclusive remedy available to the Client in case of delays apart from right of termination once the cap is reached.

Article 21: Communication

Any written communication exchanged or recorded with or between the Parties through any media including emails, minutes of meetings, letters, faxes, transmittals and telegrams shall hold good and effective for conveying the instructions or directions or requirements to each other, under this Contract.

Article 22: Suspension

Suspension by the Client - The Client may suspend, at any time and for any reason, any part of or the whole of the Work by giving at least 7 days' written notice thereof to the Contractor/Supplier, specifying any part of or the whole of the Work to be suspended, the effective date of such suspension and the tentative date of resumption of the Work.

On receipt of suspension notice, the Contractor/Supplier shall cease work on said part of the Work on the effective date of such suspension but shall continue to perform any unsuspended part of the Work. During a suspension, the Contractor/Supplier shall be entitled to full payment from the Client for all Work performed by the Contractor/Supplier to the date of suspension and reimbursement for all costs, including but not limited to the charges towards idle resources, demobilization & remobilization of resources and extension of time incurred by the Contractor/Supplier (including its sub-contractors), which are fair and reasonable. The Client may, at any time, authorize resumption of the suspended part of the Work by notifying the Contractor/Supplier of the part of the Work to be resumed and the effective date of suspension withdrawal. The SE shall resume any suspended Work within 7 days of the Client's written notice directing the same.

Party or occurrence of Force majeure conditions, the Parties shall enter into a Change Order which shall include the extension of Delivery Schedule reflecting the Suspension.

Article 23: Termination / Cancellation

Client can terminate/cancel the Contract with prior written notice of 30 days to the Contractor/Supplier for any of the following reasons:

- a) Insolvency, receivership or bankruptcy proceedings are commenced by or against the Party;
- b) Party makes a general arrangement for the benefits of its creditors;
- c) Party abnormally delays or fails to fulfill its contractual obligations including, but not limited to, approval and timely payments etc.

- d) Any material breach or representations or warranties made was false or intentionally misleading when made.
- e) The occurrence of Force Majeure event continues for 3 months or above.
- f) Client fails to take delivery of material due to whatever reasons for more than 3 months.
- g) Repetitive suspension of work or equipment deliveries are withheld beyond 3 months
- h) A change in Law of any Government Authority where performance of contractual obligations are not feasible or possible.

Termination by Employer for default

If the Contractor/Supplier is in default, this clause for termination be accepted for

- Notice of termination to be in writing
- Termination only in case of material breach and that to if it is not remedied within a predefined period of time. If possible, termination will be limited to only in respect of the part of the scope of work affected by the non-performance.

Article 24: Force Majeure

No delay or failure by either of the Parties in the performance of this Contract shall give rise to any claim by the other Party or shall be deemed to be a breach of this Contract if such delay or failure is the result of occurrence and/or continuation of any one or more events or circumstances of the Force Majeure.

Force Majeure means any occurrence or event that is beyond the reasonable control of a Party hereto, including, but not limited to,

(a) fire, flood, flooded land, rains, snow, lightning, drought, storm, typhoon, earthquake, tsunami, ash clouding, inundated with sea/ river water, tornado, landslide, subsidence, natural disasters, washout or epidemic or unusual inclement weather, unfavorable weather conditions (foreseeable or unforeseeable) or unusual project site or sea conditions any other similar conditions or acts of God; etc.;

(b) war, (declared or not) hostilities, explosions, insurrection, rebellion, sabotage, vandalism, invasion, riots, strikes, freight embargos, social commotion; agitations, labour disturbances, turbulence, accident, casualties, civil war, or any other act of public enemies, etc.

(c) acts or omissions of any court, legislative, judicial or executive body, or other governmental authority (such as a taking by condemnation or power of eminent domain), any expropriation or confiscation of facilities, compliance with any order of any governmental authority, changes of law etc.. Any Party that is affected by an Event of Force Majeure shall give written notice thereof to the other Party no later than 15 (fifteen) days following the date of occurrence of the Event of Force Majeure in question, providing appropriate details thereof. If performance under this Agreement is delayed as a result of continuation of the Event of Force Majeure, the time allowed to comply with such obligation shall be extended for as long as the relevant event of Force Majeure causing such delay or suspension continues. If the Event of Force Majeure continues for a period of (3) three months, then either Party may suspend the Contract by providing notice to the other Party and both the Parties shall mutually discuss and agree for the suitable next steps to be taken up. For such time, the suspension is in force, the Client shall provide the equitable extension to the Contractor/Supplier. In case Parties to the Contract decides to terminate the Contract, Parties to the Contract to settle their account with each other without any damages or cost. The Contractor/Supplier shall be entitled for the entire cost of work done. The consequences of termination under this Clause would be similar to termination at convenience of the Client.

Article 25: Applicable Law and Dispute Resolution

The Contract shall be governed by and interpreted in accordance with the laws of India for every purpose. The Parties agree that, any and all disputes, claims, controversy or causes of action (‘Dispute’) which the Parties are unable to resolve for any reason after negotiations, shall be completely and finally settled by submission of any such Dispute to arbitration under the rules conciliation and arbitration of The Arbitration and Conciliation Act, 1996 (IAC) then in effect. For resolution of any dispute, IIT (BHU) shall appoint one arbitrator. Any arbitration proceeding shall take place at Varanasi. The language of the arbitration shall be English. Any award made by the arbitrators shall be final and binding on the Parties. The Contract shall be subject to exclusive jurisdiction of appropriate court of Varanasi jurisdiction for the purposes only of compelling compliance with the above arbitration provisions and for enforcement of any arbitration award made in accordance with the above provisions.

Article 26: Provisional Acceptance

All supplies of material or service works executed by the Contractor/Supplier shall be certified by the Client within 7 days of submission of its documents or measurement sheets or invoices.

Upon completion of the following conditions, the Client shall issue a Provisional Acceptance Certificate to the Contractor/Supplier.

All Equipments are installed, tested and commissioned in accordance with User and Maintenance Manuals or as per instructions of the Client representative;

However, any punch-list points so noticed shall not be any hurdle for issuing the Provisional Acceptance Certificate (PAC). The Contractor/Supplier shall be authorized attend punch list points after issuance of PAC.

In case the plant is partial commissioned or equipment are put in service, the Client shall issue the partial PAC.

Article 27: Final Acceptance

Upon completion of the following conditions, the Client shall issue a Final Acceptance Certificate to the Contractor/Supplier.

- Material reconciliation has been submitted to the Client.
- Any and all defects notice during testing have been rectified by the Contractor/Supplier;
- All as-built drawings and User & Maintenance Manuals handed over to the Client.
- All debris, scraps and excess material have been removed from site by the Contractor/Supplier.

The date of stated on Final Acceptance Certificate shall be the date on which all works have been performed to the Client's satisfaction. This shall also confirm that all contractual obligations have been fulfilled by the Contractor/Supplier and the Client has fully accepted the Plant.

Article 28: General Indemnification

Each Party shall indemnify, defend and hold harmless the other Party and their respective officers, directors, employees and agents from and against any and all third party demands for damages, costs and expenses (including reasonable legal fees) directly relating to or arising from injury or death to persons, or damage or loss to property to the extent directly caused by the negligence or willful misconduct of that party, provided that the indemnified Party: (a) gives the indemnifying Party prompt written notice of such claim; and (b) cooperates with the indemnifying Party, at the indemnifying Party's expense, in the defense of such claim.

The indemnifying Party shall not be responsible for any settlement made by the indemnified without the indemnifying Party's prior written consent.

Article 29: Insurance

The Contractor/Supplier shall take out and maintain in effect, during the performance of the Contract, Transit and Erection All Risk Insurance policy covering the performance of its Scope of works. The Contractor/Supplier shall cover the risks associated with its manpower, vehicles, tools and tackles.

In the event of an insurance claims is being made by the Contractor/Supplier, the Client shall issue an NOC with respect to the proceeds of such claims so that the Contractor/Supplier may collect such proceeds.

SECTION E: ADDITIONAL CONDITIONS FOR SUB-STATION

1. **Specification:** - The work shall be executed as per enclosed annexure general specification for Electrical Works (as per Annexure – A to E), Indian Standards amended up to date and as per direction of Engineer-in-charge.
2. **Location:** - The contractor is advised to visit the site before submission of their tender and ensure that equipment being offered by them shall be accommodated in the spaces available.
3. **Rates:** - The rates quoted by the tenderer, shall be firm and inclusive of all taxes, (GST, Labour cess etc.), duties levies, octroi etc. and all charges for packing forwarding, insurance, freight and delivery, installation, testing, commissioning etc. at site including temporary construction of storage, risks, over head charges, general liabilities/ obligations and clearance from Directorate General Electrical safety Government of UP. However, the requisite fee charged by the Directorate General Electrical Safety, Government of UP for inspection shall be borne by the Institute.
4. **Completion period :** -
The completion period indicated in the tender documents is for the entire work of planning, designing, approval of drawings etc., arrangement of materials & equipments, delivery at site including transportation, installation, testing, commissioning and handing over of the entire system to the satisfaction of the Engineer-in-charge.
5. **Storage :** -
Responsibility for storage space for execution of work shall be of main contractor.
6. **Power & Water supply :** -
Responsibility for supply of power & water for execution of work shall be of main contractor.
7. **Indemnity :** -
The successful tenderer shall at all times indemnify the department, consequent on this works contract. The successful tenderer shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising there from during the period of erection, construction and putting into operation the equipments and ancillary equipment under the supervision of the successful tenderer in so far as the latter is responsible. The successful tenderer in so far as the latter is responsible. The successful tenderer shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the successful tenderer on account of the above.
8. **Insurance and Storage :** -
All consignments are to be duly insured up to the destination from warehouse at the cost of the contractor. The insurance covers shall be valid till the equipment is handed over duly installed, tested and commissioned.
9. **Inspection by Directorate General Electrical safety Government of UP:** -
After completion of the work, the contractor will offer the same for inspection of Directorate General Electrical safety Government of UP. The contractor will extend all help including test facilities to the representative of Directorate General Electrical safety Government of UP. In case the contractor fails to make desired facilities available during inspection, the department reserve the right to provide the same at the risk & cost of the contractor. The observation of Directorate General Electrical safety Government of UP which are a part of agreement will be attended by the contractor promptly. The installation will be commissioned only after receiving clearance from Directorate General Electrical safety Government of UP. Inspection fees of Directorate General Electrical safety Government of UP will be borne by the department.
10. The material in required quantity to be used in the work shall be got approved from the Engineer-in-charge before its use at site. The Engineer-in-charge shall reserve the right to instruct the contractor to remove the material which, in his opinion, is not as per specifications.
11. Contractor shall preserve the copies of invoices, test certificate; gate pass etc. to prove the genuineness of material/purchase. The responsibility of procurement, genuine material of specialized works shall rest with the contractor.
12. **No inspection outside the country is permissible if required so the same will be deemed to be waived off and necessary test reports shall be submitted before the dispatch of equipment.**
13. **Statutory Approvals :**
All mandatory statutory approvals / certificates / license / permissions from commencement to commissioning of E & M components shall be obtained by the contractor from the local body authorities, Chief Fire Officer, Directorate General Electrical safety Government of UP etc. as required. However the Department shall pay necessary fees in connection with these approvals, if required.

SECTION F:- SPECIAL CONDITIONS OF CONTRACT

1. GENERAL

These special conditions are intended to amplify the General Conditions of Contract, and shall be read in conjunction with the same. For any discrepancies between the General Conditions and these Special Conditions, the more stringent shall apply.

2. SCOPE OF WORK

The general character and the scope of work to be carried out under this contract are illustrated in Drawings, Specifications and Schedule of Quantities. The Contractor shall carry out and complete the said work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the Engineer-in-charge. The contractor shall furnish all labour, materials and equipment as listed under Schedule of Quantities and specified otherwise, transportation and incidental necessary for supply, installation, testing and commissioning of the complete electrical system as described in the Specifications and as shown on the drawings. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/Documents as being furnished or installed, but which are necessary and customary to be performed under this contract. The electrical system shall comprise of (but not limited to) the following:

a.	Supply & Installation of HT Panel Supply & Installation of Transformer and accessories
b.	Cables (LT), Mains and Sub-Mains.
c.	LT panel, Main Distribution / Sub Distribution panels & Final Distribution panels
d.	Cables on cable trays and / or within suspended ceiling spaces including installation, cable trays, hangers, supports, cable terminations and all fixing accessories.
e.	Earthing (Grounding) System.

5. PERFORMANCE GUARANTEE

The contractor shall carry out the work in accordance with the Drawings, Specifications, Schedule of Quantities and other documents forming part of the Contract.

The contractor shall be fully responsible for the performance of the selected equipment (installed by him) at the specified parameters and for the efficiency of the installation to deliver the required end result.

The contractor shall guarantee that the Electrical system as installed shall perform to complete satisfaction of the owner. The guarantee shall be submitted to the Department.

Complete set of architectural drawings is available in the office of Engineer-in-charge and reference may be made to same for any details or information. The contractor shall also guarantee that the performance of various equipments individually, shall not be less than the quoted capacity; also actual power consumption shall not exceed the quoted rating, during testing and commissioning, handing over and guarantee period.

At the close of the work and before issue of final certificate of virtual completion, the contractor shall furnish written performance guarantee against defective materials and workmanship for a period of fourteen months (425 Days) from date of testing, commissioning and handing over. The guarantee shall be submitted to the Department. The Contractor shall hold himself fully responsible for reinstallation or replacement, free of cost the following:

- a. Any defective work or material supplied by the Contractor.
- b. Any material or equipment damaged or destroyed as a result of defective workmanship by the Contractor.

6. BYE-LAWS AND REGULATIONS

The work shall be carried out to the satisfaction of the Engineer-in-charge and in accordance with the Specifications, Regulations of the Electric Supply Authority, Indian Electricity Rules and Regulations, latest Indian Standards, CEA and as per the requirements of the Chief Fire Officer.

7. FEES AND PERMITS

The Contractor shall pay any and all fees and obtain permits required for the installation of this work. On completion of the work, the contractor shall obtain and deliver certificate of final inspection and approval by authority (Directorate General Electrical safety Government of UP /CFO/ State/Central govt. whichever is applicable)

8. DRAWINGS

The Electrical Drawings which may be issued with tenders are diagrammatic only and indicate arrangement of various systems and the extent of work covered in the contract.

These Drawings indicate the points of supply and of termination of services and broadly suggest the routes to be followed. Under no circumstances shall dimensions be scaled from these Drawings. The architectural/interiors drawings and details shall be examined for exact location of equipment, electrical points & fixtures.

The contractor shall follow the tender drawings in preparation of his shop drawings, and for subsequent installation work. He shall check the drawings of other trades to verify spaces in which his work will be installed.

Maximum headroom and space conditions shall be maintained at all points. Where headroom appears inadequate, the contractor shall notify the Engineer-in-charge before proceeding with the installation. In case installation is carried out without notifying, the work shall be rejected and contractor shall rectify the same at his own cost.

The contractor shall examine all architectural, structural, plumbing, HVAC and other services drawings and check the as-built works before starting the work and report to the Engineer-in-charge any discrepancies and obtain clarification. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Engineer-in-charge.

9. SPECIFICATIONS

The Specifications shall be considered as part of this contract. The Drawings indicate the extent and general arrangement of power distribution, location of lighting fixtures, controlling switches, wiring system, cabling and earthing. These drawings are essentially diagrammatic.

The Drawings indicate the point of termination of conduit runs and broadly suggest the routes to be followed. The work shall be installed as indicated on the Drawings. However, any change found essential to coordinate the installation of this work with other trades shall be made without any additional cost.

The data given herein and on the Drawings is as exact as could be secured, but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels shall be governed by the site conditions and the Architectural & Interior layouts.

10. SHOP DRAWINGS

10.1 **All the shop drawings shall be prepared on computer through Autocad System based on Architectural Drawings, site measurements and Interior Designer's Drawings. Within two weeks of the award of the contract, contractor shall furnish, for the approval of the Engineer-in-charge, two set of detailed shop drawings of all equipment and materials including layouts for all conduit layouts, distribution panels, switch boards, cabinets, special pull boxes, cable trays and any other requirement to be fabricated or purchased by the contractor.**

10.2 These shop drawings shall contain all information required to complete the Project as per specifications and as required by the Engineer-in-charge. These Drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other contractors. Each shop drawing shall contain tabulation of all measurable items of equipment/materials/ works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings.

Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer strictly from the manufacturers listed in Appendix-III.

When the Architect/Consultant/ Engineer-in-charge makes any amendments in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check print, for approval. The contractor shall submit further six sets of shop drawings to the Engineer-in-charge for the exclusive use by the

Engineer-in-charge and all other agencies. No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the approved shop drawing for the particular material/ equipment/installation.

- 10.3 Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow Engineer-in-charge /Consultant ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.
- 10.4 Manufacturers drawings, catalogues, pamphlets and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labelled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.
- 10.5 Samples of all materials like conduits, accessories, switches, wires, control cables etc shall be submitted to the Engineer-in-charge prior to procurement. These shall be submitted in two sets for approval and retention by Engineer-in-charge and shall be kept in their site office for reference and verification till the completion of the Project.
- 10.6 Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contract.
- 10.7 Where the contractor proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, wiring or any other part of the mechanical, electrical or architectural layouts; all such re-design, and all new drawings and detailing required therefore, shall be prepared by the contractor at his own expense and gotten approved by the Engineer-in-charge.
- 10.8 The contractor shall extend full cooperation to HVAC contractor in preparation of his coordinated services drawings. He shall issue floppies and hard prints of his shop drawings to HVAC contractor well in advance to complete the coordinated services drawings in accordance with schedule prepared by the Owner site representatives. Where the work of the contractor has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment.
If so directed by the Engineer-in-charge, the contractor shall prepare composite working drawings and sections at a suitable scale, not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost.
- 10.9 Within four weeks of approval of all the relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement, and itemized price list of recommended (by manufacturers) imported and local spare parts and tools, covering all equipment and materials in this contract.

The contractor shall make recommendation /advise to initiate action for procurement of spare parts and tools at the completion of project.

11. ACCESSIBILITY

The Contractor shall verify the sufficiency of the size of the shaft openings, clearances in wall cavities and suspended ceilings for proper installation of his conduits cables, cable trays, panels etc.. His failure to communicate insufficiency of any of the above shall constitute his acceptance of sufficiency of the same. The Contractor shall locate all equipment which must be serviced, operated or maintained in fully accessible positions. The exact location and size of all access panels, required for each concealed control damper, valve or other devices requiring attendance, shall be finalized and communicated in sufficient time, to be provided in the normal course of work. Failing this, the Contractor shall make all the necessary repairs and changes at his own expense. Access panel shall be standardized for each piece of equipment / device / accessory and shall be clearly nomenclature / marked.

12. MATERIALS AND EQUIPMENT

All materials and equipment shall conform to the relevant Indian Standards and shall be of the approved make and design. Makes shall be strictly in conformity with list of approved manufacturers as per Appendix - III.

The Contractor shall be responsible for the safe custody of all materials and shall insure them against theft or damage in handling or storage etc. A list of items of materials and equipment, together with a sample of each shall be submitted to the Engineer-in-charge within 15 days of the award of the contract. Any item which is proposed as a substitute, the contractor shall state the credit, if any, due to the Owner in the event the substitution is approved. All changes and substitutions shall be requested in writing and approvals obtained in writing from the Owner's site representative.

13. MANUFACTURERS INSTRUCTIONS

Where manufacturer has furnished specific instructions, relating to the material and equipment used in this project, covering points not specifically mentioned in these documents, manufacturer's instructions shall be followed in that case.

14. COMPLETION CERTIFICATE

On completion of the electrical installation, a certificate shall be furnished by the Contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local, state/central govt./ municipal / fire authorities concerned.

15. INSPECTION AND TESTING

Engineer-in-charge may carry out inspection and testing at manufacturer's works for this contract as per enclosed specifications. No equipment shall be delivered without prior written confirmation from the Engineer-in-charge. The contractor will intimate the date of testing of equipments at the manufacturer's works before dispatch. The successful tenderer shall give advance notice of minimum two weeks regarding the dates proposed for such tests to the department's representative to facilitate his presence during testing. The Engineer-in-charge may witness such testing. The cost of the Engineer's visit to the factory will be borne by the Department. Equipments will be inspected at the manufacturer/Authorized Dealers premises, before dispatch to the site by the contractor if so desired by the Engineer-in-charge.

Tests on site of completed works shall demonstrate the following:

That the equipment installed complies with specification in all respect and is of the correct rating for the duty and site conditions.

That all items operate efficiently and quietly to meet the specified requirements.

That all circuits are fully protected and that protective devices are properly coordinated.

That all non-current carrying metal parts are properly and safely grounded in accordance with the specification and appropriate Codes of Practice.

The contractor shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, and shall provide test certificate signed by a authorized person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the Engineer-in-charge.

If it is proved that the installation or part thereof is not satisfactorily carried out then the contractor shall be liable for the rectification of the same. Engineer-in-charge's decision as to what constitutes a satisfactory installation shall be final.

16. COMPLETION DRAWINGS

Upon completion of the work and before issuance of certificate of virtual completion the contractor shall submit to the Engineer-in-charge four set of layout drawings in progressive manner for individual systems drawn at approved scale indicating the complete wiring system as installed. Drawing shall be prepared on AUTO-CAD (latest version). Along

with the hard copies, the contractor shall submit copies of all drawings on CD and one set of all drawings on RTF shall also be submitted. These drawings must provide:

- a. Substation equipment layout & all power distribution panel layout.
- b. Single line power distribution diagram including control wiring.
- c. Cable Trays with number and size of cables installed.
- d. Run and size of conduits, inspection, junction and pull boxes.
- e. Raceways and Junction Boxes.
- f. Number and size of conductors in each conduit with phase identification.
- g. Location and details of distribution boards/panels, mains, switches along with phase balancing details.
- h. A complete wiring diagram as installed and single line diagrams showing all connections in the complete electrical system.
- i. Location of all earthing stations, route and size of all earthing conductors manhole.
- j. Layout and particulars of all LT cables.
- k. Instruction, maintenance and operation manuals including maintenance schedule for all equipment. Testing & commissioning reports of all electrical equipment.

17. OPERATING INSTRUCTION & MAINTENANCE MANUAL

Upon completion and commissioning of part Electrical system the contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract.

This shall be supplementary to manufacturer's operating and maintenance manuals. Upon approval of the draft, the contractor shall submit four (4) complete bound sets of typewritten operating instructions and maintenance manuals.

These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 4 year period of maintenance of each equipment.

18. MAINTENANCE DURING DEFECTS LIABILITY PERIOD

18.1 Complaints

The Contractor shall receive calls for any and all problems experienced in the operation of the system under this contract, attend to these within 10 hours of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist.

18.2 Repairs

All equipment that require repairing shall be immediately serviced and repaired. Since the period of Mechanical Maintenance runs concurrently with the defects liability period, all replacement parts and labour shall be supplied promptly free-of-charge.

SECTION G:- Check-list for Bid/Tender submission

List of Documents to be scanned and uploaded under cover-1 on e-tendering website and submitted up to the last date and time mentioned above in sealed cover-1 in office of IWD, IIT(BHU):

- a) **Self Certified copy of documents clearly stating the status of bidder to be uploaded.** OEM need not upload any such certificate.
- b) Documents regarding legal status of firm and written power of attorney of the signatory.
- c) Self certified copy of work completion certificate as per eligibility criteria.
- d) Scanned copy of technical eligibility criteria as mentioned at 1 (a) (i) & (ii), (b) and (c) as per section-B.
- e) Solvency certificate from bank and scanned copy of proof of submission of tender fee & EMD.
- f) Affidavit as per Sl. No. 1.2.2 of section-C.
- g) Turnover from CA, GST registration certificate, PAN card ESI, EPF etc.

List of document to be uploaded upto the last date & time mentioned above in cover-2 (Financial Bid):

- a) Duly filled in priced BoQ.
- b) Duly signed and scanned copy of priced BoQ in PDF format.

(Kindly note that no physical submission of duly filled in BoQ is required and it is to be uploaded only on e-tendering website).

**Sd-
MEMBER SECRETARY
INSTITUTE WORKS COMMITTEE
INDIAN INSTITUTE OF TECHNOLOGY (BHU)
VARANASI**

SECTION F:-TECHNICAL SPECIFICATIONS

ANNEXURE-A

Transformer

PROJECT INFORMATION

1. Project Proposed Data Centre At IIT(BHU), Varanasi
2. Name of Work Supply, Installation, Testing & Commissioning of
1 MVA, 11/0.433 KV Transformers Indoor type
3. Owner IIT(BHU), Varanasi
4. Nearest Town/City Varanasi
5. Nearest Railway Station Varanasi
6. Nearest Airport Varanasi
7. Site Conditions Ambient Temperature:

Maximum	48 °C
Minimum	5 °C
Relative Humidity	
Maximum%
Minimum%
Design Altitudeat Sea Level	

TECHNICAL SPECIFICATIONS

1. ELECTRICAL SYSTEM DETAILS

Transformers fed with 11 kV, 3phase, 50Hz. Fault Level assumed @ 250 MVA.

2. CODES AND STANDARDS

The Transformer and Accessories shall conform to the requirements of the following but not limited to, latest revision of all relevant Indian Standards or International Standards.

Colour of paint	IS 5
Ready mix paint, brushing Zinc Chrome plaster	IS 104
Ready mix paint, brushing, Priming plaster	IS 109
Insulating oil	IS 335
Testing of steel sheets and strips For magnetic circuits	IS 649
Solid press boards for electrical purposes	IS 1575
Code of practice for maintenance Of mineral insulating oil in equipment	IS 1866
Impulse Voltage testing	IS 2070
High voltage testing	IS 2071

Porcelain bushings	IS 2099
Determination of water contents in oil	IS 2362
Painting of Transformer	IS 2932
Porcelain Transformer bushings	IS 3347
Gs operated relays	IS 3637
Application guide for gas operated relays	IS 3638
Fittings and accessories for power transformers	IS 3639
Clamping arrangements for porcelain transformer bushings	IS 4275
Electric power connectors	IS 5561
Testing of specific resistance of Electrical insulating liquid	IS 6262
Method of test for power factor and	IS 6262
Dielectric constant of electrical insulating liquid	IS 8468
Guide for loading of oil immersed transformer	IS 6600
Determination of electric strength of Insulating oils	IS 6792
Oil impregnated paper insulated condenser Bushings	IS 12676
Degree of protection	IS 2147
Electrical insulation classified by Thermal stability	IS 1271
OLTC	IS 8468
Installation and maintenance of transformer	IS 10028
New Insulating Oils	IS-335
Thermal evaluation and Classification of Electrical Insulation	IS-1271
Code of practice for installation and maintenance of transformers	IS-10028
Power Transformer	IS-2026
Part I Power Transformer - General	
Part II Power Transformer - Temperature Rise	
Part III Power Transformer - Insulation levels and di-electric tests	
Part IV Power Transformer - Terminal markings, tapings and connections.	

Bushings for alternating voltages above 1000 V.	IS-2099
Fittings and accessories for power transformers.	IS-3639
Guide for loading of oil-immersed transformers.	IS-6600
Revised IS of Transformer	IS 1180

3. **DESIGN AND PERFORMANCE REQUIREMENTS**

Power transformer shall be oil filled type ONAN cooled. The transformer shall be in compliance with relevant standards. Transformers shall operate without injurious heating at the rated capacity within +10 percent of the rated voltage of that particular tap. Transformers shall be capable of delivering the rated current at a voltage equal to 105 percent of the rated voltage without exceeding the limiting temperature rise. Overloads shall be allowed within the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, or other auxiliary equipment shall apply. 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

4. **CONSTRUCTION**

4.1. **TANKS**

The tanks shall be fabricated from mild steel plates and shall be designed to withstand the pressure, which will be encountered under normal operation and abnormal conditions such as short circuit. Base channels shall be suitably reinforced to prevent any distortion during lifting. Oil tight gaskets shall be provided between the joints. The tank and other accessories shall be painted with heat resistant synthetic enamel paint of approved shade. Robust skid under base and fixing angles shall be provided to prevent bulging / warping.

Tanks shall be mounted on bi-directional rollers. When detachable radiators are fitted, isolating valves shall be provided to permit removal of any radiator unit without emptying the tank. Radiators shall be securely braced to prevent undue vibration. In case of separate cooling units, isolating valves shall be fitted in both top and bottom of connecting pipes. Tanks shall be shot-blasted internally and externally to remove rust and welding scale. All tanks shall be tested at a pressure of 0.35 kg/sq.cm. in addition to the normal oil head. Immediately after shot-blasting, the exterior of the tank shall be given a coat of Zinc Chromate primer incorporating a rust inhibitor. All fasteners and bolts, etc. shall be galvanized or Zinc passivated.

All transformers rated up to and including 500 KVA rating shall have fixed radiators, Transformers rated above 630 KVA shall have detachable type radiators.

Each transformer shall be provided with following valves on the tank:

- Drain valves so located as to completely drain the tank
- Combined filling and filter valve at top of the tank of 50mm size
- Oil sampling valves
- One 15mm air release filing

4.2. **CORE**

The core shall be assembled from special scale free high grade cold-rolled grain oriented silicon steel with minimum loss with heat and oil resistant insulation. The cores and windings shall be suitably braced to prevent displacement or distortion of the coil during short circuit. Core clamping bolts shall be insulated with synthetic resin bonded paper or equivalent. Mitred joints of lamination shall be adopted.

All parts of magnetic circuit shall be bonded to earth system.

4.3. **COPPER WINDING**

All coils shall be wound from high conductivity copper annealed to remove spring tension. The design and arrangement of winding and their insulation shall be to ensure uniform distribution of voltage surges among all coils and windings.

The windings shall be subject to thorough shrinking and seasoning process to avoid absorption of moisture.

The windings shall be properly insulated from the core and between themselves.

The coils shall be axially and radially supported in such a way that deformation does not take place under short circuit

Adequate axial strips and blocks, number of spacer rows and number of anchoring and bracing tapes etc. shall be judiciously selected.

The core windings shall be initially dried under vacuum and then be placed in their tank and shall be treated in a vacuum Drying oven. Initially the heating shall be continued until the winding attain a temperature of about 1000C determined by measurement of winding resistance. The transformer shall be then subjected to vacuum. After obtaining satisfactory results, hot oil shall be allowed into the transformer under vacuum. This oil shall be then circulated through the transformer by the oil de-gasing plant until all gases trapped in the core and windings and insulation are removed and to ensure a high degree of stability in the insulation structure and early attainment of mature condition of insulation concerning di-electric strength.

4.4. **TERMINAL BOXES**

Windings shall be brought out and terminated on indoor bushings, cable boxes or bus duct chamber, which will be located as specified on data sheets. The orientation and location of winding terminals shall be indicated in specific requirement. When indoor bushings are specified they shall be supplied complete with adjustable spark gap and terminal connectors suitable for specified size of XLPE Cables (11kVgrade).

The cable box shall be complete with gaskets between the joints. The cable boxes shall be provided with disconnecting chamber wherever specified in the data sheet.

Cable box for termination of high voltage PVC / XLPE cables shall be suitably dimensioned for air insulated termination. The air insulated terminal box shall be sized to permit use of all type of end termination kit including "PUSH-ON" type end termination kit. Such cable box shall also have arrangements for grounding the armour of PVC / XLPE cables inside the cable box.

Terminal chamber for bus duct termination shall have gasketed cover plate bolted to it. A separate inspection cover shall be provided to facilitate connection and inspection.

For transformers having provision for terminations TPN bus duct on 433V side neutral of star connected secondary winding shall be brought out to a secondary terminal chamber. A CT Turret type shall be mounted at the neutral terminal with CT secondary wired up to the marshalling box.

An extra neutral bushing shall be provided for neutral grounding of transformers having secondary voltage of 433 V. In such cases, neutral CT shall be mounted before bifurcation of neutral.

4.5. **MARSHALLING BOX**

Weather proof type marshalling box shall be provided on the front side of the transformer tank and not on radiator. It shall be provided with terminals for oil temperature indicator, winding temperature indicator, magnetic oil gauge and Buchholz Relay and other control terminals as applicable. The box shall be complete with wiring up to terminal box. Whenever the control voltage is specified as D.C, the marshalling box shall be complete with D.C. Contactors and wiring. The gaskets provided shall be non deteriorating type and suitable for outdoor installation. The box shall have hinged door with locking arrangement. The marshaling box shall have removable undrilled gland plate at bottom. Inside the marshalling box, all the instruments shall be wired with 1.5sq.mm. PVC Cu wires. Marshalling box shall be mounted at readable / approachable level.

4.6. **RATING PLATES**

All transformers shall be provided with rating plates conforming to Indian Standards. The rating plates shall be provided on the front side of the transformer.

4.7. **OIL**

The transformer shall be supplied complete with first filling of oil. The oil shall conform to relevant Indian Standards. In case the Conservator / Radiator / Cooling tubes of the transformer are sent separately, sufficient quantity of oil shall be sent loose including 10% additional oil in non returnable sealed drum. The transformer oil shall conform to IS-335.

4.7.1. The transformer and all associated oil filled equipment shall be supplied along with sufficient quantity of oil, free from moisture and having uniform quality throughout for first

filling of the tank, coolers and radiators along with 10% extra oil for topping up in non returnable containers, suitable for outdoor storage. No inhibitor shall be used in the oil.

4.7.2. The design and materials used in the construction of the transformer shall be such as to reduce the risk of the development of acidity in the oil.

4.8. **BUCHHOLZ RELAY**

The transformer shall be complete with Buchholz Relay of double float type with isolating valves on either side and distance pipe. The relay shall be complete with independent voltage free alarm and trip contacts.

Separate buchholz relay shall be provided for main tank and OLTC chamber. For OLTC chamber the relay should be single float type with one normally open and one normally close contact.

4.9. **OIL AND WINDING TEMPERATURE INDICATORS AND MAGNETIC OIL GAUGE**

Oil temperature indicator shall be complete with maximum reading pointers, alarm and trip contacts. The indicators shall be of 150 mm dia. circular type and shall be mounted inside Marshalling Box. They shall be complete with setting keys. The transformer shall be provided with 150 mm dia. magnetic oil gauge indicator with low level alarm contacts and minimum / maximum level marking on front side of the transformers. The minimum oil gauge indicator shall be provided on the conservator side.

Winding temperature indicator (wherever called for in specific requirements) shall be provided. This shall be 150 mm dia. and having maximum reading pointer, alarm contacts and trip contacts.

All these contacts shall be wired up to terminals provided in Marshalling Box.

All contacts shall be suitable for making and breaking D.C. inductive current. Minimum rating shall be 2 Amp, 110V D.C.

4.10. **COOLING METHOD**

All transformers shall be mineral oil immersed and natural air cool type (ON/AN).

4.11. **TAPPINGS AND CONTROL**

Tapping shall be provided on high voltage side and shall be capable of carrying the external short circuit current. Percentage and Number of Taps shall be as specified in specific requirements.

Off circuit, tap-changing gear shall have an external operating handle mounted on the transformer side with locking arrangement and position indicator.

4.12. **AXLES AND WHEELS**

The transformer shall be provided with bi – directional plain rollers and axles of suitable dimensions and so support that under service conditions, they shall not deflect sufficiently to interfere with the movement of the transformer. Suitable locking arrangement shall be provided to prevent the accidental movement of the transformer. All wheels should be detachable and shall be made of cast iron or steel.

5. DUTY REQUIREMENT

- 5.1. The Transformer and all its accessories like current transformers etc. shall be designed to withstand without injury, the thermal and mechanical effects of any external short circuit to earth and of short circuits at the terminals of any winding for a period of two seconds. Transformer shall be capable of withstanding thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any winding.
- 5.2. The transformer shall be capable of being loaded in accordance with IS: 6600. There shall be no limitations imposed by bushing, tap-changers, etc.
- 5.3. The overload capacity of the transformer and their emergency short time ratings call for any schedule shall be furnished.
- 5.4. The transformer shall be suitable for continuous operation with frequency variation of +/- 5% without exceeding the specified temperature rise.
- 5.5. The transformer shall be capable of being operated without danger on any tapping at the rated MVA with voltage variation of +/- 15% corresponding to the voltage of that tapping and at the same time with a frequency variation of +/- 5% below normal.
- 5.6. Similar ratio transformers shall operate satisfactorily in parallel with each other.
- 5.7. Radio interference and noise level:
 - 5.7.1. The transformer shall be designed with particular attention to the suppression of maximum harmonic voltages, especially the third and fifth, so as to minimize interference with communication circuits.
 - 5.7.2. The noise level, when energized at normal voltage and frequency, shall not exceed, when measured under standard conditions, the value specified by NEMA.
- 5.8. The maximum flux density in any part of the core and yoke at normal voltage and frequency shall be such that the flux density under over voltage conditions shall not exceed the maximum permissible values for the type of core and yoke material used. The type of material and values of flux density in the core/yoke for the 100%, 110%, 125% and 140% and the hysteresis characteristics curves shall be submitted.
- 5.9. Transformer shall be capable of operate below the knee of the saturation curve at 110% voltage to preclude Ferro – resonance and non-linear oscillations.
- 5.10. Transformer shall be capable of operating under natural cooled condition to the specified capacity. Transformer shall be capable of operating continuously in accordance with the application standard loading guide at their rated MVA and at any of the specified voltage ratio ratios.

6. CENTRE OF GRAVITY

The Centre of gravity of the assembled transformer shall be low and as near the vertical centreline as possible. The transformer shall be stable with or without oil. If the centre of gravity is eccentric, relative to track either with or without oil, its location shall be shown in the 'Outline' drawing.

7. TESTS

Transformers shall be completely assembled at Works to ascertain that all parts fit correctly.

Routine Tests

Routine tests as per specified standards shall be performed on all transformers. The following additional points may be noted

- i) 2kV withstand test for all wiring.
- ii) Zero phase sequence impedance test
- iii) Dissolved gas analysis
- iv) Temperature rise test

- v) Voltage ratio at all taps
- vi) Resistance of each winding of each phase shall be measured at principal and at all the taps and corrected to 75 deg. C.
- vii) No load loss and exciting current shall be measured at rated frequency at 90%, 100% and 110% rated voltage. These tests shall be done after impulse tests if the latter is conducted. Exciting current shall be measured on each phase and recorded. Form factor shall be noted during the test and included in the test report.
- viii) Magnetic balance test.
- ix) Calibration of temperature indicators and relays.

Type Tests- CONTRACTOR shall furnish type test certificates along with the Tender. In the absence of the same, CONTRACTOR shall carry out the type tests without any cost implication to the Client. Test certificates for short circuit test and Impulse test conducted for similar transformer shall be furnished. Test Reports Test results shall be corrected to a reference temperature of 75 deg. C. Two copies of preliminary test results shall be submitted for the Clients approval before despatch of transformer. Additional bound copies of complete test results including all tests on transformers, auxiliaries, and current transformer characteristics shall be furnished with the transformer

8. LOSSES

Tenders will be evaluated based as mentioned below:

No load losses:
Load losses:

For the purpose of evaluation of Tenders, the quoted load losses and iron losses will be increased to take into consideration tolerance as permitted by applicable standards, in the event the losses are indicated exclusive of tolerance.

Should the losses as measured on the transformer after manufacture be found in excess of the guaranteed losses with plus tolerance, the CONTRACTOR shall pay to the Client , penalty charges based on the capitalisation of cost .

9. ON LOAD TAP CHANGER (OLTC)

- 9.1. Whenever specifically specified, high speed on load tap changing gear shall be mounted on the transformer. The OLTC gear shall have diverter resistance or reactance and the current diverting contacts shall be housed in a separate oil chamber segregated from the main tank of the transformer. The contacts shall be accessible for inspection and shall be replaceable type. Separate Buchholz Relay shall be provided for OLTC tank.

Oil filled compartment shall be provided with filling plug, design valve with plug air release vent, inspection opening with gasketed and bolted cover. OLTC driving mechanism shall consist of:

- a) Suitable motor rated for 433V, 3 phase, 50 Hz AC squirrel cage with gear.
- b) Energy accumulator with springs.
- c) Selector wheel and arm limit switches to prevent motor over travel in either direction.
- d) Slip clutch.

- 9.2. OLTC shall be provided with following modes of control.

- a) Manual and Electrical mode from local on the transformer itself.
- b) Electric mode from remote manually.
- c) Electric mode from remote automatically through voltage sensitive relay.
- d) Individual / Parallel control on a master / follower.

9.3. Following technical features shall be incorporated in OLTC.

- a) Device to ensure positive and full completion of tap change once it is initiated even if power fails.
- b) Interlock to cut off electrical control automatically in case manual mechanical control is initiated and vice-a-versa.
- c) Interlock to cut off a counter impulse for a reverse tap change, being initiated during a progressive tap change and until the mechanism comes to rest and resets circuits for a fresh operation.

9.4. **LOCAL PANEL FOR OLTC (INTEGRAL TO OLTC)**

Local OLTC panel shall be suitable for indoor location. Local panel to be mounted on the transformer tank for operation of OLTC and shall consist of:

- a) High torque electric motor suitable for 433 volts, three phase.
- b) Motor drive and energy accumulator.
- c) Phase and neutral isolator, fuse, forward and reverse contactors and overload relay.
- d) Local remote selector switch (lockable in both positions)
- e) Raise / Lower push buttons.
- f) Raise / Lower limit switches.
- g) Auxiliary transformer, if required.
- h) Indicating lamps shall be provided to indicate following faults. One common fault condition shall be wired for remote annunciator.
 - i) AC Failure.
 - ii) Drive motor auto trip.
 - iii) Tap change delayed.
- i) 240V, 50 Hz, AC space heater with switch and HRC fuses.
- j) Mechanical digital operations counter with resetting arrangement.
- k) Interior lighting fixture with switch and HRC fuse.
- l) Mechanical tap position indicator.
- m) Necessary relays, contactors, etc. for remote control of OLTC (relay shall be EE make)
- n) Terminal blocks, internal wiring for power and control cables.
- o) Gasketed and hinged door with locking arrangements.
- p) Removable undrilled gland plate for cable entry.
- q) Interlock between manual and electric operation.
- r) Stepping relay.

It shall be possible to operate tap changer manually by handle. A micro switch shall be provided which shall cut off electrical operator in the manual mode.

9.5. **REMOTE TAP CHANGER CUBICLE (RTCC)**

A separate indoor mounted remote tap changer cubicle shall consist of following:

- a) Control supply transformer with suitable isolators and HRC fuses on either sides.
- b) Supply on indicating lamp.
- c) Auto manual selector switch.
- d) Raise lower push buttons.
- e) Digital tap position indicator.
- f) Master follower sequence selector switch.
- g) Out of step relay.

- h) Automatic voltage regulating relay with time delay element (AVRR).
- i) Lamp for tap changes in progress with suitable bell or alarm other than the one provided for annunciating faults.
- j) Voltmeter with HRC fuses.
- k) Annunciation windows with alarm and alarm cancellation to indicate following faults:
 - i) Drive motor auto tripped.
 - ii) Tap change delayed.
 - iii) Lower limit reached.
 - iv) Upper limit reached
 - v) Out of step
 - vi) AC failure
 - vii) Buchholz relay alarm on OLTC
- l) 240V, 50 Hz, AC space heaters with switch and HRC fuses.
- m) Interior lighting fixtures with ON-OFF switch and fuses.
- n) Terminal blocks, internal wiring for power and control cables.
- o) Gasketed and hinged doors with locking arrangement.
- p) Removable undrilled gland plate for cable entry.
- q) Sequence selector switch for parallel operation.

9.6. Any other components / equipments required for OLTC's operation shall be deemed included.

10. **JACKING PADS**

The Jacking Pad base extension shall be such that it shall be possible to locate a 3-ton Jack below the Pad.

11. **DRAWING AND DOCUMENTS**

The Supplier will be required to furnish all the necessary drawings, data etc. of the equipment with appropriate "status" stamp in adequate number of copies as indicated below.

All drawings submitted for approval shall contain the name of the Client, Project Title, Drawing Title, Scale, and Supplier Drawing Number, Date of Drawing etc. in the lower right hand corner (The drawing sheet should be in A-3 Size).

The submission of drawings and data shall be as per the manufacturer's standard and to the satisfaction of the client.

While submitting Documents, the information shall be clearly indexed, flapped and filed in a folder of the Quality, which is expected for final Documentation.

Vendor to note that his final invoice will be cleared only after submission and acceptance of final record documentation. 5% of the order value is considered for above.

11.1. DRAWINGS & DOCUMENTS SCHEDULE

Following drawings/documents shall be provided along with order acceptance for approval/review:

- a. General Arrangement drawing. – 3 (Sets in A-3 Size)
- b. Connection diagram - 3 Sets (Sets in A-3 Size)
- c. Type Tests certificates for Information – 3 Sets (Sets in A-3 Size)

11.2. Operation maintenance manual & Inspection Tests Certificates (Routine Tests) - 3 Sets for Reference & Records along with final invoice.

12. **SPARES**

12.1. Commissioning Spares

The Supplier shall include the commissioning spares along with the main equipment as per the Supplier's experience, for replacement of damaged or unserviceable during commissioning at site.

- 12.2. Supplier shall quote spares separately for two years Operation & Maintenance of equipment.
- 12.3. Supplier will provide one set of special tools & tackles required for operation maintenance & inspection of the equipment along with the delivery of the equipment.
- 12.4. The Supplier will provide the all the addresses and particulars of his Sub-Suppliers while placing the order on vendors for equipment covered under the Contract and will further ensure with his vendors that , if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
Vendor shall quote for recommended spares for two years of satisfactory operation with unit price.

13. STATUTORY REGULATIONS

All transformers shall conform to the requirement and shall be acceptable to local statutory authorities including Electrical Inspectorate. (Directorate of electrical safety Govt. of UP)

14. SPECIFIC REQUIREMENTS

Specific requirements shall be additionally to that indicated in the Single Line diagram. Vendor shall furnish Technical Particulars for transformer for client's approval.

15. REJECTION

Owner may reject any transformer if during tests any of the following conditions arise:

- Load loss exceeds the guaranteed value by 20% or more.
- Impedance value differs the guaranteed value by + 10% or more.
- Oil or winding temperature rise exceeds the specified value by 5 Deg oC.
- Transformer fails on impulse test.
- Transformer fails on power frequency voltage withstand test.
- Transformer is proved to have been manufactured not in accordance with the agreed specification

16. DATA TO BE FURNISHED BY THE VENDOR ALONG WITH OFFER

Positive Sequence impedance at maximum voltage tap.
Positive Sequence impedance at minimum voltage tap.
Zero sequence impedance at principal tap.
Efficiency at 75 Deg C winding temperature
At full load
At 75% full load
At 50% full load.
Maximum efficiency and load at which it occurs
Regulation at full load at 750C winding temperature at
Unity power factor
0.85 power factor lag.
Resistance per phase at
Primary winding: ohms
Secondary winding: ohms
Conductor area (sq. mm) and current density (amp / cm2)
Primary winding
Secondary winding

Type of winding
Primary
Secondary
Insulating materials for inter turn insulation
Primary winding
Secondary winding
Insulating materials for inter winding insulation
Insulating materials between
Winding and core
Laminations of core
Make, type, dial size, number of contacts and contact ratings current and voltage rating for following items
Magnetic oil level gauge
Dial type thermometer
Winding temperature indicator
Gas and oil actuated relay
Thermal withstand capability under full short circuit conditions, in terms of number of times of occurrence of short circuit and corresponding anticipated percentage reduction in transformer life. Relevant calculation shall be submitted.

DRAWINGS The following drawings shall be submitted for the Clients 'S approval in the stipulated time General outline drawings as submitted with the bid
General outline drawings showing plan, front elevation, and side elevation, with all fittings and accessories, locating dimensions of cable entries, earthing terminals, foundation/floor fixing details, jacking pads and weights of the following
Marshalling box Cable boxes Disconnecting chambers Bushings Plan, elevation, terminal details, mounting details, make and type number, current and voltage rating, creepage distances and principal characteristics. Rating and diagram plates
Marshalling box terminal connections wiring diagram.

17. TECHNICAL DATA

A. For 1000 KVA Distribution Transformer.

Sr. No	Description	Distribution Transformer
---------------	--------------------	---------------------------------

1	No. of Transformers
2	Maximum Continuous Rating (KVA) with ONAN coolingKVA
3	Temperature raise above ambient of 50Deg.C	
	a. Winding	55
	b. Oil	50
4	Maximum flux density in any part of core of rated voltage and frequency	1.7 Tesla
5	Over fluxing withstand requirements	
	a. 110%	Continuous
	b. 125%	10 Sec.
6	Rated Voltage in kV	
	a. HV winding
	b. LV winding	0.433
	Voltage Variation	+/- 10%
7	Vector Group	Dyn11
8	Rated Frequency	50Hz
	Frequency Variation	+/- 3%
9	Neutral Earthing	Effectively Earthed.

10	Tap Changer	
	a. Type	On load
	b. Tapping Range	+/- 15% in Step of 1.25.
	c. Make	
11	Percentage Impedance	6.25 %
12	Insulating Oil	Confirming to IS :335
13	Insulation Level In kV	
	(Highest/ Power frequency/Impulse)	
	a. H V	24/50/125
	b. L V	1/3
14	Maximum current Density of winding	300 Amps/Sq.cm
15	Termination arrangement	
	a. H V	Cable Box
	b. L V	4000A Al. Sandwich Busduct
16	Supply of Neutral bushing CT rating	Yes

DATA SHEET

(To be submitted by Supplier along with offer in this format only)

Sr. No	DescriptionKVA Dist. Transformer
1	Name of the Supplier	
2	Make	
3	Address	
4	Contact Person	
5	Rating of transformer Offered	
	a. Primary Voltage	
	b. Secondary voltage	
	c. Rating	
	d. Type	
	e. Vector Group	
6	Connection	
	a. Primary winding	
	b. Secondary winding	
7	Flux density considered	
8	Insulation Level	
	a. Primary winding	
	b. Secondary winding	
9	Impedance	
10	Temperature raise	
11	Tap changing arrangement	
12	Percentage regulation	
	a. At 0.8 lag power factor	
	b. At unity power factor	
13	Efficiency	
	a. At 50% Load at Unity Power Factor	
	b. At 50% Load at 0.8 lag Power Factor	
	c. At 75% Load at Unity Power Factor	
	d. At 75% Load at 0.8 lag Power Factor	
	e. At 100% Load at Unity Power Factor	
	f. At 100% Load at 0.8 lag Power Factor	
14	Loss in kW	
	a. No Load loss	
	b. Full Load loss at unity power factor	
	c. Full Load loss at 0.8 lag power factor	
15	Make of Oil	
16	Quantity of Oil	

17	Class of insulation	
18	Neutral bushing CT rating/5A CL. PS
19	Capitalization formulae for evaluation of loss	
20	Accessories and fitting offered	
21	Transformer Size - Over all dimensions/weight	
22	Hours of operation per year	
23	Life of equipment	
24	Temp. correction factor	

TEST REPORTS

Test results shall be corrected to a reference temperature of 75 Deg. 0C.

- 20.1 Two copies of test results shall be submitted for Clients approval before dispatch of transformer.
- 20.2 Additional bound copies, as required by the Client of complete test results including all tests on transformer, bushing, shall be furnished

HT Switchgear**TECHNICAL SPECIFICATION****1. STANDARD**

The HT Switchgear shall conform to the requirements of the following but not limited to, latest revision of relevant Indian Standards or equivalent British or any other International Standard Specifications.

IS-5	Colors for ready mixed paints and enamels.
IS-722	AC electricity meters.
IS-1248	Direct acting Indicating analogue electrical measuring instruments and their accessories.
IS-2705	Current Transformers. Part I to IV
IS-3156	Voltage Transformers.
IS-3231	Electrical relays for power system protection.
IS-3427	Metal enclosed switchgear and control gear for voltage above 1000V but not exceeding 11000V.
IS-3618	Phosphate treatment of iron and steel for protection against corrosion.
IS-4483	Preferred panel cut out dimensions for electrical relays - flush mounting IDMTL relays.
IS-5082	Wrought aluminum and aluminum alloy bars, rods, tubes and sections for electrical purposes.
IS-5578	Guide for marking of insulated conductors.
IS-6005	Code of practice for phosphating of iron and steel.
IS-6875	Control switches (switching devices for control and auxiliary circuits including contactors relays) for voltages upto and including 1000V AC and 1200V DC - Push Button and related control switches.
IS-9046	AC contactors of voltages above 1000V upto and including 11000V.
IS-13118	High Voltage alternating current circuit breakers.
IEC-298	MV metal-enclosed switchgear
IEC-265	MV Switches
IEC-129	AC Disconnections and Earthing Switches
IEC-56	MV AC Circuit Breakers
IEC-801	Monitoring and Control
IS 1388 IEC 56	Circuit Breakers
IS:2544	Busbar support insulators
IS:13947, IS:3427,	Degree of Protection
IS:9385, IEC:282	High Voltage Fuses
IS:722	AC Electricity Meters
IS:4171, IEC:694	Copper Busbars
IEC:129	Offload isolators
IS:6005	Code of Practice for Phosphating Iron and Steel
IS:9224	HRC Fuses

2. HT Breaker

2.1. CONSTRUCTION

The switchboard shall be sheet steel fabricated, free standing, dust and vermin proof, totally enclosed, fully compartmentalised, floor mounted type. The circuit breaker panels shall be draw out, multi-panel unit type unless otherwise specified. The unit shall be robust design to withstand the stresses encountered in the event of an electrical fault. The switchboard shall be constructed in suitable shipping sections for the purpose of shipping to site and correct re-erection on prepared foundations.

Adequate lifting facilities such as hooks for ease of handling at site shall be provided. These hooks when removed shall not leave any openings in the switchgear. Front / Rear access shall be available to all components in each cubicle which requires adjustment, maintenance or replacement. Rear access shall be available to all cable boxes and glands and multi-core terminal blocks. Rear side of cable chamber shall be provided with additional wire-mesh with high voltage danger notice board. Each unit of switchgear shall have necessary interior sheet metal barriers to form separate compartments for buses, switching devices, entering cable connections, etc. Each compartment must be constructed and segregated to confine the damage caused by an internal fault to that compartment. Automatic safety shutters shall be provided to shroud bus side and cable side main disconnecting contacts of the circuit breaker when the circuit breaker is taken to test position. Bus bar shutter shall be Permalli / Hylams of minimum 4.75 mm and shall have red paint

The instrument / control chamber shall incorporate the indicating instruments, lamps and components of the control circuit. The instrument chamber shall be provided with a separate door, which can be opened when the circuit breaker is 'ON'. The instrument chamber shall also be totally segregated from the rest of the panel. Wherever equipments are mounted on the door, the wiring shall be with flexible wires. The wires shall be neatly bunched and clamped and shall be sufficiently long so that the door can be opened without causing unnecessary stress on the terminations at the instruments. All instrument and relays belonging to one panel shall be mounted on the same panel.

Pressure release plates/valves shall be provided for different compartments.

Doors of all switchgears shall be provided Synthetic or neoprene gaskets to prevent entry of vermin and dust. Steel screws, bolts and washers shall be plated.

240V 15A SPN Industrial socket outlet complete with switch and HRC fuse shall be provided in each cubicle and lamp should be provided in each cubicle.

The switchgear shall be fully draw-out, metal clad type and shall have Vacuum circuit breaker One vertical panel shall include one feeder. Extension chambers at rear portion shall be considered for termination of large size / number cables, if required. Necessary dummy cubicles complete with horizontal busbars, space heaters, power, control and annunciation, busbars / cables shall be included to avoid interference of beams with cable openings wherever required.

2.2. PAINTING AND FINISHING

All metal surfaces shall be thoroughly cleaned and degreased, pickled and phosphate and chrome passivated pre-treated should be carried out. Panel shall be powdered coated in RAL-7032/35 (MAT-Finish)

2.3. BUSBARS

All bus bars and their main current carrying connections shall have the same sectional area throughout their length. Bus bars shall be sized to continuously carry the rated current without exceeding the final temperature of 85 Deg. o C. and the same shall be capable of withstanding the full fault level without any deformation. The rating of bus bars shall be same as that of incoming breaker rating. Bus bars shall be of aluminium (unless otherwise mentioned in specific requirements) with proper plating at joints. The bus bars shall be provided with cast epoxy sleeving or nylon film of suitable insulation class throughout their lengths and vertical droppers and colour coded. Joints in bus bars shall be provided with shrouds. For long bus bars, suitable expansion joints may be provided.

The bus bars shall be supported by insulators of non-carbonising material resistant to acid and alkali and having non-hygroscopic characteristics and braced to withstand the fault level specified.

The clearance between live parts and the earth shall be as per the Indian Standard. In case of copper to aluminium connections, proper treatment shall be given to minimize the bimetallic effect.

Bus bars and connections shall be secured in such a manner that the insulators are not subjected to bending forces under short circuit conditions. Dynamic stresses shall be calculated on the basis of peak short circuit current.

The vertical droppers shall be sized to carry continuously at least the rated current of the connected circuit breaker.

It shall be possible to extend the bus bars at either end of the switchboard for addition of future units. Both ends of bus bars must be suitably drilled for this purpose. Where bus bars are taken through the partitions of adjacent cubicles, shrouding shall be provided to prevent spread of fire from one unit to the next.

Thermal design of the bus bars shall be based on installation of the switchgear in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure.

2.4. EARTHING

A copper earth bus of size of suitable .Cu bus bar shall be provided at the bottom extending through the entire length of switchgear. Each stationary unit of the cubicle shall be earthed directly to the earth bus through a contact bar so that the carriage is earthed at all times except when the primary disconnects are separated by a safe distance. Suitable clamp type connectors shall be provided at both ends of earth bus to suit external earthing conductor. Also hinged doors of the cubicle base plate of C/T and P/T shall be effectively earthed. Earth bus shall protrude outside the extreme end panels and by at least by 100 mm.

One set of earthing accessories shall be supplied with the switchgear for earthing of the outgoing side of a feeder or 3 phase bus bars of the switchgear either through earthing facility comprises truck to be inserted in place of circuit breakers, separate earthing trucks shall be supplied where earthing is achieved through circuit the earth device unless the circuit breaker is in open and isolated position

2.5. SEGREGATION OF EQUIPMENT

For safety reasons, each panel (Vertical Section) shall be divided into compartments to keep main equipment segregated.

Partitions / separate compartments will be provided for:

- Bus bar compartment
- Cable termination compartment and instrument transformers.
- Circuit breaker
- Metering & Relaying Devices

Bus bar compartment shall have degree of protection of IP-41. All other compartments shall have degree of protection of IP-41.

Circuit breaker shall have Service-Test - Fully isolated positions with positive indication for each position.

2.6. SAFETY INTERLOCKS

Switchgear shall be provided with all necessary safety interlocks and features. Mechanical safety interlock shall be provided to prevent circuit breaker from following operations:-

1. Racking in or out of the service position when the breaker is closed. Racking in or out shall be possible when the front door is closed and breaker in open position. Operation of the breaker shall be possible in the service, test and isolated positions.
2. Racking in unless self-aligning control contacts / control plug is fully engaged.
3. Closing in any intermediate position between test & service position.
4. Automatic safety shutters shall fully cover the female primary disconnects when the breaker is withdrawn to test position.

2.7. POTENTIAL TRANSFORMERS

All PT's shall be epoxy cast resin type

All PT's shall be draw out type and connections between the bus bars and PT shall be completely shrouded. Automatic shutter shall be provided to shroud the bus bars when PT is taken out. For Incomer feeders PT may be mounted on circuit breaker truck and shall be of fixed type since the same are connected on the incoming cable side.

It shall be possible to remove voltage transformer from the circuit breaker whenever required

HRC fuse protection shall be provided on primary as well as secondary side. The primary connection shall be disconnected before PT or its primary fuses become accessible.

2.8. CURRENT TRANSFORMERS

All current transformers shall be epoxy cast resin type.

All current transformers shall be capable of withstanding dynamic and thermal stresses originated by short circuit fault current for one second.

Terminals shall be provided with plastic covers to prevent inadvertent contact.

2.9. CABLETERMINATION

HT switchgear will be connected to transformers or other equipment by HT XLPE cables. 150 Sq.mm. Al. All power and control cables shall enter the switchgear from bottom. Sufficient space and support arrangement shall be provided in the cubicles to accommodate cables. The number of cables per circuit sizes and types shall be intimated to the supplier. If the required number of cable terminals cannot be accommodated in the circuit breaker chamber, additional dummy panel with bus extension suitable for the number of cables to be terminated shall be provided.

The cable sockets shall be at such angle that the cable tails may be brought up for termination with minimum bending and setting.

Terminals shall be located sufficiently away from gland plates or cable boxes to facilitate easy connection. If distance is not sufficient, adaptor panels shall be provided.

Minimum distance between gland plate and termination shall be 700 mm. Additional termination points shall be provided in the outgoing bus links for power factor correction capacitor cable termination.

In case cable terminations cannot be accommodated inside panel a suitable box for mounting of bottom/rear panel shall be supplied by vendor. Earth strip shall also be brought to this box. In lieu of this a dummy panel may be provided.

The switchboard shall be supplied complete with supports for clamping outgoing and incoming cables. Terminal blocks shall not be used to support cables.

2.10. CONTROL CABLES

Control cables shall enter the switchgear from the bottom. Separate And adequate space shall be provided for termination. Supporting facilities shall be provided for clamping the control cables. All control cables shall be 2.5 sq.mm Cu conductors.

2.11. WIRING AND FERRULES

All control signalling, protection and metering wiring shall be by PVC insulated, 650 KV grade, copper stranded conductor wires of min. 2.5-sq.mm section. For CT secondary circuit wires of 2.5 sq.mm copper conductor min. shall be used. Wiring shall run in enclosed channel and shall leave at least 25% spare space for future use. Wires for connection between moving parts shall be flexible stranded copper conductors and the same shall be soldered at the ends before connections are made.

At least 10% spare terminals shall be provided in each terminal strips.

The switchgear Supplier shall do all inter-panel control wiring. The inter-panel wiring shall be taken through PVC sleeves or suitable rubber grommets.

2.12. CONTROL SUPPLY

External DC control supply shall be provided for tripping and closing circuits to one panel. Also external AC control supply shall be provided for auxiliary power and heater circuits to one panel. Supplier shall provide suitable control switch and fuse at the point of receiving control supply. Supplier shall be required to loop both these supply to all the panels in case of multi breaker panels forming one unit. Each panel shall also have control supply switch and HRC fuses or MCBs for isolation. One DC feeder shall be provided for each bus section. The bus coupler panel may be fed from any of the two supplies.

a. 24V DC supply (Internal Power Pack)

b. 240V AC supply shall be provided for feeding space heaters, etc.

2.13. SPACE HEATERS

The cubicles shall be provided with space heaters to prevent moisture condensation and maintain cubicle temperature 5o C above the ambient. The space heaters shall be located at the bottom of the switchboards and shall be controlled through a thermostat with an adjustable setting, a manually operated switch. The thermostat shall preferably be located in the metering / relay chamber.

2.14. VACUUM INTERRUPTER

Circuit breakers shall have completely sealed interrupting units for interruption of arc inside the vacuum. It shall be possible to isolate easily the vacuum interrupter unit from the breaker operating mechanism for mechanical testing of the interrupter to check loss of vacuum.

The circuit breakers shall be complete with surge arrestors to provide protection to the equipment controlled by the breaker, against switching surges. Over voltage produced by the circuit breaker during switching off induction motor or switching on / off of transformer shall be limited to 2.5 times the peak value of rated phase to neutral voltage. Surge absorbers of either Z or Cr type with non-flammable, nontoxic liquid filled capacitors shall be used and located in switchgear cubicle if the over voltage limit exceeds. Surge diverters shall be provided for vacuum circuit breakers.

2.15. CIRCUIT BREAKER OPERATING MECHANISM

1. Circuit breaker shall be power operated by a motor charged spring operated mechanism. It shall be strong, rigid, positive and fast in operation to ensure that the pole discrepancy does not exceed 10ms.
2. Mechanism shall be such that failure of any auxiliary spring shall not prevent tripping and will not cause tripping or closing operation of the power operated closing devices.
3. When the circuit breaker is already closed, failure of any auxiliary spring shall not cause damage to the circuit breaker or endanger the operator.
4. The closing release shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. A shunt trip shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity of the circuit breaker and all values of supply voltage between 70% and 110% of rated voltage.
5. Auxiliary switches mounted on the fixed portion of the cubicles and directly operated from the breaker operating mechanism on each breaker having 6 'NO' and 6 'NC' potential-free contacts rated for 10 amp, 240V AC and 0.5 amp (inductive breaking) 220V AC shall be provided. The contacts shall be in addition to those utilised in control circuit of each breaker and shall be exclusively meant for EMPLOYER use in external interlocks and controls.

2.16. SPRING OPERATED MECHANISM

1. Spring operated mechanism, shall be complete with motor of adequate rating, opening spring, closing spring with limit switch for automatic charging and all necessary accessories to make the mechanism a complete operating unit.
2. After failure of power supply to the motor, at least one open-close-open operation of the circuit breaker shall be possible.
3. Operating mechanism shall normally be operated locally, when the breaker is in "Service" position. Electrical tripping shall be performed by shunt trip coils. Provision also shall be made for local electrical control when the breaker is in "Test" position by a control switch on the switchgear cubicle door. Also, "Local / Remote" selector switch lockable in "Local" position shall be provided on the cubicle door. 'Red' and 'Green' indicating lamps shall be provided on cubicle door to indicate breaker close and open positions. Breaker "Service" and "Test" positions shall be indicated by separate indicating lamps on the cubicle door, in case mechanical indication of "Service" and "Test" positions are not available on the cubicle door.

2.17. INSTRUMENT TRANSFORMERS

CTs and VTs shall be of cast resin type (with winding insulation of class E) and shall be able to withstand the thermal and mechanical stress resulting from the rated short time withstand and peak withstand current ratings of the switchgear. These shall be completely encapsulated.

CTs and VTs shall have polarity marks indelibly marked on each transformer and at the associated terminal block. Secondary connections of CTs & VTs will be made through disconnecting type terminals with necessary shorting and earthing facility.

VTs shall be of single phase type. VTs shall be protected on their primary and secondary sides by current limiting fuses. Interrupting rating on primary shall correspond to breaker rating. Provision shall be made such that the primary fuses can be handled only in the de-energised position. Drawout contacts for Phase and Neutral terminals shall be identical.

2.18. Metering CTs

For metering, main CTs and auxiliary CTs, if used, the accuracy class shall be normally 1.0. All metering CTs shall have a adequate burden. Instrument security factor shall be less than 5 unless otherwise specified.

2.19. Protection CTs

Protection CTs shall have class of accuracy of 5P10 and minimum burden 15VA. Core balance CTs shall be such that the earth fault relay should be able to operate over its entire range. CTs to be used for REF and Differential Protection will be PS Class.

2.20. CURRENT TRANSFORMER DETAILS

Type, Voltage & frequency : Cast resin, 11kv, 50 Hz
Class of Insulator : Class F or Better and Temp limited to B
Short time rating kA : 26KA for 1 Sec. for CTs 100A & 125A
26kA for 3 Sec. for CTs rated above 125A
Dynamic rating kA (peak) : 100
Withstand Test Voltage :
(a) One minute power frequency : 28 kV (rms)
(b) 1.2/50 sec. Impulse withstand: 75 kV (Peak)

2.21. VOLTAGE TRANSFORMER DETAILS

Type : Cast resin, 3Nos. single phase,
Single / Dual Secondary
Voltage ratio : 11000 / $\sqrt{3}$ / 110 / $\sqrt{3}$ / 110 / $\sqrt{3}$
(Primary / Secondary)
Method of Primary : Star / Star
connection Secondary S1 / S2
Rated Voltage Factor : Continuous
Class of Insulation : Class 'E' or Better
One Min. power frequency withstand:
Voltage kV (rms) : 28
1.2/50 micro sec. Impulse : 75
withstand voltage kV (peak)

2.22. INSTRUMENTS & RELAYS

Meters shall be provided as per single line diagram.

2.23. Indicating instruments

Unless otherwise specified, all electrical indicating instruments will be 96 mm square, with 240 degree scale (Taut band type). They shall be suitable for semi-flush with only flanges projecting on vertical panels. Instruments shall have accuracy class of 1.5 or better. The design of the scales shall be such that it can read to a resolution corresponding to 50% of the accuracy class index.

2.24. Recording instruments

Recording instruments will be square or rectangular in shape and shall be suitable for semi-flush mounting on panels with only flanges projecting. They shall be of non-drawout type Trivector meter shall be L&T ER300P with RS485 port or equivalent type

2.25. PROTECTIVE RELAYS AND FUSES

Relays and fuses shall be provided as per single line diagram
Relay cat numbers are indicated are ANSI/ALSTOM cat numbers. Vendor shall select the and specify equivalent relay
The protective relays shall conform to standard requirements. Type of relays shall be of numerical/static type which meet the various performance requirements are considered acceptable. All relays shall be adequately protected against external voltage surges and noise signals. In addition to this, all the input circuit of relays will include their own auxiliary current and voltage transformers

with screened windings. Where auxiliary interposing transformers are not feasible in the input circuit, relays would have special surge suppression circuits to suppress external noise and surges.

Relays shall have at least the following electrically independent output contacts for the following purposes

- a) Tripping circuit
- b) Remote / local annunciation

If the main relay does not have sufficient number of output contacts inherently, these shall be multiplied using auxiliary relays. These auxiliary relays shall be used for annunciation, indication, etc. only. For tripping, only the contact of main relay shall be used directly.

Relays shall have display of currents, trip data and trip history for analysis and troubleshooting Built in self supervision and self-testing to ensure continuous reliability, Separate indication for power ON and programming mode or relay fault Separate fault indication Communication with computer and breaker control through RS 485 port Site selectable trip time character CT secondary site selectable Display of currents, trip count, self-supervision etc .

2.26. HV Fuses

Fuses shall be provided as per single line diagram.

Type	:	HRC	
Voltage Class	:	11kV	
Rated current	:	2 A	
Symmetrical interrupting rating in kA peak	:		25

2.27. WIRING AND ACCESSORIES

Cubicles shall be completely wired up to equipment / terminal block. Inter-panel and inter-cubicle looping of control and cubicle space heating supplies to be carried out by CONTRACTOR. Wiring to be carried out with 650V grade single core PVC insulated stranded copper conductor of following sizes:

- a) All circuits except CT circuit: 1.5 Sq.mm.
- b) CT circuit : 2.5 Sq.mm.

Longitudinal troughs extending throughout the full length of the panels to be provided for inter-panel wiring, AC-DC supplies, PT circuits, annunciator circuits, etc. Ferrules for wire termination to be provided. Wire connected to trip circuit will have red coloured ferrule.

2.28. TERMINAL BLOCKS

Terminals blocks for CT and PT secondary leads shall be provided with test links and isolating facilities.

All spare contacts and terminals of the panel mounted equipment and devices shall be wired to terminal blocks.

Terminal blocks to be suitable for connecting the following conductors of the cables on each side:

All circuits except CT circuit	Minimum of two 1.5 mm ² copper
CT Circuits	Minimum of four 2.5 mm ² copper

2.29. CABLE BOXES AND GLANDS

Connecting leads of adequate size with terminal clamps for connecting cable terminal kit to switchgear equipment terminals shall be included. Cable box shall withstand the short circuit rating of the switchgear. The switchgear shall be provided with cable entry facilities at top / bottom as per the layout requirement with 3 mm thick removable gland plates, with double compression cable glands. For single core cables, the gland plates shall be non-magnetic

2.30. ACCESSORIES

Space heater supply for the switchgear shall be obtained from Distribution boards by cross connecting. Cubicle space heaters with Thermostat for automatic switching and 15A, 3 pin receptacle suitable for 240V, 1 phase, 50HZ AC supply controlled by 15A single pole miniature circuit breaker of 10kA. Breaking capacity to be provided in each cubicle. Also one light fitting with 20W fluorescent tube and switch to be provided in each cubicle

2.31. **AUXILIARY SYSTEM** It is proposed to have the status of 11kV feeder in the switchgear from remote. For this purpose, following contacts will be made available in switchgear.

- Breaker 'ON'
- Breaker 'OFF'
- Breaker 'TRIP'
- Breaker 'Service'
- Breaker 'Test'
- Breaker 'Remote'
- Breaker Spring charged position

3. TECHNICAL DATA FOR HT Panel

1	Incomer 1 - Near Main Substation	11 KV VCB Panel with outdoor duty panel . Not Required
2	Incomer-2 – Near Transformer	11 KV VCB Panel near Transformer but indoor duty.
3	Circuit Breaker	Vacuum Circuit Breaker
	Rating	11kV, 800 Amps, 50Hz with Power Pack (30 min. Back up)
	Type	Draw-out type (Horizontal isolation)
	Rated Insulation Level	
	Rated Short Circuit Breaking Current	26.3kA (rms) for 3 sec
	Short Time Withstand Current	1 sec
	Spring Charging motor	24V DC
	Shunt Released (Tripping Coil)	24V DC
	Closing Released (Closing Coil)	24V DC
	Under voltage Released (Under voltage coil)	24V DC
	Locking /Interlocking	
	Door Interlocking Mechanism	Required
	Main contact Position Indicator	Required
	Operation counter	Required
	Earthing Switch	Required
	Metering	KWh (Class-1) & Load Manager
	Protective Relays for Incomer-1 (Numerical Type Only)	A. Over-current & Earth Fault Relay (50,50N, 51,51N) B. Auxiliary Relay C. Master Trip Relay (86). D. Trip Supervision Relay. E. Antipumping Relay. F. Restricted Earth Fault Relay (64 R)
	Protective Relays for Incomer-2 (Numerical Type Only)	A. Over-current & Earth Fault Relay (50,50N, 51,51N) B. Auxiliary Relay C. Master Trip Relay (86). D. Trip Supervision Relay. E. Antipumping Relay. F. Restricted Earth Fault Relay (64 R)
	Transformer Protection Relay for VCBs	A. Bucholz Alarm and Trip. B. WTI Alarm and Trip. C. OTI Alarm and Trip.

4	Current Transformers- for Incommer-1	
	Core-1 Metering	Cl.1.0 100VA, 150/5A
	Core-2 Protection	CL5P10 100VA, 150/5A
5	Current Transformer for Incommer-2	
	Core-1 Metering	Class-0.5 50 VA 50/1A
	Core-2 Protection	5P10 Class 50VA 50/1A
6	Potential Transformers	Class-1 25VA, 11kV/110V
7	Indications	a. Breaker 'On' b. Breaker 'Off' c. Breaker in test Position d. Breaker in service Posit
8	Annunciations	16 Window Annunciation for following parameters viz. As shown in SLD
9	Aux.Contacts	4NO+4NC

Sl. No.	ITEM	UNIT	
1.0	GENERAL	-	
1.1	Manufacturer's Name	-	
1.2	Applicable Standard (S)	-	
1.3	Type of Circuit Breaker	-	VACCUM
1.4	Nominal System Voltage	kV	
1.5	Type Test Report	-	<input type="checkbox"/> Enclosed <input type="checkbox"/> Not Enclosed
1.6	Compliance with Specification	-	<input type="checkbox"/> Yes <input type="checkbox"/> No Deviations Attached
2.0	CONSTRUCTIONAL FEATURES	-	
2.1	Dimensions	-	
	a) Switchgear Cubicle	mm	L x W x D
	b) Adapter Panel	mm	L x W x D
	c) Overall Based on (a) & (b)	mm	L x W x D
2.2	Minimum Clear. Required	mm	Front : Rear :
2.2.1	Cubicle Weight with Circuit Breaker	Kg.	
2.2.2	Total Switchgear Weight	Kg.	
2.3	Dynamic Loading per Cubicle	Kg.	
3.0	BUSBARS	-	

3.1	Material	–	Al-Alloy/Copper
3.2	Applicable Standard	–	
3.3	Busbar Insulation	–	
3.5	Minimum Clearance :	–	
	A) Phase to Phase	Mm	
	B) Phase to Earth	Mm	
4.0	CIRCUIT BREAKERS	–	Compliance with Spec. <input type="checkbox"/> Yes <input type="checkbox"/> No, Deviations Attached
4.1	Feeder Ratings	Amps	As Per Spec. <input type="checkbox"/> YES <input type="checkbox"/> NO Details Attached
4.2	Switching over voltage		
	a) Switching Off Unloaded Transformer	PU / ms	Amps
4.2.1	Maximum Permissible Chopping Current.	–	
4.3	External Switching over voltage Limiting Devices Required	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.3.1	Details of Voltage Limiting Device :	–	
	a) Type & Voltage	–	
	b) Continuous withstand Voltage between Line and Earth	–	Volts
	c) Residual Voltage at Discharge Current of	–	
	100A / 500A / 1000A	–	Volts
4.4	MAIN CONTACTS :		
	a) Type / Material	–	
	b) Silver Facing Provided	–	Yes / No
4.5	ARCING CONTACTS :	–	
	a) Type / Material	–	
	b) Silver Facing provided	–	Yes / No
4.6	Trip Coil consumption at Rated Voltage	Watts	
4.7	Satisfactory Operation of closing between 80% - 100% of Rated Control Voltage	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.8	VACUUM BREAKERS	–	
	a) Pressure Inside the Interrupter	Mm. Hg.	
	b) Mechanical facility for checking Loss of Vacuum Provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No Reason Given

	c) Vacuum Monitoring Relay provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No Reason Given
	d) Adequate Shielding Against X-Ray Radiations Provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No Reason Given
4.9	Type Test Report	–	<input type="checkbox"/> Enclosed <input type="checkbox"/> Not Enclosed
5.0	CIRCUIT BREAKER OPERATING MECHANISM	–	
5.1	Type of closing Mechanism	–	
5.2	Spring Charging Mechanism :	–	
	a) Spring Charging Motor :	–	
	i) Rated Voltage	Volts	
	ii) Rating	Watts	
	lii) Speed	RPM	
	iv) Class Of Insulation	–	
	v) Satisfactory Operation of Spring Charging Motor Between 80% - 100% of Rated Voltage	–	<input type="checkbox"/> Yes <input type="checkbox"/> No, Deviation Given
	vi) Time Required to charging the Spring from fully Discharged Condition	SEC.	
	vii) Overload and Short Circuit Protection Particulars	–	
	b) Mechanical Indication for Spring Charged Condition Provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No, Reason Given
	c) Whether Slow Closing/Opening is Feasible for Maintenance Testing	–	<input type="checkbox"/> Yes <input type="checkbox"/> No, Reason Given
5.3	Method of closing During Power Supply Failure	–	
6.0	INSTUMENT TRANSFORMERS	–	
6.1	Current Transformers – Metering and Protection	–	Compliance with Specification & Project Dwgs <input type="checkbox"/> Yes <input type="checkbox"/> No, Deviations Attached
6.1.1	Make	–	
6.1.2	Type (Bar / Wound / Any Other)	–	
6.1.3	Applicable Standard	–	
6.1.4	Class of Insulation	–	
6.1.5	Type Test Report for All CT Designs	–	<input type="checkbox"/> Enclosed <input type="checkbox"/> Not Enclosed
6.2	VOLTAGE TRANSFORMERS	–	Compliance with Spec. Project Dwgs <input type="checkbox"/> Yes <input type="checkbox"/> No Deviations Attached
6.2.1	Make	–	
6.2.2	Type	–	

6.2.3	Applicable Standard	-	
6.2.4	Type of Insulation	-	
6.3	Type Test Report	-	<input type="checkbox"/> Enclosed <input type="checkbox"/> Not Enclosed
7.0	INDICATING METERS	-	Compliance with Spec. /Dwgs <input type="checkbox"/> Yes <input type="checkbox"/> No, Deviations Attached
7.1		-	
7.1.1	General Make	-	
7.1.2	Applicable Standard	-	
7.1.3	Mounting, Flush type other	-	
7.1.4	Range as per Specification	-	<input type="checkbox"/> Yes <input type="checkbox"/> No, Deviations Attached
7.2	WATT HOUR METER	-	
7.2.1	Make	-	
7.2.2	Type	-	
7.2.3	Standard to which it conforms	-	
7.2.4	Maximum number of digits	-	
7.2.5	Voltage Coil Rating	Volts	
7.2.6	Current Rating	Amps.	
7.2.7	VA Burden	VA	
7.2.8	Accuracy	-	
7.2.9	Range as per specification	-	<input type="checkbox"/> Yes <input type="checkbox"/> No Deviation Attached
7.2.10	Test Plug/Test blocks testing terminals with links	-	
8.0		-	MAKE TYPE
	Protection Relay Vendor to list all relays	-	
9.0	TERMINATION / WIRING	-	Compliance with Spec. <input type="checkbox"/> Yes <input type="checkbox"/> No Deviations Attached
9.1	Colour coding for wires for :	-	
	a) D.C. Control Circuits	-	
	b) A.C. Auxiliary Power Circuit Like Panel Space Heater, Panel Illumination Etc.	-	
	c) A.C. Metering Circuit	-	
	d) Earthing	-	

9.2	TERMINALS :	–	
	a) Make	–	
	b) Current Rating	Amps	
	c) Bolt Type	–	
	d) Moulded Inter-Terminal Barriers Provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
	e) Maximum conductor size and number of conductors which it can receive	sq.mm	
	f) Disconnecting type for CT circuits	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
	i) 10% Spare Terminal provided	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
10.0	SPARES	–	
10.1	List of recommended spares for normal maintenance for a period of 3 years furnished	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
11.0	TESTS		
11.1	All Test Certificates Furnished	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
11.2	List of routine tests to be carried out attached	–	<input type="checkbox"/> Yes <input type="checkbox"/> No
12.0	DRAWINGS AND DATA		
12.1	Drawings submitted along with Bid	–	<input type="checkbox"/> Yes <input type="checkbox"/> No

4. DATA TO BE FURNISHED BY THE VENDOR

LIST OF DRAWINGS (TO BE SUBMITTED ALONG WITH THE OFFER)

1. Switchgear cubicles : Outline dimensions and general arrangement
2. Switchgear layout plan including floor openings and fixing arrangement

3. TEST CERTIFICATES (TO BE SUBMITTED ALONG WITH THE OFFER)

The vendor shall furnish the following type test certificates

A) Circuit Breakers, B) Disconnects, C) CTs, D) VTs, E) Relays, F) Bushing and Insulators

SWITCHGEAR CUBICLE DETAILS (TO BE SUBMITTED AFTER AWARD OF CONTRACT)

Final dimensions (L x W x D) mm _____ mm

a) Minimum space required in front for drawing out the circuit breaker _____ mm

b) Minimum space required at the back _____ mm
Largest package for transport (L x W x D) mm _____ mm

WEIGHTS

- a) Circuit breaker with operating mechanism, oil etc _____ Kg.
- b) Cubicle without breaker truck _____ Kg.
- c) Cubicle complete with breaker _____ Kg.
- d) Impact loading for foundation design to include the dead load plus impact due to breaker operation in terms of the equivalent dead load _____ Kg./BKR.
- e) Heaviest package for transport _____ Kg.

LIST OF DRAWINGS (TO BE SUBMITTED AFTER AWARD OF CONTRACT)

Switchgear Cubicles: Final outline dimensions and general arrangement, including plan, front elevation, rear elevation, side elevation and relevant cross-sectional views.

Schematic Control Circuit Diagrams

Detailed wiring diagrams including terminal block numbers, ferrule numbers and cable connections

Relay and instrument panel general arrangement

Inter panel interconnection wiring diagram.

TEST CERTIFICATES (TO BE SUBMITTED AFTER AWARD OF CONTRACT)

- A) Circuit Breakers, B) Disconnects, C) CTs, D) VTs, E) Relays
- F) Bushing and Insulators

Equipment shall not be despatched unless the test certificate are duly approved by the Client ,Owner .

At least 5 (five) sets of compiled and approved test certificates shall be submitted within one month of dispatch of the equipment

INSTRUCTION MANUALS(TO BE SUBMITTED AFTER AWARD OF CONTRACT)

The vendor shall furnish specified number of copies of the instruction manual which would contain detailed step by step instructions for

All erection, operational and maintenance requirements. The manual shall include, among other informations, the following aspects :

Storage for prolonged duration _____

Unpacking _____

Handling at site _____

Erection _____

Pre commissioning tests _____

Operating procedures _____

Maintenance procedures

Precautions to be taken during operation and maintenance work _____

Outline dimension drawings showing relevant cross-sectional views and constructional features

Catalogue numbers of all components liable to be replaced during the life of the switchgear.

LT Panel**B. TECHNICAL SPECIFICATIONS****SCOPE**

- 1.1 This Specification covers the requirements of Design, Fabrication, Assembly, Inspection, Testing and Delivery of 433V indoor; metal clad, cubicle type switchboards. Vendor shall furnish clause-by-clause acceptance / comments. Any deviations shall be brought out clearly in the quotation.

SYSTEM DETAILS

Design Temp. - Max 48⁰ C. and Min 5 Deg .C

HT Supply: 11.kV +/- 10%, 50Hz +/- 3%

LT Supply: 3 Phase - 433/415VAC, +/- 10%, 1 Phase – 240VAC, +/- 10%, 50Hz+/- 3%

STANDARDS

The Equipment shall conform to the requirements of the following but not limited to latest revision of relevant Indian Standards or equivalent British or any other International Standard Specifications.

IS-375	Marking and arrangement for switchgear bus bars, main connection and auxiliary wiring.
IS-722 Part - I	AC Electricity Meters Part - I General requirements and tests
IS-1248	Direct acting indicating analogue electrical measuring instruments and their accessories.
IS-1822	AC Motor starters, of voltage not exceeding 1000 volts.
IS-2147	Degrees of protection provided by enclosures for low voltage switchgear and control gear.
IS-2208	HRC cartridge fuse links for voltage above 650V.
IS-2419	Dimensions for panel mounting indicating and recording electrical instruments.
IS-2516	Circuit Breakers - Requirements and Test voltages not exceeding 1000V AC or 1200V DC.
IS-2607	Air break isolators for voltages not exceeding 1000 volts.
IS-2705 Part-I	Current Transformer - General Requirements
Part - II	Current Transformer - Measuring Current Transformers.
Part - III	Current Transformer - Protective Current Transformer.
Part - IV	Current Transformer - Protective Current Transformers for special purpose applications.
IS-2959	Contactors for voltages not exceeding 1000V AC or 1200V DC
IS-3072	Code of practice for installation and maintenance of switchgear.
IS-3106	Code of practice for selection, installation, maintenance of fuses (voltage not exceeding 650V).
IS-3156, Part - I	Voltage Transformer - General Requirements.

Part - II	Voltage Transformer - Measuring Voltage Transformers.
Part - III	Voltage Transformer - Protective Voltage Transformers.
IS-3231	Electrical Relays for Power System Protection.
IS-3914	Code of practice for selection of AC Induction Motor Starters (Voltage not exceeding 1000V)
IS-4047	Heavy-duty air-break switches and composite units of air-break switches and fuses for voltages not exceeding 1000 Volts.
IS-4064	Air break switches, air break disconnectors, air break switch disconnectors and fuse combination units for voltages not exceeding 1000V AC or 1200V DC.
Part - I	Part I - General Requirements.
IS-4146	Application guide for Voltage Transformers.
IS-4201	Application guide for Current Transformers.
IS-4237	General Requirements for Switchgear and Control Gear for Voltages not exceeding 1000V AC or 1200V DC.
IS-4483	Preferred panel cut-out dimensions for electrical relays - flush mounting IDMTL relays.
IS-4794, Part - I	Push Button Switches - General Requirement and Tests.
IS-5082	Wrought aluminum & aluminum alloy bars, rods, tubes and sections for electrical purposes.
IS-5987	Code of practice for selection of switches (Voltage not exceeding 1000V).
IS-6236	Direct recording electrical measuring instruments.
IS-6875	Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages up to and including 1000V AC and 1200V DC.
IS-8623	Factory built assemblies of switchgear and control gear for voltages up to and including 1000V AC and 1200V DC.
IEC -61439	Low Voltage Switch Gear and Control Gear Assembly

DESIGN AND PERFORMANCE REQUIREMENT

All the 433V AC, devices/equipment like bus support insulators, circuit breakers, VTs, etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions:

- i) Variation in supply voltage : + 10%
- ii) Variation in supply frequency : + 5%
- iii) Combined voltage and frequency Variation : 10%

The breaker ratings indicated refer to the nominal rating of the breaker. However, breaker shall be capable of carrying continuously at least 120% of circuit current at an ambient temperature of 40 deg.C and with breaker mounted inside the panel. If a higher rated breaker is necessary to meet this, the same shall be offered.

CONSTRUCTION

- The switchboard shall be totally enclosed, metal clad, sheet steel fabricated, compartmentalised, dead front type, dust and vermin-proof, freestanding, floor mounting type. It shall be of unit construction suitable for splitting into sections for shipping to site and to be correctly re-erected on prepared foundations without skilled supervision. The individual shipping section length shall not preferably exceed 2 metres. Provisions shall be made for addition of future units on either ends of a switchgear line-up after its installation on site. End busbar fish plates shall be provided.
- The switchgear shall be easily extensible on either side by the addition of vertical sections. It shall be possible to extend the switchgear, irrespective of the type of end panel and the design shall be such as to permit addition of extension panels of a type other than the type of end panel. Any adapter panels required shall be included in the basic price and indicated clearly in the technical particulars furnished.
- The degree of protection shall be IP-42.
- The switchboard shall be fabricated preferably from cold rolled sheet steel of minimum thickness 14/16 gauge.
- The height of the switchboard shall be constant throughout its length, but not exceeding 2300 mm.
- Adequate lifting facilities such as hooks for ease of handling on site shall be provided. These hooks when removed shall not leave any openings in the switchgear.
- Front access shall be available to all components in each cubicle, which require adjustment, maintenance or replacement. Checking and removal of components shall be possible without disturbing adjacent equipment. All auxiliary equipment shall be easily accessible. Setting of relays shall be possible without de-energizing other equipment.
- Rear access shall be available to all cable glands and multicore terminal blocks by means of sheet steel hinged doors, designed to give the maximum possible access to the cable terminations. The cable alley door shall be provided with bolts, which can be opened with special keys by authorised persons.
- Each unit of switchgear shall have necessary interior barriers to form separate compartments for buses, switching devices entering cable connection etc. All barriers shall be manufactured from non-inflammable material, preferably of sheet steel.
- Each compartment shall be constructed and segregated to confine any damage caused by an internal fault to that compartment.
- Adequate barriers shall permit personnel to work safely within an empty switching device compartment or one from which the switching device assembly has been temporarily removed with bus energized.
- The arrangement of feeders in the switchboard shall take into consideration the number and size of cables required for the feeders.
- The arrangement of the feeders shall ensure that operating handle of the switch / breaker shall be above 300 mm but below 1800 mm from ground level.
- Removable type undrilled gland plates shall be provided on bottom/top of the panel. Gland plates shall be 3 mm thick sheet steel.
- Suitable provision shall be made for clamping cables inside the switchboard.
- The cable terminations inside the cable alley shall be completely shrouded so that it shall be possible to work on any one of the terminations by switching OFF the corresponding feeder switch only.
- All bezels, handles, screws, bolts, washers, hinges and other embellishments shall be of the best quality electro galvanised or passivated to withstand attack from corrosive atmosphere.
- The fabricated parts shall undergo a **7 Tank treatment** of degreasing, pickling and two coats of primer before being given the stove enamel finish. The final finish shall be of colour shade 631 as per IS-5 or **RAL-7032/5**. Two coats of final paint shall be applied. Proper care shall be taken to grind the welded joints to give a smooth appearance after painting.
- The external finish of the board shall be of the highest standard.
- The external and internal surface of the board shall be stove enamelled finish unless otherwise specified.

- Adequate packaging against damage and deterioration shall be provided for transportation to site and subsequent storage prior to re-assembly.
- Horizontal busbar chambers shall be at the top of the board. Bus bars shall be completely shrouded to prevent metal pieces falling on the busbar during maintenance.
- The bus bars shall be of aluminium with continuous rating as given in the SLD. All bus bars and their main current carrying connections shall have preferably the same sectional area throughout their length. The bus bars shall be colour coded.
- Following minimum clearances shall be adhered to while such designs.

•	Between phases	• •	35 mm
•	Between phase & neutral	• •	25 mm
•	Between phase & earth	• •	25 mm
•	Between neutral & earth	• •	25 mm

- The busbar sizes shall be determined taking into consideration the continuous rating without exceeding the final temperature of 45°C over maximum ambient temperature and the fault level specified. The bus bars shall be supported by insulators on non-carbonizing material resistant to acid and alkali and having non-hygroscopic characteristics and braced to withstand the fault level specified.
- Auxiliary bus bars each of minimum size 18 sq mm copper shall be provided for following applications. Exact number of bus bars shall depend on various control, metering and auxiliary power distribution requirements specified in specific requirements.
 - Panel / Motor space heater supply.
 - AC / DC control supply for breaker tripping closing and indication circuits.
 - AC / DC control supply for breaker spring charging motors.
 - AC control supply for motor starter control and indication circuits.
 - AC potential supply for KWH meters.
- Earthing - Two earth terminals shall be provided on each switch cubicle, at the back, near the floor. An earth bar of at least 50 x 6 mm copper shall be fixed to these terminals. The earth bar shall be electrically continuous and shall run the full extent of each board. Each unit shall be constructed to ensure satisfactory electrical continuity between all metal parts not intended to be alive and earth terminals of the unit. Suitable holes with bolts and lugs shall be provided at each end of earth bar of switchgear for connection to a main earthing grid of 76x 10 mm GI bus. The earth bar shall be accessible in each cable entering compartment either directly or through a branch extension to ground the cable armour and shields.
- Bus bars and connections shall be secured in such a manner that the insulators are not subjected to bending forces under short circuit conditions. The vertical dropper shall be sized to carry continuously at least the rated current of the connected switching devices. When multiple switching devices are combined in tiers for a vertical unit, the droppers shall be able to carry the total current resulting from the combination of all switching devices. The vertical bus bars shall be completely shrouded with the cut-out for connection tappings.
- In case of copper to aluminium connections, proper treatment shall be given to minimise the bimetallic effect. That is, all joint surfaces at aluminium to copper joints shall be silver / tin plated, alternatively Cu-Al washers (bimetallic washers) may be used.
- Any unused circuit breaker compartment shall be fully equipped and provided with compartment door, vertical bus bars and control terminals / wiring, etc., such that the same could be used for housing outgoing breakers in future without any modifications to the panel. All quotations must indicate the number of circuit breakers, which could be provided in unused space for each switchboard line up. Unit price for providing such outgoing circuit breakers shall be quoted which could be considered during placement of order.
- The arrangement of feeders in the switchboard shall take into consideration the number and size of cables required for the feeders.
- Incomer and Bus Coupler ACB shall be limited to one per panel.
- Nameplate or polyester adhesive stickers shall be provided for each equipment (lamps, push buttons, switches, relays, auxiliary contactors, etc.) mounted on the switchboard. Special warning plates one each on each front of a shipping section shall be provided on removable covers of doors giving access to cable terminals and bus bars. Special warning labels shall be provided inside the switchboard also, wherever considered necessary. Identification tags shall be provided inside the panels matching with those shown on the circuit diagram.
- Engraved nameplates shall preferably be of 3 ply (Black-White Black) lamicoid sheets or anodized aluminium. Nameplates shall be fastened by screws and not by adhesives.
- ACB feeders for outgoing shall be limited three per panel subject to owner's approval on GA diagram.
- SFU feeders for outgoing shall be limited to three per panel.
- The feeders shall be arranged in the ascending order of alphabets followed by ascending order of equipment, e.g. A33801, M3402, and P211.
- Manufacturer shall furnish the general arrangement drawing of switchboard along with the quotation. The General Arrangement drawing of switchboard shall be subject to Owner's approval.

- All indications shall be LED type.
- Panel SLD (Mimic Diagram) to be pasted inside/outside the Panel.
- All Switchgear models should same version (no mixing old and new types)

CIRCUIT BREAKERS

- The circuit breaker shall be air break and draw out type. ALL ACBs with same rating and same frame sizes should be interchangeable.
- All ACB's unless otherwise specified shall be provided with built in microprocessor based SC / EF / OC with variable settings and fault indications shunt release, Auxiliary contact block, manual operating handle, Positive position indication on facia.
- All ACB's in the main LT panel should be four pole Type unless otherwise specified.
- The charging mechanism of the circuit breaker shall be motor operated spring charged independent type. The close / trip control switch to be interlocked to trip before close. The closing and tripping circuits shall be self-opening on completion of their respective functions irrespective of the position of the control switch. Manual closing devices shall also be provided.
- The circuit breaker shall be electrically and mechanically trip free.
- Air circuit breakers (ACB) shall comply with standards IEC 61439
- The breakers shall be tested & certified at CPRI/ERDA.
- For all electrical circuit breakers anti-pumping device shall be incorporated.
- The breaker shall be provided with minimum 6NO + 6NC auxiliary contacts. 20% auxiliary contacts (Min. 3 NO + 3 NC) shall be provided for Owner's exclusive use. All spare contacts shall be wired up to terminal blocks. Auxiliary contactor or relay shall be used to multiply contacts.
- The auxiliary contact for the shunt trip shall be of advanced nature such that the auxiliary contact close before main contacts.
- The main and secondary isolating contacts of the circuit breaker shall be of self-aligning type.
- The main isolating contact shall have continuous rating equal to the rating of the breaker.
- The secondary isolating contact shall be of wiping contact type.
- The fixed portion of the circuit breaker shall have rail arrangement over which the chassis can move smoothly.
- It shall be possible to bring the circuit breaker to isolated position with the help of external lever without opening the compartment door.
- The breaker shall have 3 distinct positions, such as "SERVICE", "TEST" and "ISOLATED".
- Proper mechanical indication shall be provided to locate these three positions without opening the compartment door.
- It shall be possible to further withdraw the breaker from isolated position for inspection of the circuit breaker "withdrawn" position.
- A stop block shall be provided on the slide rails to prevent the forward movement of the circuit breaker when it reaches the isolated position so that any accidental fall can be avoided. Provision shall be provided to padlock the breaker in all the three positions.
- The following interlocks shall be provided on the circuit breaker:
 - It shall not be possible to withdraw the circuit breaker from the service position with the contacts of the breaker closed.
 - It shall not be possible to close the circuit breaker unless any one of the three positions is located, the service position, a definitely located test position, or isolated position.
 - It shall not be possible to open the compartment door when the circuit breaker is ON.
 - It shall not be possible to push breaker in if either set of safety shutter is not free and not in its normal closed position.
 - The circuit breaker can be padlocked in OFF position.
 - The castell interlocking shall be provided as per the SLD.
 - The circuit breaker shall be provided with mechanical ON/OFF, TRIP and SPRING CHARGED indication, mechanical trip push button, operating handle or `close' push button, in case of electrically operated circuit breaker and padlocking facility wherever specified.
 - In case of electrically operated breaker, emergency operating handle shall be provided.

- It shall be possible to close the circuit breaker with the emergency operating handle without opening the compartment door.
- Wherever cut-outs are provided for the control box, proper gaskets shall be provided. Provision shall be made for closing the cut-out provided for the control boxes when the C.B. is taken out of the compartment.
- The circuit breaker shall be provided with automatic safety shutters, so that before the breaker reaches 'isolated' position the main isolating contacts are completely shrouded.
- The circuit breaker compartment shall be so designed that hot gases produced shall be lead away from the operator.
- The protective relays and instruments shall be mounted as near to the circuit breaker as possible. Separate compartment for the instruments and relays shall be provided.
- When the circuit breaker compartment door is open, it must not be possible to touch the live parts.
- All removable covers protecting live parts shall be clearly labelled with warning notices reading "LIVE PARTS. ISOLATE ELSEWHERE BEFORE REMOVING COVER'.
- It shall be possible to readily remove the arc chutes for routine inspection of the contacts with the circuit breaker in the "withdrawn" position.
- All circuit breakers of same rating shall be identical in all respects and shall be interchangeable.
- All the non-conducting metal parts of the circuit breaker trolley shall be bonded together and shall make perfect electrical connection to earth through substantial sliding contacts, at service and test positions. Such sliding contacts shall be arranged to make before power plug in and interrupt after power draw out.

SWITCHES

- The switches shall be quick-make, quick-break heavy-duty type.
- The switches shall be able to make and break 300% of the rated current at 0.3 P.F. as required by IS-4047.
- The operating handle shall be mounted on the door of the compartment housing the switches. The switches shall be provided with an interlocking arrangement such that when the switch is ON it shall not be possible to open the compartment door.
- It shall also be ensured that closing of the switch when the compartment door is open shall not be possible.
- To facilitate closing of switch with door open during maintenance / testing, interlock defeat mechanism shall be provided.
- The castell interlock shall be provided, wherever specified in the SLD.
- In case of switch fuse feeders, the switch rating shall be equal or greater than the fuse rating.
- The switch shall be provided with padlocking facility in OFF position.
- All removable covers protecting live parts shall be clearly labelled with warning notices reading "LIVE PARTS. ISOLATE ELSEWHERE BEFORE REMOVING COVER".
- Rating of the switches shall be as given in the SLD.

MINIATURE CIRCUIT BREAKER

All MCB's used in panels & DB's shall be din rail mounted, 50 KA Breaking capacity, 'D' characteristic unless others wise specified. Terminals of MCB's shall be suitable for connecting proper size Cu / Al cables with lugs. Multiple MCB's shall be provided with common fixed operating handle.

HRC FUSES

- Fuses provided shall have rupturing capacity greater than the fault level specified.
- Fuses shall be of link type and shall conform to the relevant Indian Standards. They shall be of class 3 AC duty.
- Fuses for motor feeders shall be decided taking into consideration bimetal relay characteristics provided.
- Rating of the fuses shall be as given in the SLD.
- Delayed action fuses shall be preferred for motor feeders.
- Indication shall be provided in the fuses to indicate the fuse has operated. Operating indicator shall be visible without removal of fuses from service. Removal of fuses, however, must be possible, although full voltage may exist at the terminals. Fuses shall be pressure fitted type.
- Fuse handle shall be supplied along with switchboard.

SINGLE PHASING PREVENTER RELAY (SPPR)

- If specified Single Phasing Protections shall be provided in all motor starter modules with contactor rating of 200 Amps and above. The Single Phasing Protection shall be of the current operated type and shall operate on the principle of sensing negative sequence of current.
- In case of single phasing, the Single Phasing Protection shall operate after a time delay of 2 to 3 sec. The relay shall be of the hand reset type and visual indication of the relay operation shall be available.
- The Single Phasing Protection shall be suitable for protection of the non-reversible and reversible motors.
- Current transformer operated Single Phasing Protection Relay shall be provided for feeders, if specified.
- Thermal overload relays shall be provided with minimum 1NO + 1NC contacts with a rating of 5 Amps at 240V, 1 phase, 50 Hz AC and 1.3 Amps at 110 V DC (inductive load).

MULTIFUNCTION METERS

Applicable Standards

The meters shall conform in all respects to International standards – IEC 61557-12, IEC 62053-22, IEC 62053-23 or the relevant Indian standards with latest amendments thereof.

General Requirements

- The meter shall be suitable for operation in single - or multi- phase networks, balanced as well as unbalanced load
- It shall be possible to use the multifunction meter directly in 690V networks
- The current inputs shall be configurable at site for measuring on x/1 A or x/5 A current transformers
- The multifunction meters shall be suitable for operation up to 55 Deg C
- The meters shall be suitable for operation with AC auxiliary power and shall have wide tolerance band of 95V to 240 V ($\pm 10\%$)
- The multifunction meters shall have high degree of protection (IP65 from the front) against ingress of dust & water
- The multifunction meters shall have backlit LCD display with adjustable contrast
- The meter shall be tamper-proof (password protected) to avoid mishandling by unauthorized person
- All Main & DG incomers and important feeders shall be provided with Digital LOAD MANAGERS unless otherwise specified instead of regular meters. LOAD MANAGERS shall provide minimum voltages, currents, KW, KVA, KWH, KVA Rh, frequency, Cos ϕ % harmonics, Maximum demand KVA reading with scrolling. These will be with RS 485 port

for down loading data. LOAD MANAGER should be able to store last 8 days data, which can be downloaded. Necessary software for Load Manager shall be provided.

- Measured Values requirement
- All metered values will be in "true RMS" values. The monitor shall include a keypad allowing for the viewing of different selected values. The monitor shall display the following values

Voltages	Phase-phase / phase-neutral
Currents	Per phase
Apparent, active and reactive power	Per phase and total
Power factor	Per phase and total
Frequency	45...64 Hz
THD for voltage and current	Per phase
Min. / max. values	Voltage - phase-phase, phase-neutral, Current / Power / Power factor / THD per phase, Frequency, Three phase average voltage and current
Average values	Voltage - phase-phase, phase-neutral Voltage min. / max. for phase-phase, phase-neutral Current Current min. / max.
Active energy	Import / export; high / low tariff
Reactive energy	Positive / negative; high / low tariff
Apparent energy	High / low tariff
Energy demand per measuring period	Three phase average rating for active and reactive power: 1 to 60 min.
Min. / max. rating values within the measuring period	Should be possible to be measured
Meter running counter	Uptime in hours
Universal counter	Pulse counting of external devices like water, gas, etc.

Measurement Accuracy

The multifunction meters shall be of high accuracy type and shall have the following levels of accuracy.

Voltage	± 0.3 %
Current	± 0.2 %
Power	± 0.5 %
Power factor	± 0.5 %
Active energy	Class 0.5S in accordance with IEC 62053-22:2003-01
Reactive energy	Class 2 in accordance with IEC 62053-23:2003-01

- The meter shall have at least 1 Digital Input and 1 Digital Output as standard. It shall be possible to switch between High-tariff and Low-tariff via the digital input or the communication interfaces.
- The device shall allow for monitoring of upper or lower limit values for parameters like V, I, pf etc. It should be also possible to build in logics so that multiple limit criteria are addressed. In case of limit violation, it shall be possible for triggering specified actions through the digital output of the meter
- Communication-The meters shall be capable of communicating the measured parameters via high speed (preferably 1.5mbps) open protocol bus system like profibus. It shall be possible to parameterize the device either by the keys on the device or through parameterization software.

INDICATING INSTRUMENTS AND METERS

- All indicating instruments and meters shall be capable of carrying continuously their full load currents and full voltage across their pressure coils. They shall not be damaged by the passage of fault currents or the existence of over pressure on the primary side of their instrument transformers for the maximum permitted duration of fault conditions, which may occur during normal operation. All instruments and meters shall be back connected.
- For incoming feeders, measuring instruments shall be of 96 x 96 mm square pattern, flush mounting type, 72 x 72 mm instruments shall be used for outgoing feeders. Instruments shall be provided wherever indicated in specific requirements. All auxiliary equipment such as shunts, transducers, CTs, VTs that are required shall be included in the supply of the switchboard.
- All AC ammeters, voltmeters. KW meters shall be of moving iron type for AC and permanent magnet type for DC. Accuracy class shall be 1.0 for KW / KWH meters and 1.5 for ammeters and voltmeters as per IS: 1248. The range shall be as indicated in the SLD. Ammeters for motor feeders shall have non-linear compressed scale at the end to indicate motor starting current. Voltmeter shall be suitable for direct line connection.
- KWH meters and KVARH meters shall be of registering type and shall be installed inside unit but readable without opening doors. KWH meters shall be with maximum demand indicator in KVA.
- KW, KWH and power factor meters shall be suitable for 3 phases, 4 wire unbalanced system with voltage coil suitable for 230V AC. The current coils shall also be suitable as given in SLD.
- Instruments shall be mounted above 900 mm but below 2000 mm from the base channel of the switchboard.
- They shall be provided with zero adjusting devices for external operation.
- Indicating instruments and protective relay for respective feeder shall be located either in the same panel or in adjoining panel and shall be grouped together.

CURRENT TRANSFORMERS

- The Current Transformers shall be Resin cast bar primary / wound primary type. The burden ratio shall be minimum as indicated in Specific Requirements. However, current transformers shall have sufficient capacity to operate with the burden imposed by the devices shown on drawings with their accuracy classification. Separate cores shall be used for metering and protection.
- Current transformers for instruments shall have an accuracy class 1.0 and accuracy limit factor less than 5.0. However, accuracy class 3.0 is acceptable for ammeters only. If a metering load is fed from a protection CT, suitable 1/1 or 5/5 ratio saturable interposing CTs shall be used.
- The current transformers shall be capable to withstand dynamic and thermal stresses originated by the fault current.
- The CTs shall be suitably insulated and the mounting of the CTs shall facilitate easy maintenance.
- The CTs shall be mounted in stationary part of switchgear.
- The secondary of the CTs for metering when wired to terminals, shorting links shall be provided. Shorting links shall be of removable type of Wago make.
- For proper relaying, one side of current transformer secondary shall be grounded in the compartment with the meters or relays, which they serve, and each CT group shall be grounded with a separate identified lead, which may be disconnected for testing.

POTENTIAL TRANSFORMERS

- The potential transformers wherever provided shall be epoxy cast resin type and shall have class of burden minimum as given in the SLD. However, potential transformers shall have sufficient capacity to operate with the burden imposed by the devices shown on the drawing with their accuracy classification.
- The voltage transformers shall have an accuracy class 3.0 from 50% to 110% of normal voltage and class 1.0 from 80% to 120% of normal voltage with burdens varying between 25% to 100% of the rated value at 0.8 PF lagging.

- The primary of the voltage transformers shall be rated for 415 volts and the secondary for 110 volts.
- The PT shall be provided with HRC fuse on the primary side and secondary side.
- The PT shall be mounted in a separate compartment complete with its accessories.
- For proper relaying, one side of PT secondary shall be grounded at the transformer and the ground connection shall be identified and removable for testing.
- Test terminals shall be provided for PT circuits.

TIMERS

- For reacceleration duty, timers unless otherwise stated, shall be pneumatic type and shall have adjustable time setting of 0 - 60 secs. The time settings, where specified shall be accurately set before despatch of the switchboard.
- Timers for auto-transfer schemes shall be of static type with timing ranges suitable for the scheme employed.

INDICATING LAMPS

- Indicating lamps shall be filament type with series resistance. The domes of the fittings shall be heat resistant.
- The lamp shall be suitable for the voltage supply as given in SLD.
- It shall be possible to replace the indicating lamp without opening the compartment door.
- Screwed type lamps are preferred to bayonet cap lamps.

CONTROL SWITCHES

All circuit breaker operating switches shall be of the pistol grip type, spring return to neutral and lockable in that position.

They shall be arranged to close the breaker by being turned clockwise and to trip it by being turned anti-clockwise. The trip, neutral and close positions shall be clearly indicated. The movement shall be such that the switch cannot be operated inadvertently and that it is mechanically interlocked to trip before close. The operating switch shall be located preferably on the centre line at about 1.5 M from the floor level. The switch shall be GE make.

TVSS SPECIFICATIONS

1.	Protection	Electronics & cables
2.	Response time	<0.5ns
3.	Let-through Voltage	600V-800V
4.	Status indication	On-line LED
5.	Technology	MOV with fusing Elements
6.	Surge Capacitors	Yes
7.	Failure Testing	Yes Safe Failure
8.	MCOV	320V (max. continuous Operating voltage)

WIRING, TERMINATION AND FERRULING

- All control conductors insulating material shall be of the PVC type.
- Control, signalling, protection and metering wiring shall be by PVC insulated,
- KV grade copper conductor wires of minimum 1.5 sq mm section, for CT secondary circuit wires of 2.5 sq mm copper conductor minimum shall be used.
- Flexible conductor ends shall be fitted with suitable crimped thimble for efficient termination.
- All control wires shall be properly bunched, cleated and supported on panel frames.
- Where it is necessary to use a large number of conductors in one run, they shall be divided into two or more cable runs in enclosed channels.
- Conductors shall only be carried over or bent around sharp corners or edges where this is unavoidable, in which case a suitable insulating strip shall be fixed to the sharp edge.
- Sharp bends shall be avoided.
- Conductors carried across a hinged portion of a chassis or door shall be flexible stranded copper conductors and the same shall be soldered crimped at ends before connections are made.
- Suitable means of protection against abrasion shall be provided.
- Sufficient slack shall be left at conductor ends to allow components to which the conductors are attached to be removed for inspection and servicing.
- Conductors passing through holes in chassis or screens shall be fully protected by correctly fitted grommets or bushes.
- Control and main wiring shall be kept separate as far as practically possible.
- Colour coding for wiring shall be used and shall be indicated on the drawing.
- Terminal strips for connecting entering control cables shall be Wago make plug in type of adequate size, shall be located conveniently for easy accessibility, without danger of contact with live part, ease of connection, and shall be separated by barriers from power circuits. At least 10% spare terminals shall be provided in terminal strips. Sufficient terminals shall be provided on each terminal strip to ensure that not more than one outgoing wire is connected per terminal.
- The wire shall be identified by numbered ferrules at each end all in accordance with the connection diagram. All ferrules shall be made of non-deteriorating materials. The ferrules shall be universal triangular type so that they cannot move freely on the wire.

CABLE TERMINATION

Incoming feeders of 415V switchgear will be connected with transformers by bus duct (with aluminum bus bars) from top and other feeders by cables. The bus enclosure and flanges shall match the through openings on the switchgear. All power and control cables shall enter the switchgear from bottom. Sufficient space and support arrangement shall be provided in the cubicles to accommodate cables. The number of cables per circuit, sizes and types shall be as specified in SLD. The cables shall be terminated through cable gland.

GLANDS

It shall be preferable to have all the glands on the removable bottom gland plate. Gland plate shall be 3 mm thick M.S. sheet.

Suitable provision for cable clamping shall be given alley for bringing cables to the respective compartments.

PANEL SPACE HEATERS

Wherever specified in specific requirements all switchgear shall be provided with space heaters in each vertical units to prevent condensation and the same shall be equipped with differential thermostat to automatically cut in and cut off the heater, so as to maintain interior temperature 5 DEG C above the ambient and shall also have manual disconnect switch and fuse for protection.

LABEL DETAILS

Labels of 3-ply laminate shall have black lettering on yellow background provided for following:

Main nameplate for the PCC as per description given in SLD in centre on top side on front of the PCC.

Name plates for all incomers and outgoing feeders indicating description, rating, equipment no., feeder no., etc.

Nameplates for all door mounted components.

Name plates for panel numbers on front and rear.

Warning labels for interlocks.

Danger labels shall be provided for interlocks.

Danger labels for the PCC as per statutory regulations.

Danger labels for bus bar chamber.

Danger labels for cable alley housing live terminals.

All components shall be provided with components identification stickers.

Every component shall be provided with label on inside of the door indicating following information:

- Switch / Breaker Rating
- Fuse Rating
- BMR Rating
- Contactor Rating
- CT Rating
- Rating of other major components

All nameplates shall be fastened by means of screws to the panel.

HT & LT Cable**TECHNICAL SPECIFICATIONS****1. SCOPE**

This Specification covers the Requirement of Design, Manufacture, Inspection, Testing and Delivery to Site of HT and LT Cables.

2. ELECTRICAL SYSTEM DETAILS

Design Temp. - 45⁰ C.

HT Supply: 11/433 kV +/- 10%, 50Hz +/- 3%

LT Supply: 3 Phase – 433 VAC, +/- 10%, 1 Phase – 240VAC, +/- 10%, 50Hz +/- 3%

3. STANDARDS

The Cables shall conform to the requirements of the following, but not limited, to latest revision of relevant Indian Standards or equivalent British or any other International Standard Specification.

IS: 209 - Specification for Zinc.

IS: 1554 - PVC insulated (heavy duty) electric (Part I) Cables - Part I for working voltages upto and including 1100V.

IS: 1753 - Aluminium conductors for insulated cables.

IS: 2633 - Methods for testing uniformity of coating of zinc coated articles.

IS: 3961 - Recommended current ratings for (Part II) cables: Part-II PVC insulated and PVC sheathed heavy-duty cables.

IS: 3975 - Mild steel wires, formed wires and tapes for armouring of cables.

IS: 5831 - PVC insulation and sheath of electrical cables.

IS: 7098 - Cross-linked Polyethylene insulated (Part-II) PVC sheathed cables: Part-II for working voltages from 3.3 KV upto & including 33 KV.

IS: 8130 - Conductors for insulated electric cables and flexible cords.

IS: 9968 - Elastomer - insulated cables, for (Part I) working voltage upto and including 1100V.

4. CONSTRUCTION

The cables shall be suitable for laying in trays, trenches, ducts, conduits and underground, buried installation with uncontrolled backfill and possibility of flooding by water. Extra PVC/Rubber end caps for each cable size shall be supplied free of cost with a minimum of five per thousand meter length as minimum. For all cables, cable manufacturer shall provide information on correct voltage drop values when the current is less than the full current rating of the cable.

5. PVC Cables

5.1.1 All power / control cables for use on medium voltage systems shall be heavy-duty type, 1100V grade with aluminium / copper conductor, PVC insulated, inner-sheathed, armoured and overall PVC sheathed.

5.1.2 The construction of the conductors shall be solid for aluminium / copper cables upto 6 sq.mm. 10 sq.mm and above shall be stranded only. Conductors of nominal area less than 25 sq. mm shall be circular only. Conductors of nominal area 25 sq.mm and above may be circular or shaped.

5.1.3 The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of Type 'A' compound of IS: 5831. Control cables having 6 cores and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation.

5.1.4 Colour of the numbers shall be black with a spacing of maximum 500 mm between two consecutive numbers.

5.1.5 The inner sheath shall be applied over the laid-up cores by extrusion/wrapping and shall be on PVC / unvulcanised rubber. If PVC compound is used it shall conform to the requirements of Type ST1 PVC compound of IS: 5831.

- 5.1.6 For multicore cables, if the armouring is specified, the same shall be by single round galvanised steel wires where the calculated diameter below armouring does not exceed 13 mm and galvanised steel wires / strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanization shall be as per IS: 3975 and IS: 2633. If armouring is specified for single core cables, the same shall be with hard drawn aluminium round wire of 2.5 mm diameter.
- 5.1.7 The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST1 compound of IS: 5831. To protect the cables against rodent and termite attack, suitable chemicals shall be added into the PVC compound of the outer sheath.
- 5.1.8 The dimensions of the insulation, armour, inner and outer sheath materials shall be governed by values given in Section-VI of IS: 1554 (Part-I).
- 5.1.9 If heat resisting PVC cables are specified, it shall conform to the following requirements. It shall be possible to continuously operate the cable at a maximum conductor temperature of 85 Deg C. The PVC compounds used for HR PVC cables shall be as follows:
 - a) Conductor insulation - Type C
 - b) Inner Sheath - Type ST 2
 - c) Outer Sheath - Type ST 2

5.2 XLPE Cables

- 5.2.1 Power cables shall be with Aluminium / Copper Conductor, XLPE insulated, armoured and overall PVC sheathed. All cables rated above 3.3 KV shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semiconducting shielding. The insulation screening shall consist of non-metallic extruded semi-conducting compound in combination with a non-magnetic metallic screening of copper. The insulation screen shall be strippable without application of heat. The copper screen shall be capable of carrying the single line to ground fault current for a duration of 1 second. For cables rated above 3.3 KV the conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by Triple Extrusion process to ensure perfect bonding between the layers. The core identification shall be coloured strips or by printed numerals.
- 5.2.2 The construction of the conductors shall be stranded and compacted circular for all cables.
- 5.2.3 The core insulation shall be with cross-linked polyethylene unfilled insulating compound. It shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions.
- 5.2.4 The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of Type ST 2 compound of IS: 5831.
- 5.2.5 For multicore cables, the armouring shall be by galvanised steel wires / strips. If armouring is specified for single core cables the same shall be with hard drawn aluminium round wire of 2.5 mm diameter.
- 5.2.6 The outer sheath for the cables shall be supplied by extrusion over the armouring and shall be of PVC compound confirming to the requirements of Type ST 2 compound of IS: 5831. To protect the cable against rodent and termite attack, suitable chemicals shall be added into the PVC compound of the outer sheath.
- 5.2.7 The dimensions of the insulation, armour, inner and outer sheathing materials shall be governed by values given in IS: 7098 Part - I & Part - II.

6. TESTING AND INSPECTION

- 6.1 All the cables shall be tested and examined at the manufacturer's works. All the materials employed in the manufacture of the cables shall be subjected, both before and after manufacture of the cable, to examination, and testing by vendor.
- 6.2 All routine and acceptance tests in accordance with the relevant standards shall be conducted in presence of the Client.
- 6.3 Vendor shall furnish Test Certificates for all cables before despatch for approval.
- 6.4 Vendor to confirm the availability of facilities at their works for the following tests and the standards to which they will conform to.
 - 1) Accelerated water absorption test for insulation.
 - 2) Dielectric retention test.
 - 3) Oxygen index test.
 - 4) Test for rodent and termite repulsion property.

PACKING AND FORWARDING

The cables shall be supplied duly wound on non-returnable wooden drums. The drums shall be fully sealed to protect the cable from mechanical damage during transit. The wood used for construction of the drum shall be properly seasoned and free from defects. Wood preservatives shall be applied to the entire drum.

All cables shall be supplied in one length. If cable length exceeds standard drum length then the balance quantity shall be supplied in one length. If required by the Client, the vendor shall supply the cable in lengths as specified / informed to vendor during delivery.

On flange of the drum necessary information such as manufacturer's name, type / size / voltage grade and length of cable, drum No, year of manufacture shall be printed. An arrow shall be printed on the rim of the flange to show the direction of rotation of the drum.

NOTES TO VENDOR

The quantities of various types of cables indicated in the attached BOQ which are tentative and liable for change at the time of order placement.

Addition / Deletion of quantities shall be at the sole discretion of the Client.

ATS & RTPFC

Automatic Transfer Switches

- 1.01 Scope
- A. Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage, withstand and close-on ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.
- 1.02 Codes and Standards
- The automatic transfer switches and controls shall conform to the requirements of all the below mentioned standards. 3rd party test certificates from independent laboratory MUST be produced on demand.
- A. UL 1008 - Standard for Transfer Switch Equipment
Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment- AC 33A utilization category for Mix Load Application.
NFPA 70 - National Electrical Code
NFPA 99 - Essential Electrical Systems for Health Care Facilities
NFPA 110 - Emergency and Standby Power Systems
IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
UL 508 Industrial Control Equipment
- 1.03 Acceptable Manufacturers
- The manufacturer should have a minimum of 5 years installed base in India and must comply fully with the tender specs.
- 2.01 Mechanically Held Transfer Switch
- A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Main operators which include over current disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency.
- B. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
- C. The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- D. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
- E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- G. Where neutral conductors must be switched as shown on the plans, the ATS shall be provided with fully rated complete overlapping neutral transfer contacts. The neutrals of the normal and emergency power sources shall be connected together only during the transfer and retransfer operation and remain connected together until power source contacts close on the source to which the transfer is being made. The overlapping neutral contacts shall not overlap for a period greater than 100 milliseconds. Neutral switching contacts which do not overlap are not acceptable.
- H. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2.02 Microprocessor Controller

- A. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.
- B. A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.2\%$. The panel shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.
- C. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator's manuals.
- D. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows tested by 3rd party at an independent laboratory:

- 1. EN 55011:1991 Emission standard - Group 1, Class A
- 2. EN 50082-2:1995 Generic immunity standard, from which:
 - EN 61000-4-2:1995 Electrostatic discharge (ESD) immunity
 - ENV 50140:1993 Radiated Electro-Magnetic field immunity
 - EN 61000-4-4:1995 Electrical fast transient (EFT) immunity
 - EN 61000-4-5:1995 Surge transient immunity
 - EN 61000-4-6:1996 Conducted Radio-Frequency field immunity
 - IEEE472 (ANSI C37.90A) Ring Wave Test.

3.01 Controller Display and Keypad

- A. A four line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:

- 1. Nominal line voltage and frequency
- 2. Single or three phase sensing
- 3. Operating parameter protection
- 4. Transfer operating mode configuration
(Open transition, Closed transition, or Delayed transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.02 Voltage, Frequency and Phase Rotation Sensing

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Sources	Dropout / Trip	Pickup / Reset
Under voltage	N&E, 3 ϕ	70 to 98%	85 to 100%
Overvoltage	N&E, 3 ϕ	102 to 115%	2% below trip
Under frequency	N&E	85 to 98%	90 to 100%
Over frequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

- B. Repetitive accuracy of all settings shall be within $\pm 0.5\%$ over an operating temperature range of -20°C to 60°C.
- C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

- D. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
 - E. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.
- 3.03 Time Delays
- A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.
 - B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
 - C. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
 - D. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
 - E. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following modes:
 - 1. Prior to transfer only.
 - 2. Prior to and after transfer.
 - 3. Normal to emergency only.
 - 4. Emergency to normal only.
 - 5. Normal to emergency and emergency to normal.
 - 6. All transfer conditions or only when both sources are available.
 - F. The controller shall also include the following built-in time delays for optional Closed Transition and Delayed Transition operation:
 - 1. 1 to 5 minute time delay on failure to synchronize normal and emergency sources prior to closed transition transfer.
 - 2. 0.1 to 9.99 second time delay on an extended parallel condition of both power sources during closed transition operation.
 - 3. 0 to 5 minute time delay for the load disconnect position for delayed transition operation.
 - G. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments.
 - H. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port.
- 3.04 Additional Features
- A. A three position momentary-type test switch shall be provided for the test / automatic / reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.
 - B. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
 - C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed, when the ATS is connected to the emergency source.
 - D. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
 - E. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

The following features shall be built-in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:

- F. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- G. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or serial port.
- H. An In phase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in phase monitor shall be specifically designed for and be the product of the ATS manufacturer.
- I. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.
- J. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines. For each routine, the user shall be able to:
 - 1. Enable or disable the routine.
 - 2. Enable or disable transfer of the load during routine.
 - 3. Set the start time,
 - time of day
 - day of week
 - week of month (1st, 2nd, 3rd, 4th, alternate or every)
 - 4. Set the duration of the run.

At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.

- K. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key a maximum of two times. This screen shall display a clear description of the active operating sequence and switch position. For example,
 - Normal Failed
 - Load on Normal
 - TD Normal to Emerg 2min15s

Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual, are not permissible.

- L. Self Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- M. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication module, with a network of transfer switches, locally (up to 4000 ft.) or remotely through modem serial communications. Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control and setup of parameters.
- N. Data Logging – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
 - 1. Event Logging
 - 1. Data and time and reason for transfer normal to emergency.
 - 2. Data and time and reason for transfer emergency to normal.
 - 3. Data and time and reason for engine start.
 - 4. Data and time engine stopped.
 - 5. Data and time emergency source available.
 - 6. Data and time emergency source not available.
 - 2. Statistical Data
 - 1. Total number of transfers.
 - 2. Total number of transfers due to source failure.
 - 3. Total number of days controller is energized.
 - 4. Total number of hours both normal and emergency sources are available.

Communications Module - A full duplex RS485 interface shall be installed in the ATS controller to enable serial communications. The serial communications shall be capable of a direct connect or multi-drop configured network. This module shall allow for the seamless integration of existing or new communication transfer devices.

External DC Power Supply – An optional provision shall be available to connect an external 24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead.

PART 4 ADDITIONAL REQUIREMENTS

4.01 Withstand and Closing Ratings

- A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of over current protection shown on the plans.
- B. The ATS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 1½ and 3 cycle, long-time ratings. ATSs which are not tested and labeled with 1½ and 3 cycle (any breaker) ratings and have series, or specific breaker ratings only, are not acceptable. The ATS upto 600A should be tested for any breaker rating. The ATS from 800A to 4000A should have short time withstand capacity as follows
 - 800A to 1200A....36KA for 18 cycles
 - 1600A to 3200A....42KA for 18 cycles
 - 4000A.....65 KA for 30 cycles.

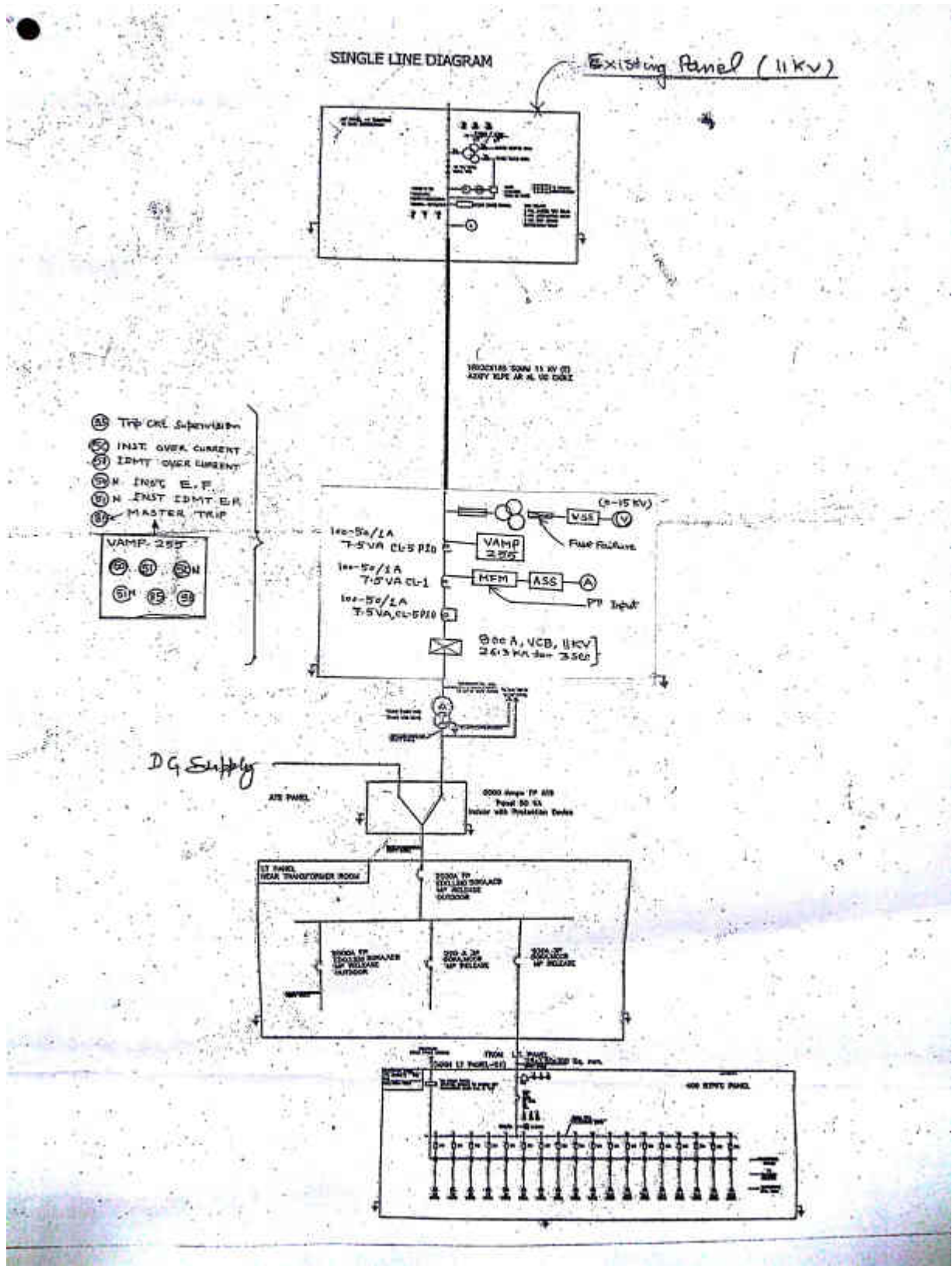
4.02 Tests and Certification

- A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
- B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
- C. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

4.03 Service Representation

- A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

Single Line Diagram



BILL OF QUANTITY

Sl. No.	Description	Unit	Qty	Supply		Installation		Total supply & installation cost
	<u>HT SYSTEM</u>			Rate	Total	Rate	Total	
1	Transformer (Indoor Type) Cooling- ON/AN, Make-Schneider/ABB/CGL/Siemens							
1.1	Supply, Erection, Testing and Commissioning of 11 kV / 0.433 kV, 1000 kVA, Dyn 11 , 5% Impedance, Oil Insulated Transformer with OLTC and RTCC and all accessories complete , Scope shall include unloading shifting from stores to plinth and BDV test & topping up of fresh transformer oil as per requirement to complete the task. If required filtration of oil. (Specifications as enclosed ANNEXURE-A).	Set	1.00	1369500.00	1369500.00	173695	173695	1543195.00
2	Supply, Erection, Testing & Commissioning of 11 KV Vacuum Circuit Breaker Panel including necessary support structure, hardware & testing of the equipment at site after Erection as per specification. All other work to complete the erection of equipment Make-Make-Schneider/ABB/CGL/ Siemens/ L&T							
2.1	Supply, Installation, Testing & Commissioning of 11 kV, 800A, 26.3kA for 3 sec, Indoor VCB Panel (Extendable) (horizontal isolation) including relay , control panel ,Power Pack and Batteries as per specifications and Data Sheet along with CT&PT. PT should be mounted on incomer side. (Specifications enclosed as ANNEXURE-B). Cable box along with detachable gland plate for 3CX185sqmm XLPE Al cable (11 kV grade for I/C & O/G should be provided and entry of the cables should be bottom.)(Relay should be SCADA compatible with existing SCADA network:- MOD Bus 3 protocol and communication cable of appx length 200mtrs shall be laid as per site conditions/instruction of Engineer-in-charge))	Set	1.00	935000.00	935000.00	145000	145000	1080000.00

3	Supply ,Installation, testing and commissioning of L.T. panel boards Compartmental cubicle type, freestanding with appropriate cable entries, with Cu busbars & manufactured based on IS 8623, specifications and single line diagrams. Scope shall include unloading, shifting, unpacking, Section assembly from storage place to desired Installation. All required protections will be as per SLD. Make- Schneider/SIEMENS/ABB/L&T							
3.1	2000A IP 42 Isolation Panel Consisting of 2000A,ACB,Ics=Icu=50kA & 3 nos CT's of 2000/5A,15VA,CL-PS & 5P20 Resp. as incomer and 1 X 2000 Amps 4 P ACB for Data Centre and 1X 630 Amps 4 Pole MCCB for RTPFC and 1 X 200 Amps TPN MCCB as outgoing. Panel should be cubical type .One no Hydraulic trolley should be provided along with cubical panel. (Specifications as enclosed ANNEXURE-C).	Set	1.00	350000.00	350000.00	55000	55000	405000.00
3.2	Supply installation testing & commissioning of RTPFC Panel of 400kVAR with 7% detuned reactor , Panel should be with Thyristor switch and switching sequence will be 12.5X9 + 25X8 +50X2KVAR Panel should have isolation MCCB with adequate protection .Space heater and cooling fan to be provided in each compartment. MAKE-L&T/SIEMENS/SEIL/ABB (As per ANNEXUR-C of Point No-10)	Nos	1	950000	950000.00	200000	20000 0	1150000.00
3.3	ATS Panel-SITC of ATS Panel 2000 Amp 4 Pole 50 KA with Overlapped Neutral facility. The ATS Controller should have communication facility. MAKE-L&T/SIEMENS/SEIL/ABB (Specifications enclosed as ANNEXURE-E)	Nos	1	1950000	1950000.00	210000	21000 0	2160000.00

4	Supply, Testing, tagging, laying, & commissioning of following 11 kV grade XLPE HT cable on readymade Trench/Excavation with (sand cushioning of 75mm, laying bricks on both sides of cable) & covering with RCC / PCC tiles or half round hume pipe of 200 mm dia. and refilling of cable trench, leveling of cable trench etc. as required. (Note: Quantity is tentative as Route is tentatively decided).The depth of cable Trench should be minimum-1200mm Make-UNIVERSAL/GLOSTER/KEI (Specifications as enclosed ANNEXURE-D).							
4.1	3C x 185sqmm Al.XLPE HT Cable,	Rmt r	220.00	1400/mtr	308000.00	300.00	66000	374000.00
5	Supply, installation, testing & commissioning of heat shrink jointing for 11kV HT cables of following sizes including necessary accessories, spider supports, plated hardware like lugs / ferrules, insulation tapes etc. complete. Standard make. Scope also includes making suitable cutouts in gland plate & sealing them after connections.Make-BIRLA-3M/RECHOM							
5.1	Indoor End Termination.	Set	4.00	11000.00	44000.00	1000.00	4000	48000.00
6	Supply installation of Earthing station as per IS 3043 using SIP/PIP electrode complete(Eqvt to Ashlok T 39) with watering pipe & suitable GI strip up to chamber, soil treatment with suitable backfill powder, brick inspection chamber with 450x450 mm CI cover, disconnecting link complete including excavation or earth pit, refilling.	Nos.	8.00	7000.00	56000.00	2500.00	20000	76000.00
7	Statutory Approval from local EB	job	1.00	50000.00	50000.00			50000.00
8	Supply, installation, material equipment required as per statutory provision & safety.							
8.1	11 kV grade Rubber matting 1000 mm width.	Mtr	4.00	4000.00	16000.00			16000.00
8.2	11 kV class Hand gloves.	Pair	1.00	2000.00	2000.00			2000.00
8.3	11kV Danger boards of appropriate size & marking.	Nos	4.00	160.00	640.00			640.00
8.4	433 V Danger boards of appropriate size & marking.	Nos	4.00	160.00	640.00			640.00
8.5	1.1 kV grade Rubber matting 1000 mm width.	Mtr	4.00	3800.00	15200.00			15200.00

8.6	First Aid Box	Nos	3.00	200.00	600.00			600.00
8.7	Laminated First aid chart with frame.	Nos	3.00	300.00	900.00			900.00
8.8	4.5 Kg fire extinguisher ABC type	Nos	5.00	7000.00	35000.00			35000.00
8.9	9 Kg fire extinguisher ABC type	Nos	5.00	10000.00	50000.00			50000.00
9	Providing of set of 3 nos 9.5 litre capacity GI bucket painted in post office red color with prior coat of red oxide paint FIRE and mounted on MS angle iron frame with bracket of appropriate size and capacity i/c filling sand etc.	Nos	3.00	2000.00	6000.00			6000.00
10	HT Cable Route Marker	Nos	10.00	200.00	2000.00	200.00	2000	4000.00
11	Supply, installation, testing of GI/ Cu. earthing strips & wires in ground at a depth of 600 mm. or in readymade trenches or on ready tray with necessary clamps & bimetallic strips as per specification. (excavation required for this will be ensured separately.) Refer layout & tender spec for various applications							
11.1	75 x 10 mm. GI strip.	Rmt r	100.0 0	900.00	90000.00	250.00	25000	115000.00
11.2	50 x 10 mm. Cu strip.	Rmt r	5.00	2000.00	10000.00	250.00	1250	11250.00
11.3	50 x 10 mm. GI strip.	Rmt r	50.00	700.00	35000.00	200.00	10000	45000.00
11.4	50 x 6 mm. GI strip. (Transformer Body ,HT and LT panel Body Earthing)	Rmt r	70.00	500.00	35000.00	200.00	14000	49000.00
12	Supply, installation, testing & commissioning of Transducer type Building lightning arrester "EARLY STREAMER" to cover protection radius of 42.0 mtr. & up to 20 mtr heights With 3 mtr rod height & with stem and fixing arrangement. (Indelec). Required installation/ mounting details shall be submitted prior to installation or SATELITE-3PRODUCT/ASH GEL (Saint-Elimo Lighting conductor with discharge counter & piezoelectric exciter device). Supply, installation, testing of 02 nos disconnecting link box for lightning down conductor at 1 mtr. from GL with SMC insulator and Gunmetal 50 x 6 mm disconnecting link.	Nos.	1.00	242604.00	242604.00	60651.00	60651	303255.00
13	Supply, laying of following different types of GI pipes/pipes in trenches for road crossing for electrical, telephone cables etc. complete as required							

	including excavation of trench in all types of strata except hard rock and refilling, leveling of trench, shifting of extra earth or debris to dump yard complete as required.							
13.1	100 mm dia. GI Pipe B-CLASS MAKE-TATA/JINDEL/QST.	Mtr	18.00	750	13500	50	900	14400.00
14	Supply, Installation, Testing and Commissioning of 1100V grade L.T. PVC insulated multistrand Al. conductor cables with necessary clamps, identification tag. & all other items required to complete the task. (Note:-Actual cable lengths shall be measured at site prior to procurement.)							
14.1	3.5C x 300 Sq.mm. AYFY Cable. (From Transformer to LT Indoor Panel)	Rmtr	50	1200	60000	200	10000	70000.00
14.2	3.5C x300 Sq.mm. AYFY Cable. (From LT Outdoor Panel to Main LT panel inside DC)	Rmtr	330	1200	396000	250	82500	478500.00
14.3	5C x2.5 Sqmm YWY Cu Armoured (RTCC Panel to OLTC)	Rmtr	50	250	12500	50	2500	15000.00
14.4	3C 4Sqmm YWY Cu Armoured (RTCC Panel to OLTC)	Rmtr	50	200	10000	50	2500	12500.00
14.5	12C 2.5 Sqmm YWY Cu Armoured (RTCC Panel to OLTC)	Rmtr	50	400	20000	150	7500	27500.00
15	Supply & installation of End termination for cables as above with Brass, heavy duty, Double compression glands, lugs, other consumable, crimping, gland hole drilling, ferrulling, marking, etc.							
15.1	3.5C x 300 Sq.mm. AYFY Cable.	Nos.	20	700	14000	200	4000	18000.00
16	Supply, installation, testing & commissioning of ACDB							
16.1	440V,AC Distribution board comprising 200 TPN as Incomer and 63Amp TPN-SFU as outgoing -4 no Make-Schneider/SIEMENS /ABB/L&T	Nos	1	168000	168000	42000	42000	210000.00
							Total	83,86,580.00

Note:-

- 1 Work completion period - 90 Days
- 2 Amount and quantity variation: Quantity may vary as per actual work execution/site requirement/end user suggested changes during execution but the final bill value shall not exceed more than 5% of order value.
- 3 Taxation included as per applicable rule of GST.

- 4 Warranty period: 01 year for all above works after handing over of user certificate.
- 5 All electrical works shall comply to applicable IS electrical safety norms.
- 6 Any loss of material/ manpower during the execution of works shall be responsibility of the contractor.
- 7 For execution of above works all accessories shall be arranged by contractor at their end.
- 8 Contractor must have valid Electrical Safety Certificate issued by The D.G., Electrical Safety.
- 9 Any other losses occurring during the execution of above work shall also be the responsibility of the contractor.
- 10 All works shall be executed by skilled electrician under the supervision of qualified supervisor.
- 11 Quality of work must comply with CPWD norms.
- 12 Work shall be executed by skilled manpower of suitable proficiency level and details of manpower shall be submitted before execution of work
- 13 All equipment/ material should be fabricated after approval of drawing.
- 14 Pre dispatch inspection is necessary at manufacturing sites and same should be intimated after readiness of equipments.
- 15 Work progress execution plan and schedule should be submitted after LOA.