यूनियन बैंक ऑफ इंडिया
भारत सरकार का उपक्रम

Union Bank of India
A Government of India Undertaking

REGIONAL OFFICE – UDAIPUR

TENDER FOR ELECTRIFICATION WORK

FOR

UNION BANK OF INDIA

RLP BRANCH
(RK CIRCLE, UDAIPUR)

(EMPANELLED VENDORS OF UDAIPUR REGION ONLY)

ISSUED TO : ……..……..
……..……..
……..……..
……..……..

CLIENT

CHIEF MANAGER
UNION BANK OF INDIA
Regional Office,
446, First & Second Floor
Bhupalpura Main Road
Shastri Circle Udaipur, Rajasthan 313001

ARCHITECT

AAKAAR ARCHITECTS & PLANNERS
7-New Bhopalpura, UDAIPUR
313001

Mobile No. :9414163254

यूनियन बैंक ऑफ इंडिया
भारत सरकार का उपक्रम

Union Bank of India
A Government of India Undertaking

REGIONAL OFFICE – UDAIPUR

Regional office, 446, First & 2nd Floor Bhupalpura Main Road, Near Shastri Circle, Udaipur

Telephone: 0294-2411272

SUBJECT: PROPOSED ELECTRICAL WORKS OF RLP BRANCH AT RK CIRCLE, UDAIPUR UNDER REGIONAL OFFICE UDAIPUR

ISSUE OF TENDERS FROM 07.09.2026 To .22.09.2026

LAST DATE OF SUBMISSION 22.09.2026 UPTO 15.00 HOURS.

TENDER OPENING DATE 22.09.2026 TIME 15.30. HOUR

(TENDERS WILL BE OPENED IN PRESENCE OF CONTRACTING AGENCIES)

PRICE OF THE TENDER DOCUMENT RS.500 (NON-REFUNDABLE) BY WAY OF DEMAND DRAFT/PAY ORDER ISSUED BY ANY NATIONALIZED BANK IN FAVOUR OF UNION BANK OF INDIA UDAIPUR

PLACE OF SUBMISSION: THE CHIEF MANAGER ,
UNION BANK OF INDIA
Regional Office,
Shastri Circle Udaipur, Rajasthan-313001

TENDER ISSUED TO: M/S _____

TENDER NOTICE

SUBJECT: **PROPOSED ELECTRICAL WORKS OF RLP BRANCH AT RK CIRCLE, UDAIPUR UNDER REGIONAL OFFICE UDAIPUR**

1. **Sealed item rate tenders are invited by <u>The Chief Manager, Union Bank of India, Regional office, 446, First & 2nd Floor Bhupalpura Main Road Near Shastri Circle Udaipur 313001</u>.**

   The approximate cost of the work is Rs. 3,61,974/-

   Rupees three Lakhs sixty-one Thousand nine Hundred and seventy-four Only

2. The work to be completed within **30 days from 7th day** of the date of acceptance of work order placed by M/s. Union Bank of India.

3. The tenderers are required to complete form of tender, price the schedule of quantities and sign each page of the Tender Documents before submission. The completed set is to be enclosed in sealed envelope addressed to:

   THE CHIEF MANAGER ,
   UNION BANK OF INDIA
   Regional Office,,
   Shastri Circle Udaipur, Rajasthan313001

4. Tender will be received up to 15.00 hours on **22.09.2026**.

5. No tender will be received after the expiry of the time notified for receiving tenders under any circumstances whatsoever.

6. The tender will be opened at 15.30 hours on **22.09.2026** at above address in the presence of authorized representative of contracting agency.

7. Tender shall remain valid for acceptance for a period of 90 days from the notified last date of tender submission.

8. The Bank reserves the right to reject any or all tenders received without assignment of any reasons thereof.

9. The tender rate against each item of work / price indicated in the schedule of quantities and rates / price should be indicated both in words and figures. In case of any discrepancy, the rates indicated in words would prevail. **All rates should be exclusive of all applicable Taxes including GST,** Sales tax, work contract tax, VAT, octroi, etc.

10. The rate quoted against each item of work / price should be for the complete finished item of work and include all labour, material, taxes, overhead, duties, etc. The Bank as per shall reimburse any statutory change in the tax structure after opening of the tender actual.

11. Each tender be accompanied by Earnest Money of **Rs. 18098/- (Rupees eighteen Thousand ninety-eight Only)** in the form of Pay Order / Demand Draft in favour of Union Bank of India payable at Udaipur. Tenders without Earnest Money shall be summarily rejected.

12. The earnest money deposited shall not carry any interest and will be refunded to the unsuccessful tenders. The Bank till completion of the work will retain earnest

money paid by the successful contractor.

13. Earnest money paid by contractor shall be forfeited by the Bank if contractor fails to undertake the job if he is communicated about acceptance of his rates.

14. All tenders in which any of the prescribed conditions are not fulfilled or incomplete in any respect are liable to be rejected.

15. This tender notice shall form part of the contract documents.

For Union Bank of India

TENDER DOCUMENT ISSUING LETTER

LETTER ISSUING TENDER DOCUMENT FOR PROPOSED ELECTRICAL WORKS RLP BRANCH at RK CIRCLE, UDAIPUR UNDER REGIONAL OFFICE UDAIPUR

This tender document set for the Electrification work of RLP BRANCH containing One Volume, totaling 1 to 80 pages in Tender and 1nos. drawings are issued.

Name of Tenderer :

Address of Tenderer :

The non - refundable fee for this set of Tender Document is Rs.500/-

The Tender Document is issued on date:

For
UNION BANK OF INDIA

To,

The Chief Manager,
UNION BANK OF INDIA,
REGIONAL OFFICE,
446, FIRST & SECOND FLOOR
BHUPALPURA MAIN ROAD
SHASTRI CIRCLE , UDAIPUR
313001

Dear Sir.

With reference to the tender invited by you for the work.

I/We hereby offer to execute the work under contract at the respective rates mentioned in the schedule of quantities.

I/We have seen the site, understood the general conditions of contract, special conditions, additional conditions.

I/We agree to execute the work as per specifications, general conditions of contract, special conditions, and additional conditions.

I/We deposit earnest money Rs. 18098/- by demand draft /pay order which amount shall not carry any interest. I/we do hereby agree that the sum shall be forfeited by the bank in event our tender is accepted & I/We fail to execute the contract when required to do so.

I/we understand that you are not bound to accept the lowest or any other tender that you received.

Yours faithfully,

(Contractor)
Signature of partner / prop. of the firm.

In the presence of witness

GENERAL CONDITIONS OF CONTRACT

SUBJECT: **PROPOSED ELECTRICAL WORKS OF RLP BRANCH AT RK CIRCLE, UDAIPUR UNDER REGIONAL OFFICE UDAIPUR**

General Instructions to Contractor:-

1 **Inspection of sites:** The contractor shall visit and examine the site and satisfy as to the nature and correct dimensions of work and facilities for obtaining material and shall obtain generally his own information on all matters affecting the execution of work. No extra charge made in consequence of any misunderstanding or incorrect information on any of these points on the ground of insufficient description will be allowed. All expenses incurred by the contractors in connection with obtaining information for submitting this tender including his visit to site and efforts in compiling the tender shall be borne by the tenderer ad no claims for reimbursement thereof shall be entertained.

2 **Safety Regulations:** The contractor shall take all the necessary precautions while working and to safeguard adjacent property, Bank's property, Bank's employees, and traffic persons

3 **Compliance to local laws:** The contractor shall conform to the provisions of any Act of the Legislature relating to the work and to the Regulation of Bye Laws of any authority. He shall also obtain the permission of the Municipality or any other Authorities if required under the existing rules.

4 **Site cleaning:**All the rates quoted are inclusive of removal of rubbish / debris collected during the progress of work, rejected material and clearance of site before and after the work is completed. Not more than one truck load shall be stored that to for not more than 3 days. The contractor shall arrange to remove the same immediately. If the contractor is failing to remove the same and the expenses shall be recovered from the contractor and he will not dispute for the expenses so incurred.

5 **Vouchers / bills:** Contractor shall upon the request of the Bank furnish bills, invoices, accounts, receipts and other vouchers for all materials brought on site to prove that the material purchased are as mentioned in the specification.

6 **Contractor's responsibility:** The work will from time to time be examined by Bank's Architect / Engineer, but such examination shall not in any way exonerate the contractor from the obligation to remedying any defects which may be observed at any stage of the work or after the same is completed.

7 **Dismissal from work:**The contractor shall upon the written request of the Bank's Architect / Engineer immediately dismiss from the work any person employed by him thereon, who may in the opinion of the authority be incompetent or misconduct himself and such person shall not be again employed on the work, without the permission of the bank.

8 **Order of work, etc.:** Bank reserves the right to fix the order in which the various items of work involved are to be executed. However, the contractor shall be responsible for the completion of the entire job within the item limit specified failing which liquidated damages as mentioned in clause No.49 shall be recovered from the contractor.

9 **Commencement of work:** The work must be started within 7 days upon accepting the work order and the program for carrying out the various jobs shall be drawn out in consultation with the Bank's Architect / Engineer. Adequate labour force shall be provided to complete the work within the specified period. Proper security aspects should be taken care of by adequate vigilance in view of the importance of the building. Default in compliance with the programs so finalized shall entail operation of liquidated damages as stated.

10 **Subletting the work:** The contractor shall not directly or indirectly sublet the work to other party without written permission from the bank.

11 **Quantities of works are provisional:** The quantities mentioned in schedule are provisional and likely to increase / decrease to any extent or may be omitted thus altering the aggregate value of the contract. No claim for loss of profit / business shall be entertained on this account

12 **Distribution of work:** The Bank reserve the right to distribute the work for which quotation have been called, among more than one parties, if found necessary. No claim in this respect shall be considered and the contractor agrees to cooperate with other agencies appointed by the bank.

13 **Third party damage:** The contractor shall be responsible for all injury to persons, animals, building, building structure, any damage to road, streets, footpaths and shall rectify it at its own cost.

14 **Insurance cover:** All the workers of the contractor as well as his sub-contractor must be properly covered by an Insurance Policy under Workman's Compensation Act and Fatal Accidents Act. The contractor at his own expenses arrange to effect and maintain until the virtual completion of the contract, insurance policy in the joint name of the Bank and the contractor against this risk to be retained by the Bank until the virtual completion of the work, and indemnify the Bank from all the liabilities arising out of such events. In case of delay, contractor shall arrange to extend insurance policy till work is completed.

15 **Delay & Extension of time:** All the work should be completed within the specified period in the tender. If the work is delayed due to the reasons beyond the control of the contractor, he should applying to the Bank explaining, therein the reasons for such delays, immediately and if in the opinion of Bank's authorities the delay is justified, the contractor shall be granted extension in time limit.

16 **Certificate of virtual completion:** As soon as the work is completed, the contractor shall inform in writing such completion to the Bank's Architect / Engineer who will inspect the work and if satisfied will issue the certificate that the work has been virtually completed and the defects liability period shall commence from the date of such certificate.

17 **Defect liability period:** The defects or other faults which may appear during the defect liability period which is 12 months after the virtual completion of the work, arising in the opinion of the bank due to inferior quality of material or bad workmanship not in accordance with the contract, contractor shall make good at his own cost within a reasonable time. In case of default, Bank may employ and pay other agencies to amend and make good such defects and all expenses / damages / losses shall be recoverable by Bank or may be deducted from any money due to the contractor

18 **Arrangement of work:** The contractor shall organize the work in such a way that the office users or the nearby public area put to no hardships and the working of the office is not affected. The contractor shall take adequate care during the progress of work to protect the office property like stationery, furniture, etc. In case of any damage, the same shall be made good by the contractor. Contractor is agreed to work after office hours for which no extra cost shall be considered.

19 **Stacking of material:** The contractor is not to stack any of his material recklessly so as to endanger the safety of the building and cause any nuisance to the occupants and the public.

20 **Extra charges:** It must be clearly understood that all the conditions of contracts are intended to be strictly enforced and that no extra charges in respect of extra work will be allowed unless they are clearly outside the spirit and meaning of the condition and unless such work shall have been ordered in writing.

21 **Protection of material and work:** The contractor shall be responsible for storing and watching his own material and protecting the work at his own cost. The contractor and his worker will be allowed to use lift after office hours. However, no paint drums or heavy bag of cement / paint will be allowed to be taken into the lift. Any damage / spoiling of lift / floor / dado caused during such act will have to be made good by the contractor at his own expenditure.

22 **Water supply:** The contractor shall make his own arrangement for water required for the work. in case the water is available and supplied by the Bank, the charges for the same shall be recovered at the rate of 1% of value of the work executed. In case water supplied by the Bank, the contractor shall make his own arrangement for the storage, pipeline from point of tape of to the required location.

23 **Electric supply:** Electricity will be supplied by the Bank, the contractor shall make his own arrangement for providing points, wires lines, extension board wherever it is required in the premises, in and out.

24 **Approval of samples:** The contractor shall furnish well in time before work commence at his own cost, colour samples, samples of material or workmanship that may be called by Bank's Architect / Engineer for approval. Rates quoted

shall cover for such preliminary work.

25 **Workmanship:** The work involved calls for a high standard of workmanship combined with speed. All the glass panes, door handles / hinges, electric fitting, fans, furniture records, floors etc. are to be thoroughly cleaned after work is completed. Any damage to the flooring, tiles, dado, paneling or any other part of the building, etc. shall be made good at the cost of the contractor to the entire satisfaction of the Bank. Contractor shall make all arrangements for shifting of furniture / records and keeping the same in its original position after he finishes the work on daily basis. The contractor at his own cost shall provide brown paper, polythene, tarpaulin etc. for protecting furniture / fixtures, paneling, electrical, fittings, records, etc.

26 **Interpretation of documents / drawing:** Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design drawings and instructions herein before mentioned and as to the quality of workmanship or materials used for the work or as to any other question, claim, right, matter or thing whatsoever, in any way arising out of or relating to the contract, designs, drawings specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the competent authority of the Bank whose decision shall be final and binding on the contractor.

27 **Use of scaffolding:** The contractor shall allow the use of scaffolding erected by them to any other agency employed by the Bank during the contract period without any payment.

28 **Provisional Item:** If ordered by the Bank, contractor shall be required to carry out provisional items at the same conditions and rates as applicable for this contract.

29 **Measurements of all concealed items:** Measurements of all concealed items of work and extra item if any, shall be got recorded by the Bank's Architect / Engineer before they are checked up.

30 **Measurements:** All measurement tapes shall be of steel and all scaffolding and ladders that may be required for taking measurements shall be supplied by the contractor.

31 **Cleaning during the work:** The rates quoted shall include cleaning of ceiling roses, electric switches, boards, window panes etc. after the repairing leaving the site neat and tidy from time to time.

32 **Complying I.S. specification:** Unless otherwise mentioned in the contract, the latest Indian Standard Code for material specifications, method of work, mode of measurements shall be followed. The payment shall be made on the basis of actual measurement of work done to be submitted along with bill

33 **Rate to include:** The rates quoted by the contractor shall cover for work at any height in the premises for all finished items under this contract. The rate quoted shall be inclusive of all material cost, wastage, labour, loading, profit, taxes if any, scaffolding, transport, supervision, spot light arrangement and any other means to complete the job. Octroi, sales-tax, works contract tax or any other taxes present or future to be included in the rates so quoted. If there is a change in the tax structure / duties as per State / Central Govt. order after opening of tender, the Bank shall reimburse difference in tax as per actual.

34 **Price Fluctuation:** The rates quoted by the contractor shall be firm throughout the currency of contract (including extension of time if any granted) and will not be subject to any fluctuation due to variation in the cost of material or labour.

35 The successful tenderer if called upon to do so, shall obtain a letter from the approved trade manufacturer whose product is used, if found necessary by the Bank confirming that the manufacturer shall provide all the technical assistance and supervision during the execution of the work at all such places as directed and the contractor shall bear the expenses, if any, for such supervision and technical assistance supplied by the trade manufacturer.

36 **Testing of materials:** If at any point of time during the work, if Bank authorities desire to carry out the tests of certain materials, the contractor shall arrange for the same and submit the test report without any extra cost to the Bank.

37 The contractor shall note that they should bring to the notice of the Architect / Engineer any breakage in glass window before starting work. However, if any glass window is found to be broken during the repairing work, the same shall be replaced by the contractor at his own cost.

38 **Conditional tenders:** Conditional tenders are liable to be rejected.

39 **Rates of non-tendered items:** The successful tenderer is bound to carry out any item of work necessary for the completion of the job even though such items are not included in schedule of quantities.

40 **Abandonment of work:** If in any case the work required to be abandoned, the contractor shall not be entitled for any claims and he will be paid as per the actual work done till that period.

41 The Bank reserves the right to accept / reject the lower or any or all tenders in part or in whole without assigning a reason therefore.

42 Decision of the Bank shall be final and binding on any matter connected with the work. The matter of any dispute shall be decided after mutual discussions based on the terms and conditions of this contract. However, if the matter can not be resolved then the same shall be referred to the respected, qualified person in the field agreed to both the parties and his opinion shall be binding on both the parties. However, this is pre course to any legal action in this regard.

43 **Incomplete quotation:** Incomplete quotations shall be summarily rejected

44 **Payments:** The contractor shall be paid by the Bank from time to time under interim payment on account of works executed and when the value of work equal to the approximate value named in the Appendix as 'Value of work for Interim Certificate' has been executed in accordance with this contract.

45 When the work has been virtually completed and Bank's Architects / Engineer has certified in writing that the work has been completed on the basis of detailed measurements and has made a final scrutiny and that there is no dispute items, rates, ad quantities, the contractor shall be entitled to the payment of the final bill in accordance with the final certificate which will be honored within the period specified in the Appendix as period of honoring final certificate.

46 The contractor shall be paid by the Bank within the period named in Appendix (period of honoring certificate) after such certificate has been delivered to the employer by the Bank's Architect / Engineer. Bank's Architect / Engineer has power to withhold any certificate in the work or any part thereof are not carried out to his satisfaction or the contractor fails to show the desired progress or fails to follow the instructions given or in case of breach of this contract.

47 For water proofing works on traces, bathroom, WC, Chajja, work has to be executed through the agency specialized in waterproofing. Contractor will have to submit a guarantee of 10 years on stamp papers as per the format toe be prescribed by the Bank.

48 Earnest Money Deposit of successful tenderer shall be treated as security deposit. The contractor should pay this amount to the Bank by DD or PO at the time of submission of tender. This amount shall be retained by the Bank till the work is virtually completed and all amounts relating thereto settled. Second part of security deposit shall be built through the retentions from interim and final bills of the contractor and the amount of retention shall be as stated in the Appendix.

49 When the certificate of the virtual completion is issued to the contractor the security deposit in the form of EMD and 50% of retention money shall be refunded, provided that the contractor has fulfilled all the conditions of contract and further provided that the employer has no claim for forfeiture of part or whole of the said deposit. The balance 50% of the retention money built up through retention from interim and final bills will be returned to the contractor after the expiry of defect liability period, subject to deductions for any appropriations thereof required to be made by the Bank as per conditions of the contract. The contractor should note that no interest will be allowed on his security deposit.

50 The contractor is requested to sign each page of the quotation and put rubber stamp, seal below his signature and seal the quotation in an envelope.

51 **Liquidated damages:** If the contractor fails to maintain the required progress or to complete the work and clear the site or before the contract or extended date period of completion, he shall without prejudice to any other right, pay as agreed compensation amount of 1% of contract amount per week of delay

subject to maximum of 10% of contract amount as liquidated damages.

52 **Records & measurements:** Measurements shall be taken jointly by Bank's Architect / Engineer and contractor and shall without extra charges provide assistance with appliance , labour and other things necessary for the work and measurements will be signed and dated by both the parties on completion of measurements.

53 **Safety measures:** The contractor at his own cost shall provide tarpaulins on the external side of the building at the time of breaking plaster etc. to safeguard adjacent property, Bank's property, employees, traffic, etc. The contractor shall follow all the safety measures while carrying out the work. Employer that is Bank shall not be liable for any compensation due to accident, any mishap or negligence.

54 If there is delay in commencement of work for any reason, the employer that is Bank shall not be liable for any compensation.

55 If at any point of time during the progress, it is observed that the contractor is not progressing the work with due diligence, care and lagging much behind the schedule or fails to gear up the work despite instructions from Bank's Architects, the employer (Bank) reserves the right to terminate the contract with 7 days notice. In such case, the contractor shall be liable to pay the employer any extra cost involved for the completion of the said work and will not obstruct any way in completing the work through other agency. After completion of entire work the contractor shall be paid for the actual work executed by him at the quoted rates after deducting any claims, damages. In case of such termination the security deposit held by the Bank will be forfeited

56 Although the number of coats of paints / polishing / white washing are specified the contractor will have to additional coats if the surface is not to the satisfaction of the Bank's Architect / Engineer and there shall be no extra payment on account of such coats

57 **First Aid:** The contractor shall be responsible for all first aid and he shall keep the site fully equipped to meet such emergency.

58 **Supervision:** The contractor is required to have on site during all working hours a competent supervisor (acceptable to Bank) who will be responsible for the conduct of worker and who has authority to receive and act on such instructions issued by the Architect / Engineer of Bank.

59 All work shall be carried out in a workman-like manner to the entire satisfaction of the Architect / Engineers.

60 Contractor shall follow all rules / regulations in force and should possess the license for employing labour and also follow all safety measures, labour bye law and shall be responsible for any lapse.

61 **Transfer of Tender Documents:** Transfer of tender documents purchased by one

intending tenderer to another is not permissible.

62 Safety: The contractor shall carry out the entire work in a workman like manner having full regard for the safety of the men working at site. All safe practices shall be strictly adhered to by the workmen of the contractor like wearing helmets, safety belts when working at heights, gloves when handling sharp objects and reinforcement, eye shields during welding, safety shoes, etc. The contractor shall protect sides of openings in floor slabs, edges of slabs, stairs, stairwells etc. with barricades, warning signs / lights and educate all his workmen regarding following safe working practices. He shall provide first aid boxes at site.

In spite of following safe methods, in case of any unfortunate accident, the contractor shall indemnify the employer against any expenses or claims towards treatment or compensation.

63 A Daily Diary Register: A daily diary register (with cement and steel stock statement) will be kept in the Engineer's Office or the site office. The contractor or his representative will furnish every day at 9.00 hrs. details of work for the day proceeding and the diary will be written up every day and jointly signed by the Engineer and the Contractor or their representatives in token of its correctness.

64 Nuisance: The contractor shall not any time do cause or permit anyone to do or cause any nuisance on the site or do anything which shall cause unnecessary disturbance of inconvenience to the Employer or to the owners, tenants or occupiers of other properties near the site and to the public generally.

65 Rights, remedies and powers:

I) Termination of contract due to contractor's default. If the contractor:

a. Abandon the contract.

b. At any time defaults in proceedings with the works with due diligence and continues to do so after a notice in writing of seven days from the Engineer or Project Architect or Employer, or

c. Commits default in complying with any of the terms and conditions of the contract and does not remedy it within 7 days after a notice in writing is given to him in that behalf of the Engineer or Project Architect or Employer.

d. Persistently disregards the instructions of the Engineer, Project Architect or contravenes any provision of the contract, or

e. Fails to remove materials from the site or to pull down and replace work after receiving from the Engineer, Project Architect notice to the effect that the said materials or works have been rejected.

f. Fails to complete the works or items of work on or before the stipulated date (s) of completion, and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer, or Project Architect of Employer, or

g. Offer or gives or agrees to give to any person in the Employer's service or to any other person on this behalf, any gift or consideration of any kind as an inducement or reward for doing or forbearing to do so for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for the Employer, or

h. Shall enter into a contract with the Employer in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have previously been disclosed in writing to the Employer / Engineer, or

i. Shall obtain a contract with the Employer as a result of ring tendering or other non-bonafide methods of competitive tendency, or

j. Being an individual, or if a firm, any partner thereof, shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation fir the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or support so to do, or any application be made under any Insolvency Act for the time being in force for the sequestration of his estates or if a trust deed be executed by him for benefit of his creditors, or

k. Being a company, shall pass a resolution or the court shall make an order for the liquidation of its affairs, or a appointed or circumstances shall arise which entitle the court or debenture holders to appoint a receiver or manager, or

l. Shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days, or

m. Assigns, transfers, sublets (engagement of labour on a piece work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be sub-letting) or attempts to assign, transfer or sub-let the entire works, or any portion thereof without the prior written approval of the employer.

I) The Bank may, without prejudice to any other right or remedy which shall have accrued or shall accrue thereafter as the Employer by written notice determine the contract either as a whole or in part.

II) Upon such determination of the contract in whole or in part, the security deposit with the Employer in respect of the contract shall stand forfeited to the Employer without in any way effecting the rights of the Employer.

III) Rights of the employer after determination of the contract due to contractor's default.

The Engineer shall on such determination have powers to:

a. Take possession of the site and any materials equipment, plant, implements stores etc. thereon, and / or

b. Carry out the incomplete work by any means at the risk and cost of the contractor.

IV) On determination of the contract in full or in part, the Engineer shall determine what amount, if any, is recoverable from the contractor for completion of the works or part of the works or in case the works or part of the works is not to be completed, the loss or damage suffered by the Employer. In determining the amount, credit shall be given to the contractor for the value of the work executed by him up to the time of cancellation or the value of contractor's materials to be present so as to record the measurements in his presence. If the contractor fails to be present in response to the notice, the recording of measurements shall be preceded with ex-parte and the measurements as recorded shall be binding the contractor.

V) The Bank shall have the right to use contractor's plant, machinery and materials on the balance work but shall not in any way be responsible for any damage or loss of the same and the contractor shall not be entitled to any compensation thereof.

66 No extra charges shall be payable for removal of furniture/partitions.

APPENDIX TO THE CONTRACT DOCUMENTS

Subject: **PROPOSED ELECTRICAL WORKS OF RLP BRANCH AT RK CIRCLE, UDAIPUR UNDER REGIONAL OFFICE UDAIPUR**

1.	Defect liability period Completion of work.	:	12 months from the date of virtual
2.	Date of commencement	:	7 days after the contract is accepted by the Contractor
3.	Date of completion	:	30 DAYS.
4.	Liquidated damages	:a)	1% of contract amount per week / day of delay subject to maximumof 10% of contract amount for the works of less than 6 month completion period.
		b)	0.5% of contract amount perweek / day of delay subject to maximumof 7.5% of contract amount for the works of which completion period is 6 months to 24 months completion period.
5.	Period of honoring final certificate	:	60 days
6.	Value of work for interim certificate	:	Full & Final Payment to made
7.	Period of honoring certificate	:	15 days

8. Retention money: Retention money @ 8% of tender / contract value shall be deducted from the running bills.

9 Earnest Money to be submitted: Rs. 18098/- being 5% of the estimated cost of work by demand draft or pay order issued by any Nationalized Bank drawn in favor of Union Bank of India payable at UDAIPUR.

SPECIFICATIONS FOR ELECTRICAL WORKS

SPECIAL CONDITIONS OF CONTRACT

1. COMPLETENESS OF TENDER :-

All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections as required, and all other sundry items which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

2. RATES: -

The rates tendered shall be for complete items of work inclusive of Cost of material, erection, connection, testing, labour, supervision, tool & plants, storage, contingencies, breakage, wastage, execution at any level & height, all taxes (including works contract tax, if any), duties, and levies etc. and all charges for items contingent to the work, such as, packing, forwarding, insurance, freight and delivery at site for the materials to be supplied by the contractor.

3. WORKS TO BE DONE BY THE CONTRACTOR :-

The scope of internal and external electrification under this contract shall include the design, engineering, manufacture, assembly, testing, delivery, erection and commissioning of electrical system including supply of all material, labour, T&P etc for followings –

- Main Switches, Main L T Panels, meter board and external cable connection.
- 11 KV HT Panel.
- 11 KV / 0.433 KV Transformers.
- D. G. Sets with fuel tank, piping, fuel pump, exhaust piping with lagging and supports, cooling system complete.
- Sub and branch distribution boards, MCB's and RCCB's etc.
- Mains and Sub mains between various panels, meter boards and distribution boards.
- Point wiring with Conduits for all type of wiring including circuits, sub mains, light, fans, power and AC etc.
- Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with accessories complete.
- Earthing and Lightning Protection with earth leads/strips.
- Conduits and wiring for Telephone, EPABX, TV system, PA system, Music system and Computer networking, fire alarm, broad band etc.
- Cables and other allied works.
- Provision of emergency electrical supply and distribution for complete light, fans and other specified points are also included in the scope of work. For the purpose of emergency distribution separate DB's shall be installed for Light/fans and fax machines & staircase lighting at every place, so that these can be separated.
- Lighting Fixtures fans and exhaust fans. (If these are supplied by the client, then the contractor will erect the fixture as required without any extra payment beyond the contract)

- External lighting including underground cables and connection with the external cables and earthing.
- Feeder pillars with circuit breakers.
- Underground cables.

All the above work shall be complete in all respects up to the satisfaction of architect, consultant, Client and Engineer in charge as per the details mentioned in BOQ and drawings supplied time to time.

Unless and otherwise mentioned in the tender documents the following scope of works shall be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost:

a) Furnishing of all labour, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti corrosive paints, jute cotton waste etc., and hardware for timely and efficient execution of the erection work.

b) Transport vehicles necessary for efficient transportation of equipment from Owner's stores to site of erection and excess materials back to owner's stores.

c) Complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations of above equipment.

d) The items of work to be performed on all equipment and materials shall include but not limited to the following:

I. Receiving, unloading and transportation at site. (To Owner or Contractor's stores and from their up to actual place of erection).

II. Opening, inspecting and reporting all damages and short supply items.

III. Arranging to repair and/or re-order all damaged and short supply items.

IV. Storing at site with suitable all weather protection.

V. Assemblies, erection and complete Installation.

VI. Necessary coordination between work done by other Contractors.

VII. Final check-up, testing and commissioning in presence of Owner's representative.

VIII. Obtaining Owner's written acceptance of satisfactory performance.

4. INFORMATIONS REQUIRED FROM CONTRACTOR

5.

I. Typical GA drawing of all equipment to be supplied and disposition of various fittings and loading.

II. All Annexures of this specification duly filled in and signed by the contractor.

III. Catalogue of all equipment and components explaining construction features.

IV. Transportation/shipping dimensions and weights, space required for handling parts for maintenance.

V. Type test certificates for all equipment on similar type of equipment.

VI. Final Single line diagram complete with cable sizes etc.

VII. Bill of Materials, Control & schematic line diagram for meter & relay panel, terminal connection/Master Terminal box diagram, wiring diagram with physical location of components for all equipment.

VIII. Detailed cabling layout showing cable trench / tray layout, earthing layout.

IX. Detailed lighting layout showing position of fixtures / type of fixtures, circuiting and route of wires / cables / fixing details, DB details.

X. Protection relay settings.

XI. Cable schedule & interconnection chart.

XII. Foundation details and plan, loading details for all equipment.

XIII. Test certificates.

XIV. Instruction manuals of all major equipment.

XV. Test Procedures at sites.

XVI. Test reports of all tests carried out at site.

XVII. 'AS BUILT' drawings (2 sets of soft copies on CD and six sets of hard copies duly wound).

XVIII. All layout drawings shall be made in scale of 1:50 or 1:100 unless until agreed by the Owner/ Consultant.

5. PRICES

a) The price quoted for supply items shall include all packing, crating, excise duty, sale tax / Works Contract tax, insurance, freight, loading/ unloading, handling & all other charges.

b) The price quoted for erection & commissioning shall include cost of all consumables, taxes & duties. (if any). No additional taxes/duties shall be payable by Owner.

c) Prices quoted shall be firm and no variation shall be allowed during contract period.

d) Contractor shall furnish prices separately for spare parts for two (2) year's trouble free operation of the equipment and shall furnish the list of the same.

6. ELECTRIC POWER SUPPLY AND WATER SUPPLY :-

Unless and otherwise specified, power supply and water supply as may be required shall be arranged by the contractor for installation and testing of the equipment's at the site of work.

7. PROVISIONS AGAINST ACCIDENTS AND SAFETY MEASURES

a) All safety rules and codes as applicable to work including rules applicable as per factory inspector shall be followed during execution of above work.

b) All safety appliances and protective devices including hand gloves, aprons, helmets, shields, goggles, safety belts etc. shall be provided by Contractor for his personnel.

c) The Contractor shall arrange to provide guards and prominent display caution notices if access to any equipment / area is considered unsafe and hazardous.

8. SPECIFICATIONS

In the absence of specifications for any work or materials, relevant Indian Standard Specifications shall be applicable. If such codes for a particular subject have not been framed, the decision of the Employer / Consultant will be final and binding.

9. VARIATION IN QUANTITY

a) The Owner shall have right to delete or increase / decrease quantity specified in this specification as specified in preamble to Bill Of Materials.

b) Quantities indicated in Bill of Materials are based on engineering status of the project as on date. It is necessary that proper engineering is carried out by the contractor before procurement of material.

c) For procurement of any material & sequential delivery at site from point of view of erection etc. Contractor shall take prior approval from the employer.

d) All left over material for which payment has been made by the employer, has to be taken back by the contractor. The employer shall make necessary deduction from the bills of contractor.

10. SITE VISIT

It is recommended that contractor shall visit site before submission of his offer. Time and date shall be fixed with employer.

11. TOOLS FOR HANDLING AND ERECTION :-

All tools and tackles required for handling of equipment and materials at site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the contractor.

12. CO-ORDINATION WITH OTHER AGENCY: -

The contractor shall co-ordinate with all other agencies involved in the building work so that the building work is not hampered due to delay in his work. Recessed conduit and other works, which directly affect the progress of building work, should be given priority.

13. CARE OF BUILDINGS :-

Care shall be taken by the contractor to avoid damage to the building during execution of his part of the work. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of his work from the site, from time to time as designed by the Engineer-in-charge.

14. STRUCTURAL ALTERATIONS TO BUILDINGS :-

I. No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-in-charge.

II. Structural provisions like openings, cutouts if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.

III. All such openings in floors provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.

IV. All chase required in connection with the electrical works shall be provided and filled by the contractor at his own cost to the original architectural finish of the buildings.

15. WORK IN OCCUPIED BUILDINGS: -

I. When work is executed in occupied buildings, there should be minimum of inconvenience to the occupants. The work shall be programmed in consultation with the Engineer-in-charge and the occupying department. If so required, the work may have to be done even before and after working hours.

II. The contractor shall be responsible to abide by the regulations or restrictions set in regard to entry into, and movement within the premises.

III. The contractor shall not tamper with any of the existing installations including their switching operations or connections there to without specific approval from the Engineer-in-charge.

16. STATUTORY REGULATION AND APPROVALS :-

All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only "A" Class government approved electrical contractor shall execute the job.

It shall be the responsibility of the Contractor to comply with the regulations laid down by the Indian Electricity Rules and local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Architects/Clients at the completion. All coordination with the local electric supply authorities, submitted of application, getting the desired load sanctioned shall be in the scope of contractor. The fees required to obtain the desired load sanctioned and other legal and miscellaneous charges by local electric supply authority / undertaking shall be given by the client but all follow-ups etc. shall be the contractor's responsibility.

On completion of the work, the contractor shall obtain the certificates of final inspection and approval by the local electric supply authority and deliver these certificates to the Owner/Architects in original. The contractor shall bear all expenses and fees required to obtain these certificates without which the work shall not be taken over and shall not be considered complete.

17. STANDARDS AND CODE OF PRACTICE :-

The work shall be carried out as per the enclosed Specifications of work and the construction drawings to be issued from time to time. These specifications shall be read in conjunction with National Building Code, National Electrical Code 1985, Relevant Codes of Practices and Standards as issued by ISI and Indian Electricity Rules, CPWD specifications for electrical works (all with the latest amendments). The installation shall confirm in all respects to Indian Standard code of Practices. Following BIS codes shall be referred –

a) National Electrical Code

b) IS: 694 – 1977: PVC insulated cables for working voltage up to and including 1100 volts

c) IS: 732 -1989: Electrical wiring installation

d) IS: 1225 -1938: Installation and Maintenance of power Cables up to and including 33 KV Rating

e) IS: 1554: PVC insulated heavy-duty electrical cables.

f) IS: 1860: Installation operation and maintenance of passenger and goods elevator.

g) IS: 2309 -1989: Protection of building and allied structures against lightning.

h) IS: 3043 -1987: Earthing

i) IS: 3646 (Part-1) -1992 : Interior Illumination
j) IS: 3661 (Part-2) -1967 : Current rating for cable

k) IS: 3661 (Part-5) -1968: Current rating for cable

l) IS: 5216 (Part-1) -1982: Recommendations on safety procedures and practices in electrical work.

m) IS: 7098 (1 & 2): XLPE insulated cables

n) IS: 10028 (Part-1) -1985: selection, Installation and Maintenance of Transformers

o) IS: 10118 (Part-1) -1982: Selection, Installation and Maintenance of switchgear and Control gear

18. MATERIAL SAMPLES AND SHOP DRAWINGS :-

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Architect/Consultant. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Architect/Consultant. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit for Architect/Consultant's approval the shop drawings at approved scale indicating the custom built equipment, L.T. Panels, run of cables and conduits he proposes to install.

19. ELECTRICAL DRAWINGS: -

i) The electrical drawings issued from time to time to the contractor are diagrammatic but shall be following as closely as actual construction and work will permit. The Contractor at his own expenses shall make any deviation from the drawings required to conform to the building construction. The architectural drawings shall take precedence over the electrical drawings as for as the civil and other trades works are concerned.

ii) If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Architect/Consultant and his decision would be final and binding on the Contractor.

20. TESTING AND COMMISSIONING: -

The Contractor shall be responsible for testing and commissioning the entire electrical installation described in these specifications and relevant IS specifications and will demonstrate the operation of the systems to the entire satisfaction of the Architect/Consultant and to the Client approval.

21. GUARANTEE

At the close of work and before issue of final certificate of virtual completion by Owner / Consultant, the contractor shall furnish a written guarantee indemnifying the owner against defective materials and workmanship for a period of one year after commissioning. The contractor shall hold himself fully responsible for reinstallation or replacement of defective material free of cost to the owner.

22. COMPLETION DRAWINGS

The contractor shall submit, after the completion of the work, one set of originals and two sets of prints of the As-Fitted drawings/Completion drawings, giving the following information:

a. Run and size of conduits, inspection, junction and pull boxes.

b. Size of conductor in each circuit.

c. Location and ratings of sockets and switches controlling the light/fan and power outlets.

d. Location and details of distribution boards, mains, switches, switchgears and other particulars.

e. A complete wiring diagram as installed and schematic drawings showing all connections in the complete electrical system.

f. Location of telephone outlets, junction boxes and sizes of various conduits.

g. Location of all earthing stations, route and size of all earthing conductors etc.

h. Layout and particulars of all cables.

i. Location of all equipments with dimensions and connections.

23. INSPECTION

All equipment I material covered under this specification Is liable for inspection by the Owner/ his representative. The vendor shall inform two weeks in advance for inspection to be carried out at the manufacturer's works.

The contractor shall furnish data Sheets & other details. Additional information, if desired by the bidder can also be furnished separately.

SYSTEM DESCRIPTION

1.0 GENERAL INFORMATION

1.1 Ambient air temperature shall be taken as 50 deg. C for the purpose of designing of electrical equipment.

1.2 This specification shall be read and constructed in conjunction with the drawings and annexure to determine the scope of work.

1.3 All equipment shall be capable of continuous operation satisfactorily under the following conditions:

a.	**voltage variation**		**:**	**± 10%**
b.	**frequency variation**	**:**	**± 5%**	
c.	**combined voltage & frequency variation**		**:**	**± 10%**

1.4 Nominal system supply available shall be as follows:

a.	**Incoming**	**:**	**11 kV, 3 Ph., 50 Hz,**
b.	**Utilization**	**:**	**415V, 3 Ph., 4 wire, 50 Hz**

2.0 CODES AND STANDARDS

2.1 All equipment and materials specified herein or not, shall be designed, manufactured and tested with the latest applicable standards & bureau of Indian standards.

2.2 All electrical equipment shall also conform to the latest electricity rules as regards safety and other essential provisions.

2.3 All electrical installation work shall comply with the requirements of the following Act / rules / codes as amended up to date:

a) Indian electricity act.
b) Indian electricity rules.
c) National electric code published by 818.
d) All relevant IS codes of practice.
e) Regulations published by tariff advisory committee.

3.0 SYSTEM DESCRIPTION

3.1 GENERAL

a) One independent radial feeder is envisaged from Torrent power for receiving incoming supply on 11 kV.

b) Two poles structure consisting of LAs, Isolator, drop out fuses etc. or 11 KV incoming supply shall be connected to Metering Panel through 11 kV XLPE cable. On two Pole structure 11 kV XLPE cable shall be terminated through outdoor termination.

c) 11 kV XLPE cable from two pole structure to metering Panel to shall be buried in ground

d) 11 KV Panel shall have one incomer cum outgoing (unit panel), which will feed power to the Transformer.

e) 415V L T panel shall receive power from Transformer I DG sets and shall feed power to various Blocks & Common Services as per enclosed single line diagram. The panel will be PLC controlled for automatic operation in case of power failure for DG synchronization and auto load sharing arrangements.

f) Further routing of cables and Power Distribution shall be as per Single Line Diagram.

4.0 DESIGN CRITERIA

4.1 GENERAL

a) The equipment shall be used in high voltage system having characteristics as listed in this specification.

b) The equipment shall be installed in a hot, dusty, humid and tropical atmosphere.

c) There shall be no radio interference when the equipment are operated at maximum service voltage.

d) The max. temp. in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

e) The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

f) All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

g) The safety clearances of all live parts of the equipment shall be as per relevant standards.

h) All equipment/components of identical rating shall be physically and electrically interchangeable.

i) All outdoor equipment shall be suitable to mount on steel structure. Connectors shall be bimetallic conductor.

j) Wherever single core cables are terminated in any equipment, gland plate shall be of Aluminum (3-4 mm thick).

k) There shall be no straight through joints in power & control cables.

l) All cable terminations shall be with Double compression cable gland with armour holding system.

m) The lighting fixture shall have loop in & loop out facility.

GENERAL & TECHNICAL

1 POINT WIRING :-

1.1. Definition :-

A point (other than socket outlet point) shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall, however, include the wiring work necessary in tapping from another point in the same distribution circuit.

i. Ceiling rose or connector (in the case of points for ceiling/exhaust fan points, pre wired light fittings and call bells).

ii. Ceiling rose (in the case of pendants except stiff pendants)

iii. Back plate (in the case of stiff pendants).

iv. Lamp holder (in the case of goose neck type wall brackets, batten holders and fittings which are not pre wired).

1.2. Scope :-

Following shall be deemed toincluded in point wiring.

i. Conduit/casing and capping as the case may be, accessories for the same and wiring cables between the switch box and the point outlet.

ii. All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc as required.

iii. Metal switch boxes for control switches, regulators, sockets etc, recessed or surface type, and phenolic laminated sheet covers over the same.

iv. Outlet boxes, junction boxes, pull-through boxes etc, but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.

v. Any special block required for neatly housing the connector.

vi. Control switch or MCB, as specified.

vii. 3 pin or 6-pin socket, ceiling rose or connector as required.

viii. Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.

ix. Interconnecting wiring between points on the same circuit, in the same switch box or from another.

x. Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets. (The length of protective conductor run along with the circuits/sub mains is excluded from scope of points)

xi. Bushes conduit or porcelain tubing where wiring cables pass through wall etc.

1.3 Material :-

The system of wiring shall consist of ISI marked single core PVC insulated flexible copper conductor wires as per IS: 694 amended up to date.

2. MEASUREMENT :-

I. **Contractor shall measure the work jointly with the site engineer and prepare measurement sheets in triplicate. Three copies of measurement sheets shall be submitted along with running account bills. Bills received without proper measurements of work shall not be considered submitted.**

II. **Should the contractor neglect to measure the work, then the measurement taken by Engineer/Architect or a person approved by the Bank shall be final and binding to him. Such measurements shall be taken in accordance with the mode of measurements wherever specified or as per actual executed quantities.**

III. **All authorised extra works, omissions and all variations made without the Engineer/Architect/Bank's knowledge, or subsequently sanctioned by him in writing (with the prior approval of the contractor in writing) shall be included in such measurement.**

IV. **All bills for the work shall be submitted in the tender price bid format.**

2.1. Point wiring (other than socket outlet points) :-

i. **Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.**

ii. **No separate measurement will be made for interconnections between points in the same distribution circuit and for the circuit protective (loop earthing) conductors between metallic switch boxes.**

2.2 Point wiring for socket outlet points :-

i. **The light plug (5A/6A) point and power (15A/16A) point wiring shall be measured on linear basis, from the respective tapping point of live cable, namely switch box, another socket outlet point, or the sub distribution board as the case may be, up to the socket outlet.**

ii. **The metal box with cover, switch/MCB socket outlet and other accessories shall be measured and paid as a separate item.**

iii. **The power point outlet will be 15A/5A or 16A/6A six-pin socket outlet.**

2.3 Group control Points wiring :-

i. **In the case of points with more than one point controlled by the same switch, such point shall be measured in parts i.e.(a) from the switch to the first point outlet as one point, and (b) for the subsequent points each shall be treated as separate point.**

ii. **No recovery shall be made for non-provision of more than one switch in such cases.**

2.4 Twin control light Point WIRING: -

i. **A light point controlled by two numbers of two way switches shall be measured as two points from the fitting to the switches on either side.**

ii. **No recovery shall be made for non-provision of more than one ceiling rose or connector in such cases.**

2.5 Multiple controlled call bell Points wiring :-

i. **In the case of call bell points with a single call bell outlet, controlled from more than one place, the point shall be measured in parts i.e. (a) from the call bell outlet to one**

of the nearest ceiling roses meant for connection to bell push, treated as one point and (b) from that ceiling rose to the next one and so on, shall be treated as separate point(s).

ii. No recovery shall be made for non-provision of more than one ceiling rose or connector for connection to call bell in such cases.

3. CIRCUIT AND SUBMAIN WIRING :-

3.1. Circuit wiring :-

Circuit wiring shall mean the wiring from the distribution board up to the tapping point for the nearest first point of that distribution circuit, viz. up to the nearest first switch box.

3.2. Sub main wiring :-

Sub main wiring shall mean the wiring from one main/distribution switchboard to another and from Distribution Board to Power Outlet / AC Outlet.

4. MEASUREMENT OF CIRCUIT AND SUBMAIN WIRING :-

i. Circuit and sub main wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all length from end to end of conduit or casing and capping as the case may be, exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.

ii. The length of circuit wiring with two wires shall be measured from the distribution board to the first nearest switch box in the circuit irrespective of whether the neutral conductor is taken to switch box or not.

iii. When wires of different circuits are grouped in a single conduit/casing and capping, the same shall be measured on linear basis depending on the actual number and sizes of wires run.

iv. When circuit wires and wires of point wiring are run in the same conduit/casing and capping, circuit wiring shall be measured on linear basis depending on the actual number and sizes of wires run in the existing conduit/casing capping.

v. Protective (loop earthing) conductors, which are run along the circuit wiring and the sub main wiring, shall be measured on linear basis and paid for separately, if not included in item.

vi. Except as specified above for point wiring, circuit wiring and sub main wiring, other types of wiring shall be measured separately on linear basis along the run of wiring depending on the actual number and sizes of wires run.

5. SYSTEM OF DISTRIBUTION AND WIRINGS :-

i. Main distribution board shall be controlled by the circuit breaker. Each outgoing circuit shall be controlled by a circuit breaker on the phase or live conductor.

ii. The branch distribution board shall be controlled by a circuit breaker. Each outgoing circuit shall be provided with a MCB of specified rating on the phase or live conductor.

iii. The load of the circuits shall be divided, as far as possible, evenly between the number of ways of the distribution boards, leaving at least one spare circuit for future extension.

iv. The neutral conductors (incoming and outgoing) shall be connected to a common link (multi way connector) in the distribution board and be capable of being disconnected individually for testing purposes.

v. Wiring shall be separate for essential loads (i.e those fed through stand by supply) and non-essential loads throughout.

6. BALANCING OF CIRCUITS :-

The balancing of circuits in three wire or poly phase installations shall be arranged up to the satisfaction of the Engineer-in-charge.

7. WIRING SYSTEM :-

I. Unless and otherwise specified the wiring shall be done only by the "Looping system". Phase or live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

II. Lights, fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power outlets shall be wired in the 'Power' circuits. 5A/6A socket outlets shall also be wired in the "Lighting" circuit both in residential as well as non-residential buildings.

III. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear.

IV. Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.

V. In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-in-charge.

VI. In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

8. PASSING THROUGH WALLS OR FLOORS :-

i. When wiring cables are to pass through a wall, these shall be taken through a protection (steel/PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either end of such holes. The ends of metallic pipe shall be neatly bushed with porcelain, PVC or other approved material.

ii. Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end.

9. JOINTS IN WIRING :-

i. No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.

ii. There shall be no joints in the through-runs of cables. If the length of final circuit or sub main is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.

iii. Termination of multi-stranded conductors shall be done using suitable crimping type thimbles.

10. CONFORMITY TO I.E. ACT, I.E. RULES AND STANDARDS :-

i. All electrical works shall be carried out in accordance with the provisions of the Indian Electricity Act, 1910 and Indian Electricity Rules 1956 amended up to date.

ii. The work shall also conform to relevant Indian Standard codes of practice for the type of work involved.

iii. **In all electrical installation works, relevant safety codes of practice shall be followed.**

iv. **The complete wiring installation shall confirm to IS: 732 amended up to date.**

11. GENERAL REQUIREMENTS OF COMPONENTS:-

11.1 Quality of Materials :-

All materials and equipment supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to with stand the environmental conditions at site.

11.2 Rating of Components :-

i. **All components in a wiring installation shall be of appropriate ratings of voltage, current and frequency, as required at the respective sections of the electrical installation in which they are used.**

ii. **All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current, which will normally flow through them, without their respective ratings being exceeded.**

11.3 Conformity of standards :-

All components shall conform to relevant Indian Standard specification, wherever existing. Materials with ISI certification mark shall be preferred. However for conduits, wiring cables, piano/tumbler switches and socket outlets, ISI marked materials shall only be permitted.

11.4 INTERCHANGEABILITY: -

Similar parts of all switches, lamp holders, distribution fuse boards, switch gears, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

SWITCHES & RECEPTACLES (Piano Type)

1. CONTROL SWITCHES FOR POINTS:-

i. **The switch box or regulator box shall be made of metal on all sides, except on the front. In the case of cast boxes, the wall thickness shall be at least 3 mm and in case of welded mild steel sheet boxes, the wall thickness shall not be less than 1.2 mm (18 gauge) for boxes up to a size of 20 cm x 30 cm, and above this size 1.6 mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection.**

ii. **Where a large number of control switches and/or fan regulators are required to be installed at one place, these shall be installed in more than one outlet box adjacent to each other for ease of maintenance.**

iii. **An earth terminal with stud & 2 metal washers shall be provided in each MS box for termination of protective conductors and for connection to socket outlet/metallic body of fan regulator etc.**

iv. **Clear depth of the box shall not be less than 50 mm, and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern.**

v. **The fan regulators can also be mounted on the switch box covers, if so directed by the Engineer-in-charge.**

vi. **Control switches (single pole switches) carrying not more than 16 A shall be of piano type, as specified, and the switch shall be "ON" when the nob is down.**

vii. **Only MCB' s shall be used for controlling industrial type socket outlets.**

viii. **Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit.**

ix. **All switches, regulators, outlets & other accessories shall be white colour with matching white cover plate. In no case ivory or off-white switches shall be accepted.**

2. SOCKET OUTLETS: -

i. **Socket outlet shall be of the same type, white piano type as their control switches. These shall be rated either for 5A/6A or 15A/16A. Combined 5A/15A or 6A/16A six pin socket outlet shall be provided in `power' circuits.**

ii. **In an earthed system of supply, socket outlets and plugs shall only be of 3 pin type, the third pin shall be connected to earth through protective (loop earthing) conductor. 2 pin or 5 pin sockets shall not be permitted to be used.**

iii. **Every socket outlets shall be controlled by a switch or MCB, as specified. The control switch/MCB shall be connected on the `live' side of the line.**

iv. **Outlet boxes for socket outlets (both15A/16A and 5A/6A) points shall be of size 175 mm x 100mm.**

v. **Unless and other wise specified, the control switches for the 5A/6A and 15A/16A socket outlets shall be kept along with the socket outlets.**

3. SWITCH BOX COVERS :-

Phenolic laminated sheets of approved white shade shall be used for switch box covers. These shall be of white 3 mm thick synthetic phenolic resin bonded laminated sheet as base material and conforming to grade P-I of IS:2036-1974, Secured to the box with counter sunk C.P. Brass Screws. The corners of cover plates shall be at right angle.

4. SWITCHES & BOXES (Modular Type)

i. **The switch box or regulator box shall be made of metal on all sides, except on the front. Since Modular type switches are to be used in the project, hence the boxes shall also be used of the same make and model. The size of box shall be governed by the number of switches/outlets/regulators on the respective board. The boxes shall be with zinc plating and yellow passivation to complies with the rust test as per IS 3854. The boxes should have slotted holes for level adjustments. The boxes shall be fitted with riveted brass earth terminals for earth connections.**

ii. **Clear depth of the box shall not in a range of 50 mm to 65 mm depending upon the size of board and manufacturer.**

iii **Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit. The switches shall be provided with silver contacts. The neutral should make first and breaks last.**

iv. **Socket outlet shall be rated either for 5A/6A or 15A/16A. 5/6 Amp sockets shall be of 5 pin type with shutters. Combined 5A/15A or 6A/16A six pin shuttered socket outlet shall be provided in `power' circuits. The earth pin shall be connected to earth through protective (loop earthing) conductor. All sockets shall be provided with safety shutters to allow easy entry of two pin plugs without the need to force the earth terminal by unsafe means. All sockets shall confirm to IS: 1293.**

v. **Every socket outlet shall be controlled by a switch, as specified. The control switch shall be connected on the `live' side of the line.**

vi **The switches and sockets shall be manufactured using engineering plastic to make it fire retardant and highly resistant to impact.**

vii. The fan speed regulators shall be of electronic and stepped type

viii. The RJ-45 data socket shall be suitable for cat5/cat 6 data cables.

ix. Gold plated contacts shall be provided in all communication jacks to enhance data and voice transmission.

SWITCHGEAR AND CONTROLGEAR

1. GENERAL ASPECTS :-

i. All items of switchgear and distribution boards (DB' s) shall be metal clad type.

ii. The types, rating and/or categories of switchgear and protective gear shall be as specified in the tender schedule of work.

iii. RCCB's, ELCB's and RCBO's where specified, shall conform to the requirements of current rating, fault rating, single phase or three phase configuration and sensitivity laid down in the tender documents.

iv. While each outgoing way of distribution board (D.B.) shall be of miniature circuit breaker (MCB) as specified, and of suitable rating on the phase conductor, the corresponding earthed neutral conductor shall be connected to a common neutral terminal block and shall be capable of being disconnected individually for testing purpose.

v. Independent earth terminal block.
Every distribution board (single phase as well as three phase) shall have an earth terminal block identical to, but independent from neutral terminal block, to enable termination of protective (loop earthing) conductors (incoming as well as out goings) individually by screwed connection and without twisting.

vi. Earthing terminal (1 for single phase and 2 for three phase) shall be provided on the metal cladding of switches and D.B.' s for body earthing. These shall be suitably marked.

vii. Knock out holes, with or without end plates as per standard design of manufacturers, shall be provided in the metal cladding of switches and D.B.' s for termination of conduits/cables.

viii. Each distribution board shall be provided with a circuit list giving details of each circuit, which it controls, and the current rating of the circuit, and the size of the fuse element.

2. MCB TYPE DISTRIBUTION BOARDS (MCB DB) :-

i. MCB DB' s may be of single phase, three phase (horizontal type) suitable for feeding single phase loads or 3 phase (vertical type) suitable for feeding single phase as well as three phase loads, each phase isolation type three phase DB in which each phase can be isolated by a separate circuit breaker or RCCB, as specified. These shall be complete with accessories, but without MCB' s, which shall be specified as a separate item in the tender documents.

ii. The current ratings and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways. These shall be indicated as a separate item in the Schedule of work.

iii. MCB DB' s shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate MCB' s and MCB type isolators and RCCB (ELCB) at incoming in single pole or multi pole configuration, as required.

iv. MCB DB's shall be double door type; dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.

vi. MCB DB' s shall have removal type end plates with knockouts at the bottom and top, and shall have hinged covers with locking arrangement.

vii. Only the knobs of the MCB' s shall protrude out of the front covers through openings neatly machine made for the purpose.

viii. The bus bars used shall be solid electrolytic copper of appropriate sections.

ix. Din bar(s) shall be provided for mounting the MCB' s.

x. The complete board shall be factory fabricated and shall be duly pre-wired in the works, ready for installation at site.

xi. The board shall be fully pre wired with single core PVC insulated copper conductors/insulated solid copper links, and terminated on to extended type terminal connectors, suitable for connections to the sizes of the respective conductors.

xii. All incoming and outgoing wiring to the pre wired MCBDB' s shall be terminated only in the extended terminal connectors to be provided within the DB. The terminal connectors shall therefore be so provided as to facilitate easy cable connections and subsequent maintenance.

3. MCCB TYPE DISTRIBUTION BOARDS (MCCB DB) :-

i. All MCCB DB' s shall be of three phase suitable for feeding single phase loads or 3 phase loads through SP/TP MCB's, IP 42 enclosure, sheet steel, double door with tinned copper bus bar, neutral bar, earth bar, knock outs etc. The DB's shall be original factory fabricated of approved make.

ii. The current ratings of Incomer MCCB shall be up to 250 amp and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways.

iii. MCCB DB shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate Four pole MCCB at incomer and SP/TP MCB's at outgoings, as required.

iv. MCCB DB's shall be dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in contractor's scope for proper completion of work.

vi. MCCB DB' s shall have removal type end plates with knock-outs at the bottom and top, and shall have hinged covers with locking arrangement.

viii. The bus bars used shall be solid electrolytic copper of appropriate sections.

ix. Din bar(s) shall be provided for mounting the MCB' s.

4. WORKMANSHIP :-

i. Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

ii. The work shall be carried out under the direct supervision of a first class licensed foreman, or of a person holding a certificate of competency issued by the state Government for the type of work involved, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-in-charge during the progress of work.

5. COMMISSIONING ON COMPLETION: -

Before the workman leaves the work finally, he must make sure that the installation is in commission, after due testing.

6. COMPLETION PLAN AND COMPLETION CERTIFICATE :-

i. For all works completion certificate after completion of work shall be submitted to the Engineer-in-charge.

ii. Completion plan drawn to a suitable scale in tracing cloth with ink indicating the following, along with three blue print copies of the same shall also be submitted.

a) General layout of the building.

b) Locations of main switch board and distribution boards, indicating the circuit numbers controlled by them.

c) Position of all points and their controls.

d) Types of fittings, viz. fluorescent, pendants, brackets, bulkhead, fans and exhaust fans etc.

e) Name of work, job number, accepted tender reference, actual date of completion, names of Division/Sub-Division and name of the firm who executed the work with their signature.

7. ADDITION TO AN INSTALLATION :-

An addition, temporary or permanent, shall not be made to the authorised load of an existing installation until it has been definitely ascertained that the current carrying capacity and the condition of the existing accessories, conductors, switches etc affected, including those of the supply Authorities, are adequate for the increased load.

CIRCUIT BREAKERS

A. MINIATURE CIRCUIT BREAKERS (MCB) :-

Miniature Circuit Breaker shall comply with IS-8828-1996/ IEC898-1995 amended up to date.

Miniature circuit breakers shall be quick make and break type for 240/415 V AC, 50 Hz application with magnetic thermal release for over current and short circuit protection.

The breaking capacity shall not be less than 10kA at 415V AC.

MCBs shall be DIN mounted.

MCBs shall be current limiting type (class-3).

MCBs shall be C-curve.

MCBs shall have minimum power loss (watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.

MCBs shall be of self-extinguishing ULV0 grade thermoset plastic material. The housing shall be heat resistant and having high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection.

All DP, TP, TPN and 4pole MCBs shall have a common trip bar independent to external operating handle.

Mechanical Life shall be 20000 operations and Service life at rated load for In below 32A shall be 20000 and for In above 32A shall be 10000 operations.

B. Earth Leakage Circuit Breaker / Residual Current Circuit Breaker - Current Operated Type (ELCB / RCCB / RCBO**)**

- System of operation

ELCB/ RCCB/RCBO shall work on the principle of core balance transformer. The incoming shall pass through torroidal core transformer. As long as the currents in the phase and neutral shall be the same, no electro motive force shall be generated in the secondary winding of the transformer. In the event of a leakage to earth, an unbalance shall be created which shall cause a current to be generated in the secondary winding, this current shall be fed to a highly sensitive miniature relay, which shall trip the circuit if the earth leakage current exceeds a pre-determined critical value. ELCB/RCCB/RCBO shall be current operated independent of line voltage. Current sensitivity shall be of 30mA at 240/415V AC or as specified in BOQ / drawings and shall have a minimum of 10000 electrical operations. The RCBO shall also provide over load and short circuit protection in addition to the earth leakage protection.

- Mechanical Operation

he moving contacts of the phases shall be mounted on a common bridge, actuated by a rugged toggle mechanism. Hence, the closing/opening of all three phases shall occur simultaneously. This also shall ensure simultaneous opening of all the contacts under tripping conditions.

- Neutral Advance Feature

The neutral moving contact shall be so mounted on the common bridge that, at the time of closing, the neutral shall make contact. First before the phases; and at the time of opening, the neutral shall break last after allowing the phases to open first. This is an important safety feature which is also required by regulations.

- Testing Provision

A test device shall be incorporated to check the integrity of earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test knob shall trip the ELCB/RCCB/RCBO and the operating handle shall move to the "OFF" position.

C. MOULDED CASE CIRCUIT BREAKER (MCCB's)

The rated normal current should be specified at 40°C

1. General

Mounded case circuit breakers shall be incorporated in the switchboard wherever specified. MCCB shall conform to IS:13947 (Part-2): 1993 or IEC-60947-2 in all respects. MCCB shall be suitable either for single phase AC 230 Volts or three phase 415 volts ± 10%. The rated insulation voltage shall be 600 volts. Suitable discrimination shall be provided between upstream and downstream breakers in the range of 10-20 milli seconds. The MCCBs will have earth fault module (if specifically asked) and front operated.

MCCB shall indicate its suitability for isolation and this should appear clearly on the MCCB with the symbol as specified in standard IS: 13947/IEC 60947

2. Construction

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material; operating handle shall be quick make/quick break. The operating handle shall have suitable `ON' `OFF' and `TRIPPED' mechanical indicators notable from outside. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phases.
Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type up to 250A and Microprocessor based above 250A (or as specified specifically in Bill of Quantities and drawings) provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Tripping device shall have IDMT characteristics for sustained over load and short circuits.

3. Contact tips **shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.**

4. Accessories

All the accessories shall be mounted from the front and shall be adjustment free. MCCBs shall have the electrical accessories fitted even without removing the circuit breaker from the switchboard so that site changes, if any, can be carried out easily. MCCB shall be provided with the following accessories, if specified in schedule of quantities, such as Under voltage trip, Shunt trip, Alarm switch, auxiliary switches, Rotary and motorized operating mechanism, Plug in and with drawable mechanism etc.

5. Interlocking

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switchboard.

a) Handle interlock to prevent unnecessary manipulations of the breaker.

b) Door interlock to prevent the door being opened when the breaker is in ON position.

c) Defeat-interlocking device to open the door even if the breaker is in ON position.

6. Rupturing capacity

The moulded case circuit breaker shall have a rupturing capacity as mentioned against each in Schedule of Quantity at 415 volts. Wherever required, higher rupturing capacity breakers to meet the system short circuit fault shall be used. In absence of any capacity specifically mentioned in the bill of quantities and drawings, following rupturing capacities shall be used –

100 / 125 Amp : 25 KA

160/200/250 Amp : 35 KA

300/400/630/800 Amp : 50 KA

7. **The MCCB shall be current limiting type and comprise of quick make – break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. For thermal magnetic protection the O/L adjustment should be 75%-100% and for microprocessor-based release the adjustment should be 40%- 100% and S/c for 2 to 12 times .All MCCBs rated 200 Amps and above shall have adjustable magnetic short circuit pick-up.**

8. Electrical Features

All MCCB's & shall be selected on the basis of rated current. Four poles MCCBs shall be always supplied with neutral protection. The MCCBs having 400A & should have category B as per the IEC standards to ensure the selectivity . Minimum Electrical & Mechanical Endurance of MCCB Shall be as follows

Rating of MCCB	Electrical Endurance	Mechanical Endurance
Upto 160 A	**7000 Opns**	**25000 Opns**
Above 160 A	**4000 Opns**	**15000 Opns**

9. **The trip command shall override all other commands. The manufacturer shall provide both the discrimination tables (with test certificates) and let-through energy curves. Line and Load connections shall be interchangeable.**

10. Installation

It should be possible to terminate Aluminum cable of required size for the defined current carrying capacity. The requisite size should be made available by means of extended terminals (as a standard offer) in case the direct terminals are not of adequate size. Adequate phase to phase clearance has to be ensured in case of extended terminations.

The circuit breaker should provide the flexibility of terminating line and load from any direction. Manufacturers should test the circuit breaker for this condition and requisite test certificate should be available.

Phase barrier should be provided as a standard feature.

11. Testing

- **Original test certificate of the MCCB as per BS 3871 or JS-C-8370 shall be furnished.**
- **Pre-commissioning tests on the switchboard panel incorporating the MCCB shall be done as per standard specifications.**

D. AIR CIRCUIT BREAKER

1. General

Air circuit breakers shall be incorporated in power control center and motor control centers wherever specified. ACB shall conform to IEC60947 / IS: 13947 Part-2 1993 in all respects. ACBS shall be suitable for operation on 660 volts, 3 phase, 50/60 Hz, AC supply. The rated insulation voltage shall be equal to or greater than 1000V.The rated impulse withstand voltage shall be equal to 12kV, so that the device can be used for every installation category, in compliance with the international standards CEI IEC 664-1.

2. Type and construction

Air circuit breakers shall be of enclosed pattern, dead front type with trip free operating mechanism. Air Circuit breakers shall be with draw able type with horizontal drawout carriage. **The mechanism shall be mechanical if not specifically mentioned for electrical. The ACBs shall be strong and robust in construction with suitable arrangement for anchoring when in fully engaged or fully drawn out positions. The carriage or cradle on**

which the breaker is mounted shall be of robust design made of fabricated steel, supported on rollers. Cradle shall also comprise of main and secondary separable contacts and all draw out mechanisms in a completely fig welded assembly short circuit on top. There shall be no dependence upon the panel board frame for any critical alignment. The withdrawal arrangement shall be such as to allow smooth and easy movement.

The draw out operation shall be possible through a closed door. Three positions of the moving part shall be possible:

1 - connected / service position - all auxiliary and main circuits engaged

2 - test position - all auxiliary circuits engaged all main circuits disconnected

3 - isolated position - all circuits disconnected.

All three positions should be indicated discreetly on the cradle. Safety shutter to be provided as standard

All the current carrying parts of the circuit breakers shall be silver-plated. Suitable arcing contacts shall be provided to protect the main contacts. The contacts shall be of spring-loaded design. The sequence of operation of the contacts shall be such that arcing contacts `make' before and `break' after the main contacts. Arcing contacts shall be provided with efficient arc chutes on each pole. The arc chutes shall be suitable for ready replacement. Self-aligning isolating contacts with automatic shutters to screen the live parts shall be provided. The design of the breaker shall be such that all the components are easily accessible to inspection, maintenance and replacement. The ACB at its rated current shall be suitable for operation in extremely tropical humid climate at 50°C ambient temp. The manufacturer shall declare ideal de-rating charts.

There should be total segregation between the power circuit and control circuit, thus making double insulation and ensuring fitting of accessories while the circuit breaker is in the ON position. It shall be possible to inspect the arcing chamber and main contacts. The ACB shall have metal load bearing structures. The main contacts shall be separate from the arc-breaking contacts. It shall be possible to check the wear of the main contacts with the ACB in its racked-out position, removing the arcing chambers. No mechanical junctions in the main contact shall be there so that losses are minimal.

3. Operating Mechanism

Air circuit breaker shall be provided with a quick-make, trip-free operating mechanism. The operating mechanism shall be strain-free spring operated. The operating shall be "handle front of the panel" type. The design shall be such that the circuit breaker compartment door need not be opened while moving the breaker from completely connected, through test, in to the disconnected position. The spring shall be charged automatically during the closing operation. Mechanical Indication of the position of the spring charge shall be provided.

4. Interlocking and safety arrangement

Air circuit breakers shall be provided with the following safety and interlocking arrangements:

I. It shall not be possible for breaker to be withdrawn when in `ON" position.

II. It shall not be possible for the breaker to be switched on until it is either in fully inserted position or for testing purposes it is in fully isolated position.

III. **The breaker shall be capable of being raked in to `testing' isolated and maintenance positions and kept locked in any of these positions.**

IV. **A safety latch to ensure that the movement of the breaker, as it is withdrawn is checked before it is completely out of the cubicle.**

V. **If under voltage release is provided then circuit breaker will close only if it is energized. Under voltage release should have time delay to avoid nuisance tripping for transient voltage failure**

VI. **The operating mechanism shall provide for raking the breaker in to connect, test and disconnected positions without opening the compartment door.**

VII. **Mechanical interlocks shall be provided between the operation of different breakers (if specified in Bill of Quantities).**

The circuit breaker shall provide as a standard feature, the following mechanical indicator in the front Panel

1 Contact portion indicator (on/off)

2. Stored energy status indicator

3. Trip indicator on fault

5. Rating

The CTs range from 250A to 6300A: all the CTs shall have a structure made of self-extinguishing thermoplastic material. The breaking capacity of the ACB shall be greater than or equivalent to 50kA. The Breaking Capacity of the circuit breaker shall be as indicated in the BOQ with minimum of 50kA for up to 1250A, 65kA for 1600 to 2000A and 80kA for 2500 to 3200A. Icu = Ics for all ACBs. Icw rating at 1 sec/3sec should be declared. The minimum Electrical & Mechanical Life of ACB at 415/440V shall be as follows:

Rating of ACB	Electrical Endurance	Mechanical Endurance
Upto 1600 A	**10000 Opns**	**20000Opns**
2000-4000 A	**5000 Opns**	**15000 Opns**
Above 4000 A	**1500 Opns**	**10000 Opns**

6. Accessories

All the accessories like U/V, shunt opening, shunt closing shall be accessible from the front.

Circuit breakers shall be provided with the following Accessories: -

i) Under-voltage relay for the incoming ACB.
ii) Microprocessor based Overload releases with IDMT characteristics.
iii) Microprocessor based Instantaneous earth fault release.
iv) Alarm switches (if specifically asked for)
v) Auxiliary switches
vi) NO and NC auxiliary contacts rated for 10 Amps at 415 V AC and 6 Amp at 48V DC, in addition to ones already in use for the operation of the breaker and will be used in subsequent interlocks to be incorporated in future.

8. Mechanical indicators

Mechanical indication on the front of the air circuit breaker shall be provided to indicate the following :

- **main contacts closed "ON"**
- **main contacts open "OFF"**

- **springs charged**
- **springs discharged**
- **circuit breaker in "service" position (drawout only)**
- **circuit breaker in "test" position (drawout only)**
- **circuit breaker in "isolated" position (drawout only)**

9. Mounting

Circuit breakers shall be mounted as per the standard specification of power control centers.

10. Testing

Testing of each circuit breaker shall be carried out at the works as per IEC:60947 and the original test certificate shall be furnished in triplicate. The tests shall incorporate atleast the following:

I. Impulse withstand test

II. Insulation test

III. Di-electric rigidity /Insulation test

IV. Mechanical operation checking

V. Thermal protection with a current of 3ith starting from cold conditions.

11. Protection

The ACB shall be with an integral self-powered microprocessor based current release for Overload, Short-Circuit and Earth Fault protection which works on true rms values for ensuring accurate protection, if specifically asked for. The protection unit should meet the EMI/EMC requirement as per latest standard. Online Test Fault shall be provided to test healthiness of release and ACB.

12. Setting range of protection release

a) Overload protection shall have adjustable setting from 40% to 100% of the ACBs rated current in steps of 10% and adjustable time setting from 3-18m sec.

b) Short circuit protection shall have adjustable current setting from 100% to 1000% of the overload setting and adjustable time delay setting for fault discrimination from 50-500 m sec.

c) E/F protection if specified will have adjustable current setting from 40% to 100% of ACB rated current and adjustable time setting from 100-800m sec. It shall be possible to charge the release setting on load.

METALLIC CONDUIT WIRING SYSTEM

1. SCOPE :-

This chapter covers the detailed requirements for wiring work in metallic conduits. This chapter covers both surface and recessed types of works.

2. APPLICATION :-

i. Recessed conduit is suitable generally for all applications. Surface conduit work may be adopted in places like workshops, plant rooms, pump rooms, wiring above false ceiling/below false flooring, and at locations where recessed work may not be possible to be done. The type of work, viz. surface or recessed, shall be as specified in the respective works.

ii. Flexible conduits may only be permitted for interconnections between switch gear, DB' s and conduit terminations in wall.

3. MATERIALS :-

3.1 Conduits :-

i. All rigid conduit pipes shall be of steel and be ISI marked. The wall thickness shall be not less than 1.6 mm (16 SWG) for conduit up to 32 mm dia. and not less than 2 mm (14 SWG) for conduits above 32 mm. These shall be solid drawn or reamed by welding, and finished with galvanized or stove enameled surface.

ii. The maximum number of PVC insulated cables conforming to IS : 694-1990 that can be drawn in one conduit is given size wise in table 1, and the number of cables per conduit shall not be exceeded. Conduit sizes shall be selected accordingly in each run.

iii. No steel conduit less than 20 mm in diameter shall be used.

3.2 Conduit accessories :-

i. The conduit wiring system shall be complete in all respects, including their accessories.

ii. All conduit accessories shall be of threaded type, and under no circumstances pin grip type or clamp grip type accessories shall be used.

iii. Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works.

iv. a) Saddles for surface conduit work on wall shall not be less than 0.55 mm (24 gauge) for conduits up to 25 mm dia. and not less than 0.9 mm (20 gauge) for larger diameter. The corresponding widths shall be 19mm & 25mm.

b) The minimum width and the thickness of girder clips used for fixing conduits to steel joists, and clamps shall be as per table 2.

TABLE - 1

Maximum number of PVC insulated 650/ 1100 Volt grade copper conductor cable that can be drawn into rigid steel conduit.

Nominal cross sectional area of conductor in Sq. mm.	20 Mm	25 mm	32 mm	40 mm
1.50	5	10	14	-
2.50	5	8	12	-
4.00	3	8	10	-
6.00	2	5	8	-
10.00	-	3	5	6
16.00	-	-	3	6
25.00	-	-	2	4

Note :-

The above table shows the maximum capacity of conduits for a simultaneous drawing of cables.

TABLE – 2

Girder clips or clamps

S.No.	Size of conduit	Width	Thickness
i.	20 mm	19 mm	0.9 mm (20 SWG)
ii.	25 mm	19 mm	0.9 mm (20 SWG)
iii.	32 mm & above	25 mm	1.2 mm (18 SWG)

4. INSTALLATION :-

4.1 Common aspects for recessed and surface conduit works :-

i. Conduit joints :-

a) The conduit works of each circuit or section shall be completed before the cables are drawn in.

b) Conduit pipes shall be jointed by means of screwed couplers and screwed accessories only. Threads on conduit pipes in all cases shall be between 13 mm to 19 mm long, sufficient to accommodate pipes to full threaded portion of couplers or accessories.

c) Cut ends of conduit pipes shall have no sharp edges, nor any burrs left to avoid damage to the insulation of the conductors while pulling them through such pipes.

d) The Engineer-in-charge, with a view to ensuring that the above provision has been carried out, may require that the separate lengths of conduit etc., after they have been prepared, shall be submitted for inspection before being fixed.

e) No bare threaded portion of conduit pipe shall be allowed, unless such bare threaded portion is treated with anticorrosive preservative or covered with approved plastic compound.

ii. Bends in conduits:-

a) All necessary bends in the system, shall be done either by neatly bending the pipes without cracking with a bending radius of not less than 7.5 cm, or alternatively, by inserting suitable solid or inspection type normal bends, elbows or similar fittings, or by fixing cast iron inspection boxes, whichever is most suitable.

b) Conduit fittings shall be avoided as far as possible on conduit system exposed to weather. Where necessary, solid type fittings shall be used.

iii. Outlets:-

a) All outlets such as switches, wall sockets etc. may be either flush mounting type, or of surface mounting type, as specified and as required on site.

b) All switches and accessories shall be fixed in flush pattern.

iv. Painting after erection:-

After installation, all accessible surfaces of conduit pipes, fittings, switch and regulator boxes etc shall be painted.

5. ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORKS :-

i. Painting before erection :-

The outer surface of conduit including all bends, unions, tees, junction boxes, etc. forming part of the conduit system , shall be adequately protected against rust when such system is exposed to weather by being painted with 2 coats of red oxide paint applied before they are fixed.

ii. Fixing conduit on surface :-

a) Conduit pipes shall be fixed by saddles, screwed to suitable approved plugs with screws in an approved manner at an interval of not more than one meter, on either side of the couplers or bends or similar fittings.

b) Where conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips or clamps as required by the Engineer-in-charge.

c) In long distance straight run of conduit, inspection type couplers at reasonable intervals shall be provided, or running threads with couplers and jam nuts shall be provided.

iii. Fixing outlet boxes :-

Only a portion of the switch box may be sunk in the wall, the other portion being projected out for suitable entry of conduit pipes into the box.

6. ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK :-

i. Making chase :-

a) chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.

b) In the case of buildings under construction, the conduits shall be buried in the wall before plastering, and shall be finished neatly after erection of conduit.

c) In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii. Fixing conduit in chase :-

a) The conduit pipe shall be fixed by means of staples, J-hooks, or by means of saddles, not more than 40 cm apart or by any other approved means of fixing.

b) All threaded joints of conduit pipes shall be treated with some approved preservative compound to secure protection against rust.

iii. Fixing conduit in R.C.C. work :-

a) The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.

b))Fixing of standard bends or elbows shall be avoided as far as practicable, and all curves shall be maintained by bending the conduit pipe itself with a long radius which will permit easy drawing of conductors.

c) Location of inspection/junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv. Fixing inspection boxes :-

a) Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.

b) These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm depth junction boxes shall be used in roof slabs.

c) Suitable ventilating holes shall be provided in the inspection box covers.

v. Fixing switch boxes and accessories :-

Switch boxes shall be mounted flush with the wall. All outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified in the Additional Specification.

vi. Fish wire :-

To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.2 mm (18 SWG) shall be provided along with the laying of the recessed conduit.

7. BUNCHING OF CABLES :-

a) Cable carrying alternating current, installed in metal conduit, shall always be bunched so that the outgoing and return cables are drawn into the same conduit.

b) Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.

c) In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be.

8. EARTHING REQUIREMENTS :

i. The entire system of metallic conduit work, including the outlet boxes and other metallic accessories, shall be mechanically and electrically continuous by proper screwed joints, or by double chuck nuts at terminations. The conduit shall be continuous when passing through walls or floors.

ii. Protective (loop earthing) conductor(s) shall be laid along the runs of the conduit between the metallic switch boxes and the distribution boards/switch boards, terminated thereto. These conductors shall be of such size and material, the protective earth conductors shall be either drawn inside the conduits along with the cables, or shall be laid external to the conduits. When laid external to the conduits, this shall be properly clamped with the conduit at regular intervals.

iii. The protective conductors shall be terminated properly using earth studs, earth terminal block etc. as the case may be.

iv. Gas or water pipe shall not be used as protective conductor (earth medium).

PVC CONDUIT WIRING SYSTEM

1. SCOPE :-

This chapter covers the detailed requirements for wiring work in non-metallic conduits. This chapter covers both surface and recessed types of wiring work.

2. APPLICATION :-

1. Recessed conduit work is generally suitable for all applications. Surface conduit work may be adopted in places like workshops etc. and where recessed work may not be possible to be done. The type of work shall be as specified in individual works.

Flexible non-metallic conduits shall be used only at terminations, wherever specified.

3. Special precautions :-

I If the pipes are liable to mechanical damages, they should be adequately protected.

ii. Non-metallic conduit shall not be used for the following applications :-

a) In concealed/ inaccessible places of combustible construction where ambient temperature exceeds 60oC.

b) In places where ambient temperature is less than 5oC.

c) For suspension of fluorescent fittings and other fixtures.

d) In areas exposed to sunlight.

3. MATERIAL :-

3.1 Conduits :-

II. All non-metallic conduit pipes and accessories shall be of suitable material complying with IS : 2509-1973 and IS : 3419-1988. for rigid conduits and IS : 9537(V)-2000 for flexible conduits. The interior of the conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

III. The conduit shall be circular in cross-section. The conduit shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in Table-3.

IV. No non-metallic conduit less than 20 mm in diameter shall be used.

V. Wiring capacity :-

The maximum number of PVC insulated aluminum/copper conductor cables of 650/1100 V grade conforming to IS : 694-1990 that can be drawn in one conduit of various sizes is given in table-4. Conduit sizes shall be selected accordingly.

3.2 Conduit accessories:-

i. The conduit wiring system shall be complete in all respect including accessories.

ii. Rigid conduit accessories shall be normally of grip type.

iii. Flexible conduit accessories shall be of threaded type.

iv. Bends, couplers etc. shall be solid type in recessed type of works, and may be solid or inspection type as required, in surface type of works.

v. Saddles for fixing conduits shall be heavy gauge non-metallic type with base.

vi. The minimum width and the thickness of the ordinary clips or girder clips shall be as per Table-5.

vii. For all sizes of conduit, the size of clamping rod shall be 4.5mm (7 SWG) diameter.

4. INSTALLATION:-

1. Common aspects for both recessed and surface conduit works.

i. The erection of conduits of each circuit shall be completed before the cables are drawn in.

ii. Conduit joints:-

a. All joints shall be sealed/cemented with an approved cement. Damaged conduit pipes / fittings shall not be used in the work. Cut ends of conduit pipes shall have no sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

b. The Engineer-in-charge, with a view to ensuring that the above provision has been Carried out, may require that the separate lengths of conduit etc. after they have been prepared, shall be submitted for inspection before being fixed.

iii. Bends in conduits:-

a) All bends in the system may be formed either by bending the pipes by an
b) approved method of heating, or by inserting suitable accessories such as bends, elbows or similar fittings, or by fixing non-metallic inspection boxes, whichever is most suitable. Where necessary, solid type fittings shall be used.

c) Radius of bends in conduit pipes shall not be less than 7.5 cm.

d) Care shall be taken while bending the pipes to ensure that the conduit pipe is not injured, and that the internal diameter is not effectively reduced.

iv. Painting :-

After installation, all accessible surface of metallic accessories shall be painted.

5. ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORK :-

a) Conduit pipe shall be fixed by heavy gauge non-metallic saddles with base, secured to suitable approved plugs with screws in an approved manner, at an interval of not more than 60 cm, on either side of couplers or bends or similar fittings, saddles shall be fixed at a closer distance from the center of such fittings. Slotted PVC saddles may also be used where the PVC pipe can be pushed in through the slots.

b) Where the conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips as required by the Engineer-in-charge. Where it is not possible to use these for fixing, suitable clamps with bolts and nuts shall be used.

6. ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK :-

i. Making chase :-

a) chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.

b) In the case of buildings under construction, the conduits shall be buried in the wall Before plastering, and shall be finished neatly after erection of conduit.

c) In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii. Fixing conduits in chase :-

a) **The conduit pipe shall be fixed by means of staples, or by means of non-metallic saddles, placed at not more than 40 cm apart, or shall be fixed by any other approved means of fixing.**

b) **At either side of the bends, saddles/staples shall be fixed at a distance of 15 cm from the center of the bends.**

iii. Erection in RCC work :-

a) **The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.**

b) **Fixing of standard bends or elbows shall be avoided as far as practicable, and all Curves shall be maintained by bending the conduit pipe itself with a long radius which will permit easy drawing of conductors.**

c) **Location of inspection/junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.**

iv. Fixing inspection boxes :-

a. **Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.**

b. **These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm Depth junction boxes shall be used in roof slabs.**

c. **Suitable ventilating holes shall be provided in the inspection box covers.**

v. Fixing switch boxes and accessories :-

Switch boxes shall be mounted flush with the wall. All 48outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified in the additional specification.

vi. Fish wire :-

To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.2 mm (18 SWG) shall be provided along with the laying of the recessed conduit.

7. BUNCHING OF CABLES :-

a) **Cable carrying alternating current, installed in metal conduit, shall always be bunched so that the outgoing and return cables are drawn into the same conduit.**

b) **Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.**

c) **In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be.**

8. EARTHING REQUIREMENTS :-

I. **A protective (earth) conductor shall be drawn inside the conduit in all distribution circuits to provide for earthing of non-current carrying metallic parts of the installation. These shall be terminated on the earth terminal in the switch boxes, and/or earth terminal blocks at the DB's.**

II. **Protective conductors of large size which may not be possible to be carried inside the conduits (as in the case of some sub mains etc.) may be laid external to the conduits and clamped thereto suitably.**

III. **Gas or water pipes shall not be used as protective conductors (Earth medium).**

TABLE - 3.

Dimensional details of rigid non-metallic conduits.
(All dimensions in mm)

S.No.	Nominal outside diameter (In mm)	Maximum outside diameter (In mm)	Minimum inside diameter (In mm)	Maximum permissible eccentricity (In mm)	Maximum permissible ovality (In mm)
1.	20	20 +0.3	17.2	0.2	0.5
2.	25	25 +0.3	21.6	0.2	0.5
3.	32	32 +0.3	28.2	0.2	0.5
4.	40	40 +0.3	35.8	0.2	0.5
5.	50	50 +0.3	45.0	0.4	0.6

TABLE - 4

Maximum number of PVC insulated 650/ 1100 Volt grade copper conductor cable that can be drawn into rigid pvc conduit.

Nominal cross sectional area of conductor in Sqmm.	20 Mm	25 Mm	32 mm	40 mm
1.50	5	10	14	-
2.50	5	8	12	-
4.00	3	8	10	-
6.00	2	5	8	-
10.00	-	3	5	6
16.00	-	-	3	6
25.00	-	-	2	4

Note :-

The above table shows the maximum capacity of conduits for a simultaneous drawing of cables.

TABLE - 5.

Ordinary clips or girder clips.

S.No.	Size of conduit	Width	Thickness
1.	20 mm & 25 mm	19 mm	20 SWG (0.9144 mm)
2.	32 mm & above	25 mm	18 SWG (1.219 mm)

EARTHING

1. SCOPE :-

This chapter covers the essential requirements of earthing system components and their installation. For details not covered in these specifications. IS code of Practice on Earthing (IS:3043-1987) shall be referred to.

2. INSTALLATION :-

1. ELECTRODES :-

I. Plate electrode shall be buried in ground with its faces vertical, and its top not less than 3 m below the ground level. The installation shall be carried out as per standard drawing.

II. When more than one electrode is to be installed, a separation of not less than 2 m shall be maintained between two adjacent electrodes.

III. a) The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.

b) If condition necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible, in a single straight trench where feasible, or preferably in a number of trenches radiating from one point.

IV. Earth Electrodes shall be kept clear of the building foundation & in no case shall it be nearer than 2 meters from the outer surface of the wall.

3. WATERING ARRANGEMENT :-

A. In the case of plate earth electrodes, a watering pipe 20mm dia. medium class pipe shall be provided and attached to the electrodes. A funnel with mesh shall be provided on the top of this pipe for watering the earth.

B. The \watering funnel attachment shall be housed in a masonry enclosure of size not less than 30cm*30cm*30cm.

C. A cost iron/MS frame with MS cover, 6 mm thick, and having locking arrangement shall be suitably embedded in the masonry enclosure.

4. EARTHING CONDUCTOR (Main earthing lead) :-

V. The earthing conductor shall be securely terminated on to the plate with two bolts, nuts, check nuts and washers.

VI. A double C-clamp arrangement shall be provided for terminating tape type earthing conductor with GI watering pipe coupled to the pipe earth electrode. Galvanized "C" shaped strips, bolts, washers, nuts and check nuts of adequate size shall be used for the purpose.

VII. The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class 15 mm dia GI pipe in the case of wire, and by 40 mm dia, medium class GI pipe in the case of strip. The protection pipe in ground shall be buried at least 30 cm deep (to be increased 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth in due co-ordination with the building work.

VIII. The earthing conductor shall be securely connected at the other end to the earth stud/earth bar provided on the switchboard by:

a) Soldered or preferably crimped lug, bolt, nut and washer in the case of wire, and,

b) Bolt, nut and washer in case of strip conductor.

c) Earthing Terminal / neutral point / earth bus in case of equipments / sub stations.

5. PROTECTIVE (Loop earthing/earth continuity) CONDUCTOR:-

I. Earth terminal of every switchboard in the distribution system shall be bonded to the earth bar/terminal of the upstream switchboard by protective conductor(s).

II. Two protective conductors shall be provided for a switchboard carrying a 3 phase switch gear thereon.

III. All the mountings of industrial type switchboards shall be bonded to the earth stud/earth bar using a protective conductor looping from one to another. Loop earthing of individual units will not be however necessary in the case of cubical type switchboards.

IV. The earth connector in every distribution board (DB) shall be securely connected to the earth stud/earth bar of the corresponding switchboard by a protective conductor.

V. All metallic switch boxes and regulator boxes in a circuit shall be connected to the earth connector in the DB by protective conductor (also called circuit protective or loop earthing conductor), looping from one box to another up to the DB.

VI. The earth pin of socket outlets as well as metallic body of fan regulators shall be connected to the earth stud in switch boxes by protective conductor. Where the switch boxes are non-metallic type, these shall be looped at the socket earth terminals, switch or at an independent screwed connector inside the switch box. Twisted earth connections shall not be accepted in any case.

VII. Double earthing strips in rising mains, bus trunking etc. shall be securely connected to the earth bar/earth stud at the sending end switchboard. In the case of overhead bus bar systems, protective conductors shall be provided in addition to feeder cable armouring connection.

6. EARTH RESISTANCE :-

I. The earth resistance at each electrode shall be measured. No earth electrode shall have a greater ohmic resistance than 5 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 8 ohms.

II. Where the above stated earth resistance is not achieved, necessary improvement shall be made by additional provisions, such as additional electrode(s), different type of electrode, or artificial chemical treatment of soil etc., as may be directed by the Engineer-in-charge.

iii. If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions.

7. MARKING: -

i. Earth bars/terminals at all switchboards shall be marked permanently either as "E".

ii. Main earthing terminal shall be marked "SAFETY EARTH - DO NOT DISCONNECT".

CABLES

1. GENERAL

All cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drum.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

The laying of cable shall be done as per IS 1255 amended up to date.

Cable Identification

Cable identification shall be provided by embossing on the outer sheath the following:

I. **Manufacturer's name or trade mark**
II. **Voltage grade**
III. **Year of manufacture**
IV. **Type of insulation**
V. **Printing of cable length on each meter**

Core Identification

Respective cores of power/control cables shall be identified with the following pattern :

2 core	**:**	**red (R), black (BK)**
3 core	**:**	**5 core red (R), yellow (Y),blue (BL)**
4 core	**:**	**red (R),yellow (Y),blue (BL), black (BK)**
5 core	**:**	**red (R), yellow (Y),blue (BL), black (BK) & grey (GY)**
7&14 cores	**:**	**cores shall be numbered.**

Tests

I. **Shop Tests**

The cables shall be subject to shop tests in accordance with relevant standards to prove the design and general qualities of the cables as below:

II. **Routine tests on each drum of cables.**

III. **Acceptance tests on drums chosen at random for acceptance of the lot.**
IV. **Type tests on each type of cable, inclusive of measurement of armour D.C. resistance of power cables.**

2. MATERIAL

11 kV HT Cables

The 11 KV cable shall be cross linked polyethylene insulated, GI strip armoured, PVC inner and outer sheath (to be extruded type) earthed grade cable. The outer sheath shall be resistant to water, fungus, termite & rodent attacks. Colour of outer sheath shall be black. The cable shall be confirming to IS : 7098 (Part – II) with aluminium conductor as per I.S. 8130.

L T Power Cables

The 1.1 KV cables shall be XLPE insulated PVC sheathed aluminium conductor armoured conforming to IS : 7098 (part - 1) amended up to date or PVC insulated, extruded PVC inner sheath, steel strip armored and extruded PVC overall sheath conforming to 15:1554 (PI).as mentioned in the Bill of Quantities and drawings, laid in trenches, ducts and underground as shown on drawing or as per instruction given by engineer-in-charge.

Control Cables

Control cables shall be of stranded annealed copper conductors with cross section area of 1.5/ 2.5 sq.mm, PVC insulated, colour coded or with core identification, extruded inner sheathed, steel wire armoured and over all PVC extruded outer sheath etc. The cable shall conform to 15: 1554 (P-I).

Cable Termination

a) HT Cable Terminations

Cable termination shall be heat shrinkable type/cold shrink type suitable for sizes as specified in BOQ, XLPE insulated 11 kV (E) grade, and aluminum conductor armoured cables. Termination shall confirm to IS 3573 with latest amendment.

b) L T power, control cable termination

- **L T cable termination shall be provided with compression cable glands of brass suitable for holding the armour of the cable.**
- **Lugs shall be crimping type and shall be of copper suitable for copper conductor cable and of aluminum for aluminum conductor cable.**
- **Termination shall be carried out as per details furnished in this specification.**

Compression Glands

Cable glands shall be made of brass casting, machined accurately to the required size with protective coating of nickel.

Cable glands shall be of heavy duty type and shall consist of: gland nipple, neoprene seal for inner sheath, armour clamping cone, gland body, neoprene seal for outer sheath, skid washer, gland body nut.

The Aluminium conductor shall be stranded, grade H4 class 2 as per IS 8130 and copper conductor shall be annealed copper class 2 as per IS 8130.

Technical data sheets for above cables, including all electrical & mechanical parameters shall be furnished with offer.

11 KV TWO POLE STRUCTURE SYSTEM

a) Two pole structure is intended to receive 11 kV 3 Ph. 50 Hz power supply through 11 kV XLPE cable from overhead line of Torrent power.

b) Two pole structure shall be fabricated from steel member and shall comprise of 11 kV Lightning Arrestors, Isolator, Drop out fuses (DO), Supporting channel, ACSR, Disk & pin insulators for cable suppor, Conductor, Outdoor end termination disc and pin insulators for XLPE 11 kV cable, 150 dia. GI pipe for cable protection, nut, bolts etc.

c) All structural work shall conform to relevant Indian Standards, specifications & codes etc.

d) Necessary guy wires shall be provided for supporting the structure (wherever required).

e) The structure shall be painted with two coats of red oxide.

f) Lightning arrestors shall be in single pole assembly heavy duty, station type suitable for outdoor installation & suitable to mount on steel structure.

g) Lightning arrestors shall be adequately rated to discharge the energy of voltage surges and shall be provided complete with mounting brackets as well as line and earth connections.

h) Lightning Arrestors shall be suitable for termination to ACSR conductor.

i) Isolator shall ,be suitable to mount vertically on two pole structure

j) Isolator shall have operating handle with locking arrangement

k) Isolator shall have operating handle with necessary arrangement to operate the isolator from ground

l) Isolator shall also be suitable for ACSR conductor termination

m) Drop out fuses shall be provided of suitable rating.

L. T. PANEL

1. CONSTRUCTION FEATURES

a. Panels shall be indoor, metal clad, modular construction, fix type (except circuit breaker cubicles) air insulated and floor mounted type.

b. Unless otherwise mentioned, panels shall be of single front construction and shall be of dead front type.

c. All panels shall be extensible on both sides.

d. All panels shall be dust proof and vermin proof.

e. The panels shall have horizontal Busbar Chamber at top of the panel even for top cable entry.

f. All panels shall have provision for cable entry from top or from bottom or both as required. The same shall be confirmed to the Vendor during detailed engineering ! approval of shop drawing of panel manufacturer.

g. All panels including capacitor panels shall be fully compartmentalized with metal! insulating partitions between individual compartments.

h. The Horizontal busbar chamber shall be separate & totally enclosed.

i. Minimum thickness of CRCA MS sheet member shall be 1.6 mm for non load bearing members and 2.0 mm for load bearing members.

j. All panels shall comprise a continuous line up of dead front, free standing vertical sections. The installation of circuit breakers shall be limited to the bottom two tiers only. In two tiers formation two nos. of up to 1000 Amp. breakers can be provided.

k. All doors and cutouts shall be provided with neoprene gaskets.

l. The back doors of the panels shall be double door leaf type where the panels have more than 400 mm width.

m. Strong concealed type hinges shall support all doors.

n. All relays, meters, and switches etc. shall be flush mounted type.

o. All incoming terminals shall be provided with shrouds. Support shrouds shall be transparent and shall be made of SMC/DMC material. However Bakelite/Hylam material is not acceptable and shall not be used anywhere in panels.

p. The complete structure shall be rigid, self-supporting free from vibration, twists and bends etc.

q. The panels housing circuit breaker feeders shall be in single front draw out execution. The incoming & bus coupler circuit breaker feeders shall be in single tier formation while the outgoing circuit breaker feeders may be in double tier formation, unless otherwise specified.

r. A suitable barrier shall be provided between the circuit breaker and the associated control.

s. **The number of modules shall be so decided that the cable alleys are not over crowded. However the number of module in any panel shall not exceed six. The minimum size of module shall be 300mm and 225mm for starter and switch fuse / MCCBs feeders respectively. The minimum clear width of cable alley shall be 300mm.**

t. **In cable alley, outgoing terminals shall be identified with feeder number.**

2 BUS AND BUS TAPS

a. **The main buses and connection shall be of high grade of aluminium bus bars conductivity aluminium 1 aluminium alloy (Grade EC-91 E), sized for specified current ratings with max, temp. limited to 85 deg.C (35 deg. above 50 deg. ambient temp.).**

b. **Vertical bus bars shall be designed depending upon the actual feeder requirement. Bimetallic connector shall be provided for connection between dissimilar metals.**

c. **Busbars and connections shall be fully insulated for working voltage with adequate phase 1 ground clearances. Insulating sleeves for Bus bars and shrouds for joint shall be provided. Minimum clearance of 25 mm is required between phases and between phase & earth.**

d. **Shrouds for busbars joints tapping points shall be of fiber glass only. Bus insulators shall be flame retardant, track resistant type with high creepage surface and of non-hygroscopic material such as epoxy SMC DMC.**

e. **Busbars shall be supported and braced to withstand the stresses due to max. short circuit current and also to take care of any thermal expansion.**

f. **The busbar size shall be of similar size as of bus duct.**

3 CHANGEOVER SWITCHES

a. **Changeover switches shall be 4 pole, heavy duty, group operated load break fault make type with AC 23A duty.**

b. **The switches shall be capable of successfully withstanding the thermal stress for one sec. caused by the short circuit corresponding to the fault level specified.**

c. **The switches shall be able to withstand mechanical stresses caused by the peak short circuit currents corresponding fault level specified.**

d. **The switches shall be provided with operating handle compartment door and shall be so interlocked that on the hinged compartment door and shall be so interlocked that :**

   i) The door can be opened only when the switch is in OFF position.

   ii) It shall not be possible to close the switch when the door is open.

e) **The switch shall be provided with pad-locking arrangement for 250A and above rating.**

f) **The switch shall be provided with defeat interlock facilities.**

4 FUSES

a) **All fuses shall be HRC cartridge link type.**

b) **The fuses shall be provided with visible indication when they have operated.**

c) **Rating of the fuses shall be so chosen so as to have co-ordination with switch. Fuses shall preferably mounted directly on plug in type fuse bases & sufficient number of insulated fuse pullers shall be supplied.**

d) **Fuses and links functionally associated with the same circuit shall be mounted side by side.**

Earthing and neutral links in main supply circuits shall be of silver plated copper & of bolted pattern.

5 CONTACTORS

a) **Contactors shall be of double break, single throw and electromagnetic and non-gravity type.**

b) **Contactors shall be suitable for interrupted duty and shall be rated for class AC-3 duty.**

c) **Main contacts of contactors shall be silver faced.**

d) **Operating coils of contactors shall be suitable for operation on 220/240V AC, 1 phase, 50 Hz supply.**

e) **Contactors shall be provided with at least two pairs of 'NO' and 'NC auxiliary contacts.**

f) **Contactors shall not drop out at voltages down to 70% of coil rated voltages and min. pick up voltage shall be 85%.**

6 OVERLOAD RELAYS

a) **Overload protection for each motor feeder (wherever required) shall be provided by thermal overload relay on each of the three phases.**

b) **The relay shall be duly compensated against fluctuations on ambient temp. and frequency and shall have single phasing preventer feature.**

c) **Relay shall be hand reset type from the front of the cubicle door.**

Overload relay for fan applications shall be of heavy duty type with provision of bypassing the same during starting of the fan.

7 CAPACITORS

a) **The capacitor shall be of mixed dielectric type rated for 440Volts. Capacitors shall be provided with discharge resistors. The value of discharge resistors should be such that the residual voltage be less than 50V in one minute.**

b) **Capacitors shall be suitable for prolonged operation at an rms. voltage between terminals not exceeding 1.10 times the rated voltage, excluding transients.**

c) **Capacitors shall be suitable for continuous operation at an rms. line current not exceeding 1.30 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients.**

d) **The maximum continuous reactive output of a capacitor (including any due to flow of harmonic currents) shall not exceed 30% over rated reactive output of a capacitor.**

e) **Loss in the capacitors shall be kept as low as possible. (Max. 0.5W/KV AR).**

f) **Wherever capacitor consists of several elements inside the units, each element shall be provided with individual fuses, so that the unit need not be discharged or disconnected (although with moderate reduction in output), if one of short circuit to any of the elements.**

8 AUTOMATIC POWER FACTOR CONTROL RELAY

a) **Automatic Power factor control relay (APFCR) shall operate its auxiliary relay by sensing the power factor of the plant thru' current and voltage signals.**

b) **APFCR shall have no. of steps specified in drawings.**

c) **APFCR shall be provided with Built in PF meter (0.5 lag to 0.5 lead), calibrated setting dial.**

d) APFCR shall be suitable for 5A secondary current.

e) APFCR shall be suitable for flush mounting in capacitor panel/MCCs.

f) Current rating of its auxiliary relay shall be compatible with switching and continuous energization of main contactor of capacitors. Otherwise, additional relay shall be provided.

9 COOLING

a) All the Capacitor Panels shall be properly ventilated. If required a small exhaust fan of suitable rating shall be provided on the rear door of the panel, with the opening properly covered with fine wire mesh. The fan shall start/stop automatically along with normal start/stop provision.

b) Louvers shall be provided on the door on rear side with a fine wire mesh.

10 CURRENT TRANSFORMERS

a) Current Transformers shall be cast - resin type .All secondary connections shall be brought out to terminal blocks where connection will be made.

b) Accuracy class of the current transformers shall be:

- **Class 5P20 for protection.**
- **Class 1.0 for metering.**
- **Class PS for differential Protection & REF.**

c) Current transformer shall be provided with test links and shorting on both secondary leads for setting purpose.

d) All current transformers shall be earthed by a separate earth link on terminal blocks.

e) Additional nameplate of CTsl PTs shall be provided (if required) at such a place that it shall be possible to find out details of CTsl PTs after mounting in the panel.

11 VOLTAGE TRANSFORMERS

a) Voltage transformers shall be cast-resin, fixed type and shall have an accuracy class of 1.0.

b) Low voltage fuses, sized to prevent overload, shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the board is energized.

12 RELAYS **wherever provided shall be of draw-out design with built-in testing facilities. Small auxiliary relays may be in non-drawout execution-.**

13 CONTROL AND SELECTOR SWITCHES

a) Control and selector switches shall be of rotary type having enclosed contacts, which are accessible by the removal of cover.

b) Control and selector switches shall be of flush mounted type and on front of panels.

c) Selector switches shall be of stay-put maintained contact type.

d) Control switches shall be provided with escutcheon plate clearly marked to show the position.

14 INDICATING METERS AND INSTRUMENTS

Indicating instrument (96 x 96 mm) shall be digital meter, switch board type and accuracy class of 1 (1 % full scale ± 1 count).

15 INDICATING LAMPS

a. **Indicating lamps shall be of LED type, low watt consumption and provided with appropriate value of resistors. The LEDs shall also have an in-built surge suppressor.**

b. **Bulbs and lenses shall be interchangeable and easily replaceable from the front of the panel.**

16 PUSH BUTTONS

a) **All push buttons shall be of the push to actuate the contact type.**

b) **All push buttons shall be oil tight and shall be provided with adequate no. of contacts.**

17 POWER AND CONTROL CABLE TERMINATION

a. **Suitable supporting arrangement shall be provided for all power and control cables entering the panel.**

b. **Removable undrilled gland plate of 3 mm thick of MS for multicore cables and 4mm thick of Aluminium for single core cables sufficient in size to accommodate all compression type, heavy duty brass glands shall be provided.**

c. **Adequate termination arrangement shall be provided for all power cables which shall be aluminium / copper conductor, PVC insulated, sheathed, armoured PVC sleeved overall, heavy-duty cables, 1.1 KV grade. Power cables termination shall be by means of crimping type lugs on conductor cables.**

d. **The terminal blocks shall be bolted lug type for cables. These shall be protected type and rated for 1100 Volts service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection of cable by means of lugs, necessary clearance and creepage distance are available.**

e. **Wherever there is more than one equipment connected on the same feeder, separate terminals shall be provided.**

18 INTERNAL WIRING

a) **All internal wring shall be carried out with stranded copper conductors, PVC insulated, 1100/650 V grade.**

b) **Min. size of conductor for power wiring shall be 2.5 sq.mm, 1.5 sq.mm for AC control wiring and 4.0 sq.mm. for DC control wiring. Current transformer secondary wiring shall be with 2.5 sq.mm conductor.**

c) **All wiring shall be run on the sides of the panels and shall be neatly bunched and shall not affect access to equipment mounted in the panels.**

d) **Wiring shall be terminated on terminal blocks using crimping type lugs and without joints or tees on their runs.**

e) **Power wiring shall be done either by phase identifying coloured wires or suitably coloured PVC sleeves shall be provided at each end of wire.**

The following wiring codes shall be used.

Instrument Transformer	**:**	**Red, yellow or blue depending upon phase with which wire is associated.**
A-C phase wire	**:**	**White**
A-C Neutral wire	**:**	**Black**
Earth connection	**:**	**Green**

f) **PVC identification ferrules, yellow colour with black engraved letter shall be provided at each end of all control wires marked to correspond with equipment designation & termination numbers.**

g) Ferrules provided shall be oil tight and numbered from left to right.

19 TERMINAL BLOCKS

a) Terminal blocks for control wiring shall be 650V grade 10 sq.mm size.

b) Terminal blocks shall be grouped depending on circuit voltage. Different voltage groups of terminals blocks shall be segregated.

c) Terminals blocks shall be numbered for identification and provision shall be provided for terminal labels.

d) Terminal blocks requiring duplication shall be provided with solid bonding links.

e) Terminal blocks for current transformer secondary lead wires shall be provided with shorting, disconnecting I earthing facilities.

f) Terminal blocks and control wiring shall be so arranged that only one conductor of external wiring required to be terminated in at each terminal.

20 GROUND BUS

a) A ground bus, rated to carry maximum fault current, shall extend to full length of the panel.

b) The ground bus shall be provided with two-bolt drilling with GJ. bolts and nuts at each end to receive 75X 10 mm G.I. flat.

c) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker and shall be grounded through heavy multiple contacts at all times.

d) Wherever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independent to the ground bus and connected thereto.

e) C.T. shall be earthed through removable links so that earth of one circuit may be removed without disturbing other.

f) Frames and non current carrying metal parts of all equipment mounted shall be effectively to earth bus.

g) All hinged doors shall be connected to earth bus by flexible tinned bare copper wire.

h) Instrument and relay cabinets shall be connected to earth by 2.5 sq.mm stranded copper insulated wire 1100 V grade.

21 SPACE HEATERS

Each cubicle shall be provided with thermostat controlled space heaters.

22 AC/DC POWER SUPPLY

a) The panels shall be suitable to receive following power supplies.

AC Supply	**:**	**Single Feeder**
DC Supply	**:**	**Double Feeder**

b) Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 4-pole, single throw for AC.

c) Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for AC supplies.

d) AC load shall be so distributed as to present a balance loading on three phase supply system.

23 NAME PLATES

a) Name plates of anodized aluminum shall be furnished at cubicle and at each instrument, device mounted on and inside the cubicle.

b) Caution notice on suitable metal plate shall be affixed at the back of each vertical panel.

c) Name plates for feeders shall be provided on front and back of the panel.

24 TROPICAL PROTECTION

a) All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

b) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent the entrance of insects.

25 PAINTING

a) All surfaces shall be sand blasted, pickled and grounded as required to produce a smooth, clean surface free of scale, grease and rust.

b) After clearing, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.

c) The panels shall be finished with two coats of Siemens Grey (Shade RAL 7032) powder coated / Polyester enameled.

26 TESTS & INSPECTION

a) The following routine and acceptance tests shall be carried out during final acceptance list.

i) Mechanical operation test.
ii) Electrical operation test.
iii) High voltage test on power circuits.
iv) High voltage test on control circuits.
v) Millivolt test on the circuit breakers.
vi) Millivolt Drop test on Busbar joints

b) All tests shall be performed in the presence of Owner's representative, if so desired by the owner. The contractor shall give at least 15 days advance notice of the date when tests are to be carried out.

c) Contractor shall furnish test certificate indicating that equipment has been tested by their quality control department for compliance of technical specification and approved drawings. The same shall be forwarded to owner! consultants along with inspection call.

d) These inspections shall however, not absolve the vendor from the responsibility for making good any defect with may be noticed subsequently.

27. The bank at its discretion may purchase light fixtures and supply it to the contractor for installation. Contractor cannot claim any compensation for supply of fixtures by the bank.

ERECTION & COMMISSIONING

1.0 GENERAL

1.1 EQUIPMENT ERECTION

a) The equipment in disassembled condition shall be received at site by the contractor.

b) The contractor shall unpack, assemble all parts, mount and wire up loose equipment, fitting and accessories and complete all connections.

c) The contractor shall mount the equipment on respective foundation/ supports, level & align the same & arrange for necessary grouting/anchoring.

d) The erection work shall be carried out in compliance with manufacturer's instruction and shall include all adjustments, checks and measurements.

e) The contractor shall record results of all erection tests and measurements and furnish copies of the same to the owner for his reference and record.

f) Any internal wiring of the equipment, which has been left incomplete because of shipping, split or which requires minor modifications shall be carried out by the contractor. This includes mounting of items like relays, meters etc. and connecting the same as per wiring scheme diagram furnished by the original manufacturers.

1.2 CONSUMABLES AND HARDWARE

The contractor shall furnish all erection materials, hardware and consumables required for the completion of the installation. The materials shall include but not limited to the following:

a)	**Consumables**	**:**	**welding rods & gas, oil & grease, cleaning fluids, paints, electrical tape, soldering materials etc.**
b)	**Hardware**	**:**	**bolts, nuts, washers, screws, brackets, supports, clamps, hangers, saddles, cleats, sills, shims etc.**
c)	**Materials**	**:**	**junction boxes, terminal blocks, connectors, ferrules, lugs, brass glands, rigid/flexible conduits, cables, ground wires etc.**

Supply of cement, sand, stone etc. required for the execution of the contract shall be responsibility of the contractor.

1.3 ERECTION TOOLS & TACKLES

a) The contractor shall provide all tools, tackle, implements, module equipment such as chain pulley block, trailers etc. which are required for transportation, handling and erection of equipment.

b) Special erection tools, if any, furnished by the Manufacturer along with the equipment may be used by the contractor. such tools and equipment, however, shall be returned in good working conditions to the owner on completion of the job.

c) The contractor shall also arrange for major testing equipment as list below:

- **Insulation Tester : Motor operated Megger 1000V & 10KV grade.**
- **Hand operated Megger 1000V.**
- **Hand driven earth resistance megger, range 0-1/3/30 ohms.**
- **Tong testers of suitable ranges.**

- **Contact resistance measuring set for micro-ohms.**
- **Torque wrench.**
- **Primary / secondary injection set and relay testing kit.**
- **Multimeters, test lamp, field telephone with buzzer sets, different gauges etc.**
- **Streamline filter.**
- **Chain pulley block, cable jacks & spindle, cable, collars, electricians tool kit, jointer's tool kit, fitters tool kit, welding transformer, phase sequence meter, HV testing kit, primary & secondary injection kit.**

other test equipment as required for testing and commissioning of the equipment shall have to be arranged by the contractor.

1.4 METHODS AND WORKMANSHIP

a) All work shall be installed in a first class, neat workman like manner by mechanics / electricians skilled in the trade involved.

b) The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.

c) All details on installation shall be electrically and mechanically correct.

d) The installation shall be carried out in such a manner as to preserve access to other equipment installed.

e) If in the opinion of the contractor any work is insufficiently specified or require modification, the contractor shall refer the same in writing to the owner and obtain his instruction / approval before proceeding with the work.

f) If the contractor fails to refer such instances, any excuse for the faulty erection, poor workmanship or delay in completion shall not be entertained.

g) Equipment and material, which are wrongly installed shall be removed and re-installed to comply with the design requirement at the contractor's expense, to the satisfaction of the owner/consultant.

h) All scaffolding pipes and frames shall be of tubular steel. Bamboo's/ balliesl timer frames are not permitted under any circumstances. All vertical & horizontal scaffolds shall be of MS pipes of adequate size to withstand the loads & pressures. The working platforms shall be either of conduit pipes or MS bars.

1.5 ALLOWABLE WASTAGE

a) The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed 1 %

b) Measurement shall be taken at site jointly by contractor and owner's representative.

c) If the actual wastage be more than the quoted figure then equivalent price of the balance amount will be deducted from contractor's bills.

d) The contractor shall submit a detailed account of materials issued to him after completion of work. The excess materials after completion of job shall be returned back to the owner's store.

1.6 FOUNDATION AND CIVIL WORK

a) The contractor shall check the foundations provided by owner before commencement of erection to ensure their suitability.

b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the contractor including minor modification of civil work as may be required for erection.

c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost and shall be made good to match the original work. The contractor shall obtain approval of owner/ consultant before proceeding with any cutting of masonry / concrete work.

1.7 EXCAVATION AND BACK FILLING

a) The contractor shall perform all excavation and back filling as required for the scope of work pacified.

b) The contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.

c) All excavation shall be back filled to the original level with good consolidation.

1.8 REPAIR OF DAMAGE SUBSTAINED DURING TRANSIT

The contractor shall repair minor damages sustained during transit or subsequent storage in purchaser's store. The repair charges shall be paid to the contractor on the basis of extra work.

1.9 INSPECTION

a) After completion of erection / installation, each piece of equipment shall be thoroughly tested as per approved procedure and inspected in presence of the owner/consultant for correctness and completeness of erection and acceptability for startup.

b) A check list in triplicate will be furnished by the owner/consultant wherein all details to be checked and necessary instruction shall be listed. the inspection and checking shall strictly follow the checklist.

c) on completion of the inspection (2) copies of the check list duly filled-in shall be handed over to the owner/consultant.

d) This check list shall be jointly signed by the contractor and the owner/consultant. Such endorsement, however, shall not relieve the contractor of his obligations under the contract.

2.0 11 KV SWITCHGEARS

2.1 11 KV HT Switchgears shall be installed in accordance with IS:3072 and manufacturer's instructions. The contractor shall be required to install and align any channel sills which form part of the foundation. The HT Switchgears shall be made absolutely vermin proof.

2.2 Control wiring (if any) between 11 KV HT switchgears & other electrical equipment shall be carried out as per the instructions of the manufacturers & site-in-charge.

3.0 TRANSFORMER

3.1 Installation of the transformer shall be in accordance with the IS : 1886, manufacturer's instructions and as per the enclosed drawings.

3.2 Care shall be taken during handling of insulating oil to preventing ingress of moisture or foreign material. Testing and sampling of oil shall be in accordance with manufacturer's instructions and related IS. If oil filtration is required the same shall be carried out at site by the Contractor.

3.3 Control wiring between Transformer & other electrical panels shall be carried out as per the manufacturer's drawings and as per the instructions of site - in - charge.

4.0 415 V BUS DUCT

4.1 Bus duct will be received in transportable pieces. The Contractor shall erect the bus duct including bends, wall seating copper flexible at both ends and complete all connections in accordance with Manufacturer's drawings. The work also includes erection of steel hangers / supports for these bus ducts wherever necessary.

4.2 All steel structure / support / hardware for supporting bus duct shall be calculated by the contractor.

5.0 MAIN PCC / CAPACITOR PANELS

5.1 All above panels & DBs will be available in split - up - sections for ease of transportation and handling. However in some cases, breakers, busbars relays, meters and control switches may be supplied loose to be mounted and connected at site as per the relevant drawings.

5.2 All alignments leveling, grouting, anchoring and adjustments shall be carried out in accordance with manufacturer's instructions and/or as directed by the Engineer. All boards shall be cleaned by using blower before installation.

5.3 All connections in the panels shall be completed, checked and adjusted to ensure safety and satisfactory operation of the equipment. This includes the following activities:

- **a) Functional test on circuit breakers.**
- **b) Setting of protective relays and thermal over load relays.**
- **c) Adjustment of zero error of various indicating instruments.**
- **d) Testing of thermal overload relays by primary injection and protective relays by secondary injection.**

5.4 In some cases, minor modifications may have to be carried out at site in the wiring of an equipment to meet the requirements of the desired control scheme and the Contractor shall have to do the same at no extra cost.

6.0 MISC. ITEMS AND LOCAL PANEL INSTALLATION

6.1 The contractor shall install miscellaneous items such as local control station, start-stop push button stations, and local starter units. control panels, misc. panel etc.

6.2 These equipment will be generally wall or column mounted excepting a few which are floor mounted. The exact locations will be as decided by the Engineer at site.

6.3 All supports or brackets need for installation shall be fabricated by the Contractor.

6.4 All welding, cutting, chipping and grinding as and when necessary shall be carried out by the Contractor at no extra cost.

7.0 CABLING SYSTEM

7.1 CABLE TRAYS AND RACKS

- **a) The contractor shall install the cable racks, trays, risers, shafts and supports.**
- **b) Cable trays and risers shall be aligned and leveled correctly. All runs shall be installed parallel to the trench/building walls and floors except otherwise noted on the drawings.**
- **c) The contractor shall provide embedded steel inserts/supports on wall, ceiling or floor by suitable anchoring & shall secure racks and supports by welding these to inserts.**
- **d) The trays in general shall be supported at a distance of 1.5 to 2 meters on horizontal and vertical run.**

e) Cable trays shall be installed as per drawings furnished to the Contractor. Any deviation in routes shall have the prior approval of the Engineer In charge.

f) Prefabricated cable trays and accessories shall be assembled and erected at site as per instructions of Manufacturer. Alternately, the Contractor shall fabricate and install all cable trays, risers, shafts and supports as agreed upon during finalization of the award.

g) Sufficient spacing not less than 250 mm shall be provided between trays and maintained to permit adequate access for installing and maintaining the cables.

h) Contractor shall co-ordinate with other contractors (such as for piping etc.) where there is a common support for cable trays and for other services.

i) All necessary steel & all consumables as specified elsewhere shall be provided by the contractor.

7.2 STORAGE AND HANDLING

a) Cable drums shall be stored on hard and well drained surface so that they may not sink. In no case the drum shall be stored on the flat Le. with flange horizontal.

b) Rolling of drum shall be avoided as far as practicable. For short distance, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

c) In absence of any indication the drums may be rolled in the same direction as it was rolled during taking up the cable.

d) For undreeling the cable, the drum shall be mounted on jacks or on cable wheel. The spindle shall be strong enough to carry the weight without bending.

e) The drum shall be rolled on the spindle slowly so that cable should come out over the drum and not below the drum.

f) While laying cable, cable rollers shall be used at an interval of 2000 mm. The cable shall be pushed over the roller by a gang of people positioned in between rollers.

g) Cable shall not be pulled from the end without having intermediate pushing arrangement. Bending radius of the cable shall not be less than that is specified by the manufacturer.

h) All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends.

7.3 CABLE LAYING

a) Cable shall generally be installed in ladder type / perforated trays in trenches or buried in ground except for some short runs in conduit for protection or crossings the roads etc.

b) Each length of run shall be physically measured at site before cutting the cable. Contractor shall furnish cable cutting the schedule to engineer in charge with respect to able drum length available at site and runs of cables & sizes of cables.

c) Cable may also be laid through hume pipes in road crossings etc. The hume pipes shall be supplied and placed in position by the Contractor.

d) Cable laid on trays and risers shall be neatly dressed and clamped at an interval of 3000 mm and 900 mm for horizontal and vertical cable run respectively and at each bend of cable.

e) All power cables shall be clamped individually and control cables shall be clamped in groups of three or four cables.

f) Clamps for multicore cables shall be fabricated of 25 x 3 mm G.I. flats. Single core power cables shall be laid in trefoil formation and clamped with trefoil clamps made of Fiber glass/PVC.

g) Cable openings etc. in walls/floor made by the Contractor or by others shall be sealed by the Contractor suitably by Hessian tape and bitumen compound or by any other proven method to prevent ingress of water.

h) Directly buried cables shall be laid as per detail shown in drawing. These cables shall be laid on and covered with sand/raddle earth and protected by brick barriers as sides and pre cast concrete slab brick on top. Job also involve digging/excavation of earth and refilling the same after laying of cables. For cables laid underground a loop of diameter of 3 meters shall be provided near each terminating ends.

i) After completion of installation and prior to connection, all High Voltage Power cables shall be given a high potential test. The contractor shall provided this Hipot Test set having provision of leakage current measurement.

j) Laying cost shall include all above activities including supply and fixing of clamps etc.

k) Cables for machines in clean area shall be laid in suitable size of stainless steel conduit.

7.4 CABLE TAGS AND MARKERS

a) Each cables and conduit run shall be tagged with numbers that appear in the cable schedules. Cables and conduits shall be tagged at every thirty (30) meters. Cables and conduits shall also be tagged on either side of a floor/wall passage.

b) The tags shall be of PVC or Aluminium with the number engraved on it and securely attached to the cable by not less than two turns of G.!. wire.

c) Location of cables laid directly underground shall be indicated clearly by cable marker made of cast iron.

d) The location of cable joints, if any, shall be clearly indicated with cable marked with an additional inscription "Cable Joint".

e) The marker shall project 100 mm above ground and shall be spaced at an interval of 30 meters at every change of direction.

f) Where cables are cut from the drums the ends of the cables at the drums shall be properly sealed.

g) The power and control cable shall be laid with a provision of extra length at one of the end terminations. This length shall be confirmed by the Engineer in charge before laying.

h) Cost of laying shall also include supply and fixing of tags, cable markers etc.

7.5 TERMINATIONS JOINTS AND CONNECTION

a) The termination, Joints and connections of cables shall be done by qualified jointers strictly in accordance with manufacturer's instruction drawings and/or as directed by the Engineer.

b) The work shall include all clamping, fittings, fixing, plumbing, soldering, taping, compound filling, epoxy cable jointing, crimping, connecting, shorting and earthing as required for all such operations should be available with concerned contractor. For

all size of L T termination, crimping tool (Hydraulic type) shall be used. Further, inhibiting compound shall be provided before termination.

c) The equipment will be generally provided with blank plates for cable/conduit entry and cable end box for power cables.

d) The Contractor shall perform all drilling, cutting on the blank plates and any minor modification work required to complete the job.

e) If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires major modification, the same shall be carried out by the Contractor as extra work item.

f) Control cable cores entering control panel/switch gear / MCC etc. shall be neatly bunched and served with nylon cord or PVC perforated tape to keep in position at the terminal block.

g) The contractor shall provide oil resistance ferrules for all control cable cores at all terminations including at all junction boxes. and at all terminations. The ferrules shall carry terminal numbers as per drawing. The ferrules shall be of interlocked plastic type or approved equal.

h) Spare cores shall be similarly tagged, crimped with lug and taped on the ends. Spare cores shall be tagged with individual cable number.

i) Terminations and connections shall be carried out in such a manner as to avoid strain on the terminals.

j) All cable entry points shall be sealed and made vermin and dust proof. Unused opening, if any shall be effectively closed.

k) Termination kits for HT cables, Straight through joint kits for HT & L T cables, cable of all glands lugs shall be arranged by the Contractor, which includes furnishing consumable materials such as plumbing and soldering material, electrical tape including bitumen compound/resin if not a part of kit shall be included in the erection rates.

8.0 IMPORTANT NOTES FOR ERECTION ACTIVITIES

8.1 CABLES AND CONDUITS

a) Approximate lengths of cables and conduits runs will be given in the cable schedule. Before commencement of work the Contractor shall take actual measurements and prepare his own cable cutting schedules to reduce wastage to a minimum.

b) During the erection period the Contractor shall furnish weekly / fortnightly report on cable position in an approved proforma so as to keep the Engineer In Charge apprised of the position and to enable him to intimate any procurement action in time.

c) The Contractor shall also maintain and submit when requested, a record of cable insulation value when drawn from store, after laying, before and after termination/jointing.

8.2 EXCAVATION AND BACK FILLING

a) The Contractor shall perform all excavation and back filling as required for the scope of work specified.

b) The Contractor shall make his own arrangement for pumping out any water that may accumulate in the excavation.

c) All excavation shall be back filled to the original level with good consolidation.

8.3 FOUNDATION AND CIVIL WORK

a) The contractor shall provide foundations wherever required & in case same has been provided by the employer earlier, same shall be checked for correctness before commencement of erection to ensure their suitability.

b) All final adjustments of foundation levels, chipping and dressing of foundation surfaces, drilling holes on foundation channels to suit the equipment setting and grouting of anchor bolts, sills, inserts and fastening devices shall be carried out by the Contractor including minor modification of civil work as may be required for erection.

c) Any cutting of masonry work which is necessary shall be done by the Contractor at his own cost & shall be made good to match the original work.

The Contractor shall obtain approval of Engineer before proceeding with any cutting ,of masonry /concrete work.

8.4 STRUCTURAL FABRICATION WORKS

a) All chequered plate covers, cable racks, trays, supports, hangers and brackets wherever necessary shall be supplied / fabricated by the Contactor. Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.

b) Every effort shall be made to minimize the wastage of steel as far as practicable during fabrication. The wastage in no case shall exceed as specified elsewhere in this specification.

8.5 TESTING AND COMMISSIONING

a) On completion of erection work, the Contractor shall request the Engineer, for inspection and tests with minimum of fourteen (14) days' advance notice.

b) The Engineer shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.

c) The installation shall be then tested and commissioned in presence of the Engineer.

d) The Contractor shall provide all men, material and equipment required to carry out the tests.

All rectification, repairs or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the Contractor, without any extra cost. The handing over of the installation shall be effected only after the receipt of written instruction from the Purchaser/his authorized representative.

9.0 SCHEDULE OF PRE-COMMISSIONING TESTS

9.1 CIRCUIT BREAKER

a) Insulation resistance test on each pole by Meggar.

b) Insulation resistance test on control circuit.

c) Checking of all joints for leakage in breaker.

d) Measurement of contact resistance for all the Three Phases.

e) Checking the auxiliary circuits associated with circuit breaker.

f) Functional check of breaker operation electrically at 70% and 110% of rated D.C. supply voltage.

g) Checking of interlock provided in Control Circuits and tripping through

simulated protective relay contacts.

h) Auto-reclosing duty cycle check wherever auto-reclosing is required.

i) Measurement of resistance of closing and tripping coils.

9.2 CURRENT TRANSFORMER

a) Insulation Resistance test on each winding by Meggar to earth and between windings.

b) Checking of all ratios on all cores by Primary injection set.

c) Polarity check on each winding.

d) Continuity test.

e) Check for connection to correct taps.

f) Oil level check.

9.3 EARTHING

a) Continuity of earthing connection.

b) Testing of Earth Resistance of Individual Electrode.

c) Testing of Earth Resistance of the combined earthing system.

9.4 SWITCHBOARDS / MCC / DISTRIBUTION BOARD / PANELS

a) Measurement of insulation Resistance of Bus-bar System.

b) Measurement of I. R. of Control Circuit.

c) Functional check of circuit components

d) Continuity check of different circuits.

e) Calibration test of Relays and Meters.

f) Space heater operation.

g) Annunciations.

9.5 RELAYS & METERS

a) Calibration test.

b) Operation I performance test.

NOTE

Tests required for some of the major items are indicated for Bidder's reference. Apart from the tests listed herein and also as mentioned elsewhere in this specification, any other test as necessary per relevant standards, recommendations, Code of Practice, Manufacturer's recommendations etc., shall have to be carried out by the Contractor without any implication within the quoted price and time schedules.

DATA SHEET (to be filled by the Bidder)
PROPOSAL PARTICULARS
(to be filled by the Bidder)

1.0 GENERAL

1.1 Bidder's Complete company Name and Address :

1.2 Proposal Ref. & Date :

1.3 Validity of Proposal :

1.4 Name and designation of the Officer of Contractor to whom all references shall be made for expeditious technical co-ordination :

1.5 i) Bidder's license No. :

ii) License issued by :

iii) Validity date of License :

1.6 Performance guarantee period for :

a) The equipment offered :

i) From the date of commissioning at site. :

ii) From the date of dispatch :

b) Installation work from date of commissioning. :

2.0 SPECIFIC

2.1 . Details of facilities for Design / Engg. Available with the Contractor. :

2.2 Details of documents enclosed with this offer :

2.3 Prices quoted are

- **inclusive of :**
- **exclusive of :**

PROPOSAL PARTICULARS
(To be filled by the Bidder)

3.0 GENERAL TECHNICAL REQUIREMENT

3.1 Ambient temp. considered :

3.2 Equipment offered are suitable for :

a) Voltage variation :

b) Frequency variation :

c) Combined voltage & Frequency Variation :

3.3 Details of Codes I Standards to be followed :

4.0 LIST OF PERSONNEL

Contractor shall give below the list of personnel proposed to be employed for efficient execution of the job under this specification.

Sl. No.	Personnel Category	Trade	Number	Remark
01.	**Resident Engineer**			
02.	**Senior Engineer**			
03.	**Junior Engineer**			
04.	**Supervisor**			
05.	**Jointer**			
06.	**Wireman**			
07.	**Fitter**			
08.	**Labour**			
09.	**Driver**			
10.	**Others**			

5.0 DEVIATION SHEET

Bidder shall list out deviations (if any) with respect to clause no. and page no. of specification.

.....

Bidder's Signature

6.0 PERT CHART

Bidder shall submit a pert chart for various activities with time schedule.

.....

Bidder's Signature

7.0 SPARE PARTS

Bidder shall list out the spare parts for each equipment suitable for two year's trouble free operation.

.....

Bidder's Signature

8.0 INSPECTION SCHEDULE

Witness of routine / Type test (as per relevant standards/ agreed schedule) of various equipment shall be carried out at the works of manufacturer by Owner/ owner's representative. The Contractor shall furnish the following details and freeze this schedule within 2 weeks after placement of LOI in consultation with Owner/ Consultants.

ITEMS	TESTING DATE OF INSPECTION	PLACE	NAME OF MANUFACTURER

NOTE

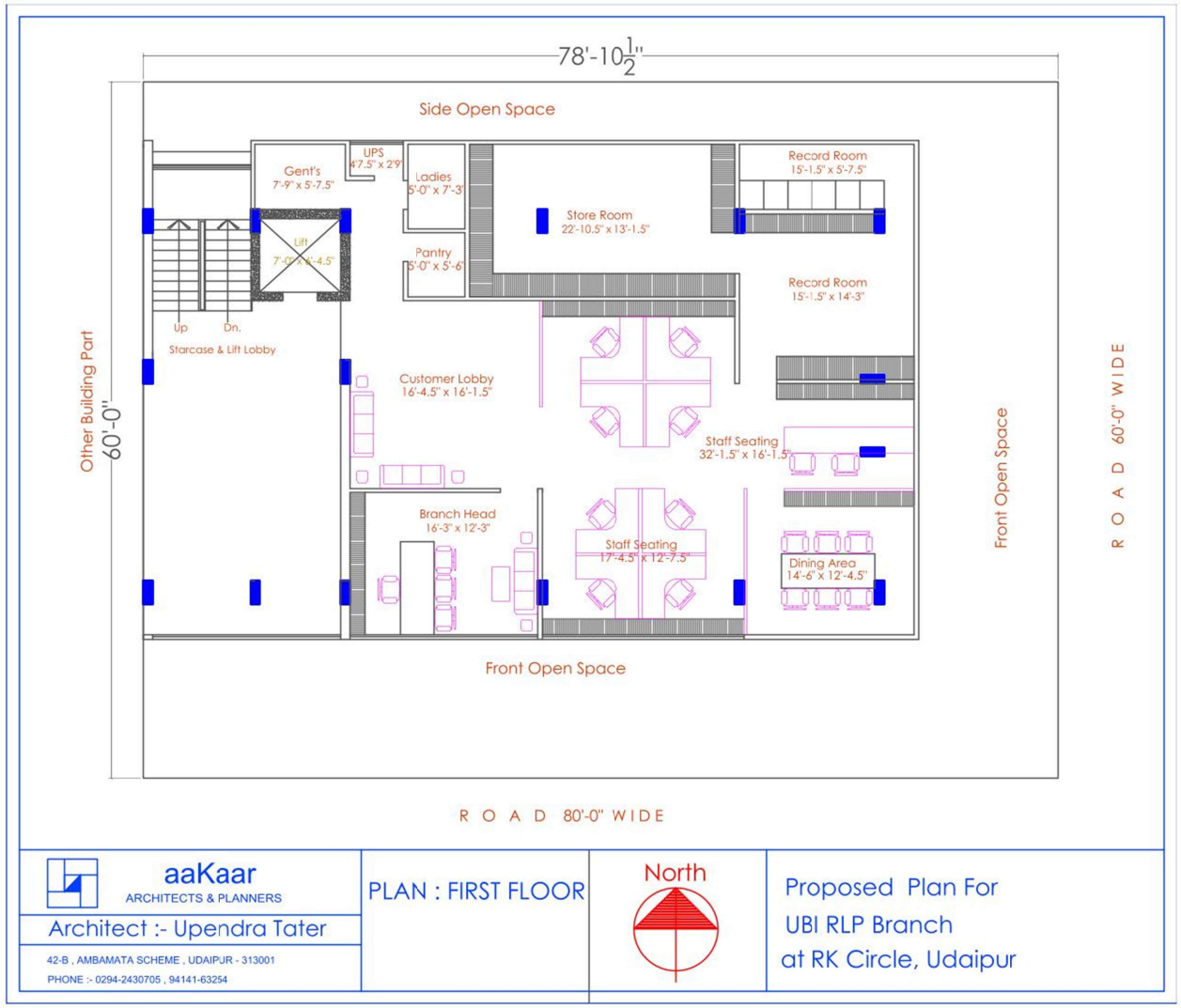
It is the obligation on the part of Contractor to inform actual date of inspection 2 weeks in advance.

Contractor's engineer shall be present in all inspection.

In some cases, Owner/ Owner's Representative may give waiver of inspection.

In all cases, test certificate shall be furnished by the contractor and the same shall be approved by owner/ Consultant.

.....



aaKaar
ARCHITECTS & PLANNERS

Architect :- Upendra Tater

42-B , AMBAMATA SCHEME , UDAIPUR - 313001
PHONE :- 0294-2430705 , 94141-63254

PLAN : FIRST FLOOR

North

Proposed Plan For
UBI RLP Branch
at RK Circle, Udaipur

C	**ELECTRICAL WORKS.**			
a b c d	**GENERAL NOTES** Rates to include all scaffolding, cartage of materials to and from the site in lead of beyond 5 kms, and working in a running branch premises, IF ANY Wire Routing provided through the walls / floor etc., rates to include cutting of wall and refinishing the same finely complete. Points include complete length of wiring, conduiting and accessories upto designated places as per the design and drawings. Electrical contractor shall have to make the layout for cutting of lights etc. at site.			
1	**Light and fan points** Providing & fixing POINT WIRING for Ceiling Llights/ wall lights/ wall fans/ call bellpoint / sockets etc. with 2x1.5 sqmm pvc insulated 1100 v grade copper conductor(FRLS)wires and 1.0 sqmm earth wire in concealed / surface, using 16 swg MS 20mm/ 25mm/ 32mm dia conduit, accessories such as bends, tees, saddles, draw boxes, mounting boxes, inner plates, cover plates, ceiling rose etc.(wherever required) and plugs etc, the circuit wiring starting from DB to point control box / switch box using 2x2.5 sqmm & 1x1.5 sqmm earthing pvc insulated wirng with color coding to be provided. identification ferrules at both ends to be provided. (flexible conduit / elbow NOT allowed). The conduits to be laid in ceiling with proper clamps / wall / floor and filling the chase with cement mortar and finish the same in original form / wooden partition / above false ceiling with proper clamps (whenever required as per standard specifications.) **Note:-** **No flexible conduit elbows will be allowed Each circuit shall have independent earth wire. Each point shall be earthed.**			
a	Circuit wiring to be included in the point wiring rates i) One light / Fan controlled by one Switch ii) Two lights controlled by one switch	22.00 Nos. 8.00 Nos.	Rs. Rs.	Rs . Rs .

b	Ceiling / Wall fan point controlled by one 6 Amp modular switch & switch board at SB level and 6 amp 5 pin socket at designed place	12.00	Nos.	Rs.	Rs.
c	6 amp Socket with switch at switch board places	22.00	Nos.	Rs.	Rs.
d	Call bell point with Anchor make buzzer	2.00	Nos.	Rs.	Rs.
e	Exhaust fan point	2.00	Nos.	Rs.	Rs.
f	Emergency Light point (OnUPS) (Including separate phase, neutral, earth) and to be in separate switch boards.	15.00	Nos.	Rs.	Rs.
2	**Power points** Same as item no.1, but wiring for 16A 6 pin sockets by using 4 sqmm pvc insulated copper conductor wire with independent 2.5 sqmm earth wire from DB to 1st socket & 1st socket to second socket with 2.5 sqmm and 1.5 sqmm earth wire including providing and fixing.				
a	Power points with **4.0 sqmm** copper conductor wires	8.00	Nos.	Rs.	Rs.
b	Power points with **2.5 sqmm** copper conductor wires	10.00	Nos.	Rs.	Rs.
3	**AC Points** Providing & laying A.C. point. with 2x 4.0 Sq.MM insulated copper conductor wire(FRLS) & 1x 2.5 Sq.mm copper conductor wire for earthing, from AC DB to AC point in 16 SWG GI conduit. Rate to include supplying and fixing of metal AC box standard manufacturer's enclosure including 3 pin metal clad top and 32/25 amp SPMCB "C" series.	7.00	Nos.	Rs.	Rs.
4	**DISTRIBUTION BOARDS** (Double Door) All MCB to be "C" series All MCB to be "C" series P/f sheet metal distribution boards of approved make. Double door type and making necessary connections etc. complete.				
a.	TPN 4 way DB Having incomer - 63 Amp 4P MCB (FOR				

	POWER & AC) outgoings - 32 Amp DP MCB - 6 nos., AND 25 Amp SPMCB 6 Nos. SITC 4way SPN DB with 2x40 amp DPMCB (for UPS i/p)	1.00	Nos.	Rs.	Rs.
b.	T P N 4 WAY DB :- (For Power/ AC) Having Incomer : 63 Amp. 4-P MCB	1.00	Nos.	Rs.	Rs.
c.	S P N 12 WAY DB :- SP MCB 6 Amp = 10 Nos. DP MCB 63 Amp = 1 NOS	1.00	Nos.	Rs.	Rs.
d.	S P N 4 WAY DB :- with one number 63 A 4 Pole MCB with enclousure	2.00	Nos.	Rs.	Rs.
5	**Light and Fan fixtures** Item includes Providing, assembling, fixing, testing & commissioning Following Fixtures including all accessories & extension chords as maybe necessary complete. All CFL / Flurescent fixtures (except down lighters) to be hung from the RCC ceiling by sitable chain /rods				
a	Philips RC 380 B LED full glow, 25/30/36 approved or equivalent	20.00	Nos.	Rs.	Rs.
b	Philips Green LEDi 15 w LED 6 K / approved or equivalent	60.00	Nos.	Rs.	Rs.
c	T-5, 28 w, Box Tube Light, Philips or equivalent	15.00	Nos.	Rs.	Rs.
d	Metallic Wall Fan – 400 mm sweep, high-speed, of reputed make such as Crompton / Almonard or equivalent, complete with oscillation mechanism, guard, mounting bracket, motor, regulator/control arrangement, fixing, testing	8.00	Nos.	Rs.	Rs.
e	Exhaust Fan – 300 mm sweep, metallic body and metal blades, high-speed, with metal bird screen, of reputed make such as Crompton / equivalent, complete with fixing, electrical connection, testing	2.00	Nos.	Rs.	Rs.
6	**CABLES / Wires**				

a	Providing and placing in position, testing and connecting heavy duty armoured cable in conduit pipe internally and GI pipe externally with all bends, junctions etc. on saddles wherever exposed and crimping the relevant connection, ends complete as per approved section and make- Gloster / National / Bonton 3.5 Core 50 sqmm Aluminum armoured (meter to panel and panel to generator room)	35.00	m	Rs.	Rs.
b	Cable termination including Supplying, connecting the end terminations with suitable cable lugs, properly crimped of size 3.5x95 sqmm . Single Compression Cable Glands, Tapping, Crimping etc. complete.	8.00	Nos.	Rs.	Rs.
c	4x16 sqmm al ar. Cable from Panel to DBs, UPS DB, including 2 x 8swg GI wire in PVC conduit.	30.00	m	Rs.	Rs.
d	Cable termination including Supplying, connecting the end terminations with suitable cable lugs, properly crimped of size 4x16 sqmm . Single Compression Cable Glands, Tapping, Crimping etc. complete.	13.00	Nos.	Rs.	Rs.
e	2x6 sqmm copper wire for UPS input / output	30.00	m	Rs.	Rs.
7	**UPS points & Circuits** P/f UPS points in 2mm thick PVC conduit with 2x2.5 sqmm insulated copper wire along with 1x1.5 sqmm pvc insulated wire for earthing including bends, nipples, junctions, MS switch boxes each to have 3 nos. 6A 5 pin modular socket 1x6 amp indicator controlled by 1 x 16amp switch complete fine finish including making necessary connections & start of equipment as per details & drawings				
	First point	13.00	Nos.	Rs.	Rs.
	Loop Point	10.00	Nos.	Rs.	Rs.
8	**MAINS PANEL**	1.00	Nos.	Rs.	Rs.

	Designing, manufacturing, installing, testing and commissioning of cubical type MAIN PANEL CPRI Approved made from 16 SWG CRCA sheet steel type, base MS channel for grouting on floor complete with MCCB, MCBs , meters, C.T. etc. complete in all respect, insulated bus bar with near srinkable PVC sleeve in suitable busbar chamber, wiring, nameplates, dangerplates, earth bus etc. and comprising of compartments with hinged doors with rubber gasket, bus bar chamber with bolted door and rubber gasket etc. the panel being of dust and vermin proof construction and to be painted with primer and smoke grey paint minimum two coats) to look attractive. the panel should be comprising of the following: (degree of protection IP-54) **INCOMER:-** i 150 Amp 4-p MCCB (3phase) I nos. ii 150 Amp 3-p On load changeover switch. 150 Amp. Capacity Aluminium bus bar, system room heat shrinkable proper insulation with color coded. Digital ameter and voltmeter with selector switches three no. indicating lamp R-Y-B phase indicators with 2 amp. Back up HRC fuses. **OUTGOING** 100 AMP. 4-P, 2 Nos. mccb 63 AMP. 4 P, 2 Nos. mccb 2 nos. 63A 4P MCB, spare				
9	**EARTHING : FOR GENERATOR AS WELL AS BRANCH** SITC of Pipe in pipe technology ASHLOK earthing system, model T-39, with outer diameter of 80mm, length 2000 mm, embedded in the soil with masonary inspection pit along with cover etc. complete in all respect. The work should be got carried out through bank's authorized vendor only. each pit installation test certificate to be submitted after measurement of earth resistences as per provision in IS 3043 (ups out DB earthing) p/f 2x8 swg copper earth wire in(and including costing of) PVC conduit	6.00	Nos.	Rs.	Rs.
10	**DATA / NETWORKING CABLING**	8.00	Nos.	Rs.	Rs.

a	Supply, installation, testing ,commitioning of cat 6 cable of D - link make in existing/ new conduit complete with termination on both side of each circuit.				
b	Supply, installation ,testing ,commitioning of dual type information outlet and face pack and gang box of D – link make suitable for cat 6 cable.				
c	Supply, installation, testing, commitioning of mounting cord 1 meter, Cat 6 of D link make (Company Made)				
d	SITC of mounting cord 2 meter, Cat 6 of D link make (Company Made)				
e	Removing, repairing, ITC of existing patch panel and switch and rack, D Link make suitable for Cat 6 cable				
11	**Wall-Mounted Data / Network Rack** – 6U, CRCA steel, powder coated, lockable toughened-glass front door, 19" adjustable mounting rails, cable entry provisions, complete with mounting hardware and accessories.	1.00	Nos.	Rs.	
	(C) Total Amount of Electrical works				**Rs.**

D	**TELEPHONE WORKS.**				
1	S/I/T/C 2 Pair PVC Insulated Telephone wire (Delton, Finolex Polycab or Eq.)	175.00	R Mt.	Rs.	Rs.
2	S/I/T/C main telephone cable from BSNL DB to EPBX machine (8/10 pair)	8.00	R Mt.	Rs.	Rs.
3	Supply,installation, testing & Commissioning of telephone outlet Box with top plate.	8.00	Nos.	Rs.	Rs.
4	**Dismantling and removal** of existing telephone, LAN, networking, data cabling, trunking, racks, patch panels and associated accessories complete.	L.S.			Rs.
	(d) Total Amount of Telephone works				**Rs.**

Seal & Signature of Bidder