NOTICE TO CONTRACTORS

To M/S:_____

_____

_____

Sub.:- Tender for providing Electrical & Installation Work for
INTERNAL ELECTRIFICATION WORK FOR MAIN BUILDING @ IIT Bombay

Dear Sir/s,

1. On behalf of our clients, Design Cell, IIT Bombay, Powai, Mumbai, We have pleasure in inviting you for the aforesaid work.

   The Tender will be available at Design Cell, IIT Bombay, Powai, Mumbai any day between _____

   Sealed tenders should be addressed to Design Cell, IIT Bombay, Powai , Mumbai. and super scribed "Tender for providing Electrical Installation Work for Electrical Installation Work for INTERNAL ELECTRIFICATION WORK FOR MAIN BUILDING , @ IIT Bombay and sent to their above office not later then _____

2. The Tender will be opened on same day at 15.00 Hrs. & all bidders can remain present.

3. a) Preliminary system designs and specifications are attached in the Tender Documents. These designs and specifications are only an indication of the nature and scope of the proposed work. The tenderer is at liberty to modify them for the purpose of obtaining greater efficiency, economy and schedule of rates as he may consider proper.

   b) The Contractor appointed will be required to submit to the Consultants, within a period of one week from the date of issue of a Work order, a complete set of detailed working drawings, designs, manuals, etc. in triplicate of their performance – oriented works entrusted to him.

4. The tenderer must obtain for himself, on his own responsibility and at his own expenses, all the information which may be necessary for the purpose of filling this tender and for entering into a contract for the execution of the same and must examine the indicative drawings and inspect the site of the work and acquaint himself with all local conditions and all the byelaws, rules and regulations of the various authorities and matters pertaining thereto, prior to submitting his offer , to enable him to prepare the necessary designs, drawing, etc. accordingly.

5. **Each page of the tender documents is required to be signed by the person or persons submitting the tender in token of his/their having acquainted himself/themselves with the General Conditions etc., as laid down. Any tender with any of the documents not so signed will be rejected as the tender document in totality forms the part of the contract.**

6. The tender form must be filled in English and all entries must be made by hand and written in ink. If any of the documents is missing or unsigned, the tender shall be considered invalid.

7. All erasures and alterations made while filling the tender must be attested by the initials of the tenderer Overwriting of figures is not permitted. Failure to company with either of these conditions will render the tender void. No advice or any change in rate of conditions after the signing of the tender will be entertained.

8. TOTAL SECURITY DEPOSIT

Total Security Deposit shall comprise of:-

(a) 5% for Contract Value up to 5,00,000.00 from RA bill

(b) 10% of Contract Value above 10 Lacs.

10. i) SECURITY DEPOSIT

The successful tenderer to whom the contract is awarded (hence forth referred as contractor) shall deposit in cash or as bank guarantee an amount equaling 5 % or 10% (as per contract amount) of the contract value as security deposit

ii) RETENTION MONEY

Apart from the initial security deposit to be made by the Contractor as aforesaid, the retention money shall be deducted from progressive running account bills @ 5% of the gross value of work done and claimed in each running account bill, provided that the total Security Deposit i.e. the Initial Security Deposit amount plus the Retention amount shall not exceed 10 % of the contract price as determined after considering all variations as approved.

The retention amount will be refunded to the Contractor after the expiry of the Defects Liability Period provided herein, provided the contractor has satisfactorily carried out all the work and attended to all defects in accordance with the conditions of the contract. No interest will be allowed on retention money. On virtual completion of the works, the retention amount may be refunded to the contractor against the Bank Guarantee to be furnished by him in approved Performa and valid until the end of defects liability period.

11. Within one week of the receipt of intimation from the Consultant of the acceptance of his/their tender, the successful tenderer shall be bound to implement the Contract by signing an agreement in accordance with the agreement and conditions of Contract attached herewith, but the written acceptance by the Employer of a tender will constitute a binding agreement between the Employer and the person so tendering whether such formal Contract is or not subsequently entered into.

12. All compensations or other sums of money payable by the Contractor to our clients under the terms of this Contract may be deducted from the Security Deposit or from any sum or sums that be or may become due to the Contractor on any account whatsoever and in the event of the Security Deposit being reduced by reasons of any such deductions, the Contractor shall within 15 days of being asked to do so, make good in cash or cheque any sum or sums which may have been deducted from his Security Deposit.

13. The procurement of all materials required for the construction as well as the necessary permits, approvals and authorizations shall be arranged for by the Contractor.

14. Our clients are not concerned with any rise or fall in the prices of any materials. The rate quoted shall include all costs, allowances, taxes or any other charges including any enhanced labour rates, etc. which may be enacted from time to time by the State and/or the Central Government. Under no circumstances shall our clients be held responsible for compensation or loss to the Contractors due to any increase in the cost of labour or materials or Transportation etc.

15. The tender shall be valid for a minimum period of 3 months from the date of submission.

16. The price quoted by contractor will be inclusive of all transport and handling charges, road taxes, or levies of any kind from manufactures premises to indicated location on site and should also include cost of transit insurance . In event of damage during transit or handling , the contractor is entirely responsible for replacing damaged equipment or parts or even the entire equipment itself , including all necessary paper work required for claiming insurance etc.

17. Time is essence of the Contract. The work should be completed in **4 months** from the date of the acceptance issued to the Contractor to commence the work. The successful tendered will have to give a schedule of the various items of work to be done so that the work will get completed within the stipulated time.

18. If the Contractor fails to complete the works by the Scheduled date of completion or within any sanctioned extended time, he will have to pay penalty of 1000.00 per day as penalty..

19. EMD - The Tender shall be accompanied by a Demand Draft as EMD of as per IIT Norms i.e. as under,

1. Contractors who have paid one time EMD (1% of registration value) need not pay EMD at time of submission of tender.
2. Contractors who have not paid one time EMD should pay 2 % of contract value towards EMD,
3. If Contractor is registered under MSME, need not require to pay EMD. However, for successful bidder – 2% EMD will be required to pay on selection of Bid. Contractor shall submit MSME registration certificate along with Tender.
4. **2% of tender amount, as Earnest Money drawn in favour of " Registrar - IIT BOMBAY ", payable at Mumbai, should be sent to :**

At:-
Design Cell,
IIT Bombay,
Powai, Mumbai

On or before
Date:-
Time :-

It is understood that Earnest Money will not bear any interest and shall be returned to all unsuccessful bidders as per IIT Norms.

The Earnest Money will stand forfeited in the event the contractor whose tender is accepted fails to execute the contract when called upon to do so.

20. **Inspection of site and sufficiency of Tender**

(a) The tenderer shall inspect and examine the site and its surroundings and shall satisfy himself before submitting his tender as to the nature of the ground, and subsoil (so far as is practicable), the form and nature of the site, the quantities and nature of the work and materials necessary for the completion of the works and means of access to the site, the accommodation he may require and in general, shall himself obtain all necessary information as to the risk, contingencies and other circumstances which may influence or affect his tender.

(b) The tenderer shall be deemed to have satisfied himself before tendering, as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the schedule of work/items/quantities or in Bill of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the contract and all matters and things necessary for proper completion and maintenance of the works.

(c) No extra charges consequent on any misunderstanding or otherwise shall be allowed.

20. Our Clients do not bind themselves to accept the lowest or any tender and reserve to themselves the right to accept or reject any or all tenders, either in whole or in part, without assigning any reasons for doing so.

21. The tenderer, if awarded the above work will be bound contractually to follow all rules and regulation with respect to Fire, Safety of personels and equipment and any other safety guidelines as prescribed under Safety codes of IIT,Bombay.

22. Our Client will refer to the consultant during the tenure of contract/or at all time, all such matters regarding technical design , commercial /fiscal aspects , sample approval ,quality of material supplied and workmanship, any claims made by contractor etc. on which they feel the consultants decision or interpretation is required. And the consultant's decision on above matters will be Final and Binding on the contractor.

For Design Cell,IIT Bombay

LETTER OF OFFER.

To: Design Cell,
IIT Bombay,Powai
Mumbai.

Dear Sirs,

Having examined the preliminary drawings and specification in this tender document prepared by M/s _____for your project,

I/ We, Hereby offer to execute the various works on the basis of the drawings, design and specifications submitted by me/ us for a specified sum of Rs._____(in words : Rupees_____only).

In the event of this tender being accepted I/we agree to enter into and execute the necessary contract required by you and agree to complete the said work within _____ from date of issue of letter of intent from yourself..

We agree not to employ Sub- contractors other than those that may be approved by your consultant.

We agree to pay all statutory Govt. taxes & duties. i.e. GST ,ESIC,EPFO and any other tax ,as prevailing from time to time , on such items for which the same are leviable and the rates quoted by me /us are inclusive of the same.

Yours faithfully

Date :

Signature

Name :

Designation :

Address :

I N D E X

APPENDIX - I

GENERAL CONDITIONS OF CONTRACT

1. The contract document consists of the General Conditions of the Contract, Specifications and Bills of Quantities including all modifications thereof incorporated in the document before the execution, and the Contract Drawings prepared by the Consulting Engineer. These form the contract.

The Employer: Design Cell, IIT B, Powai, Mumbai

The Contractor:

The Consulting Engineer:

The Engineer / The Engineer-in-Charge (E.I.C.) / Site Engineer / PMC: project engineer or any engineer appointed from time to time by the Employer or the Consulting Engineer, are those mentioned as such in the Agreement and shall include their legal representatives, assigns or successors. They are treated throughout the Contract Document as if each were of the singular number and masculine gender.

2. The Contract Document is complementary. What is called for in one shall be as binding as if called for by all. The Contract Document shall remain in the custody of the Consulting Engineer so as to be available at all reasonable times for the inspection of the Employer or of the Contractor. Immediately, after the execution of the contract, one copy of the Contract Document and two copies of the Contract Drawings shall without charge be supplied by the Consulting Engineer to the Contractor and one copy of the Contract Document to the Employer.

2.1 As soon as possible after the award of the contract two copies of the Specifications, descriptive schedule or other like document necessary for use in carrying out the work shall without charge be supplied by the Consulting Engineer to the Contractor.

2.2 After award of the Contract, the Contractor shall without charge be supplied with all such further drawings and details as may be prepared by the Consulting Engineer, from time to time as the work proceeds as are reasonably necessary either to explain or amplify the Contract Drawings or to enable the Contractor to carry out and complete the work in accordance with these Conditions. All such drawings shall be a reasonable development of the work described in the Contract Document.

2.3 None of the documents here-in-before mentioned shall be used by the Contractor for any other purpose other than this contract and neither the Employer or the Consulting Engineer shall divulge or use except for the purpose of this contract any of the prices in the contract bills.

2.4 Upon final payment under these conditions the Contractor shall if so requested by the Employer return to him all Drawings, Details, Specifications, Descriptive Schedule and any other Document of like nature which bears his name.

3. "The Site" shall mean the site of the contract work including any building and erections thereon and any other land allotted by the Employer for Contractor's use. The term "Works" shall mean the works to be executed in accordance with the Contract or part(s) thereof as the case may be, and shall include all extra or additional, altered or substituted works as required for the performance of the Contract.

4. The term "Sub Contractor", as employed herein, includes those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design

according to the plans or specifications of this work but does not include one who merely furnishes material not so worked. Any one doing work on a piece rate basis shall be deemed as a Sub Contractor.

5. The date of virtual completion of a project or a specified area of a project is the date when construction is sufficiently completed, in accordance with the Contract Documents as modified by any change or variation orders agreed to by the parties, so that the Employer can occupy the project for the use it was intended.

6. The Contract shall be an item rate contract. The Contractor shall be paid for the actual quantity of work done, as measured at site, at the rates quoted by him in the Contract Bills.

7. The schedule of quantities given in the Bill of Quantities is provisional and is meant to indicate the intent of the work and to provide a uniform basis for tendering. The Employer reserves the right to increase or decrease any of the quantities or to totally omit any item of work, and the Contractor shall not claim any extras or damages on these grounds. Any error in description or in quantity or omission of items from the Bill of Quantities shall not vitiate this Contract but shall be treated as a variation.

8. In general, the Drawings shall indicate dimensions, position and type of construction; the Specifications shall indicate the qualities and the methods; and the Bill of Quantities shall indicate the quantum and the rate of each item of work. Any work indicated on the Drawings and not mentioned in the Specifications and vice versa shall be furnished as though fully set in both. The Contractor's work shall not deviate from the Drawings and the Specifications. The Engineer's interpretation of these documents shall be final and without appeal. Errors or inconsistencies discovered in the Drawings and the Specifications shall be promptly brought to the notice of the Engineer for interpretation or correction.

9. The general character and the scope of the work is illustrated and defined by the Specifications and the Bills of Quantities herewith attached and the by the Drawings. If the Contractor shall find any discrepancy in or divergence between the Contract Drawings and or the Contract Bills he shall immediately give to the Engineer a written notice specifying the discrepancy or divergence and the Engineer shall issue instructions in regard thereto. The Contractor shall construct, complete and maintain during the Defects Liability Period all the works and shall provide everything necessary including labour, material, constructional plant, etc. whether of a permanent or temporary nature for proper completion of the work.

10. The Contractor shall provide everything necessary for proper execution /completion of the work according to true intent and meaning of the Contract Document, whether the same may or may not be shown or described therein, provided the same is required for proper completion of the work.

12. All the work, either whole or in part shall be executed in the most substantial and workmanship manner and in strict accordance with drawings, specifications, and written instructions the Engineer may from time to time issue, whose decision as to the quality and sufficiency of the work shall be final and binding on the Contractor.

13. All materials and workmanship shall be of the best quality / type in the trade and as per specifications and written instructions of the Engineer. Wherever such instructions or specifications are not available they shall conform to the latest editions of the respective I.S. codes.

14. Any material or work or part of the work which in the opinion of the Engineer is not as per specifications or substandard, shall be removed from the site or substituted within time specified by the Engineer. In case of default on part of the Contractor, the Engineer shall be empowered to employ other agency to carry out the same at the expense and risk of the Contractor. Such costs incurred will be recovered from the running bills of the Contractor.

15. Any material or work found substandard or not conforming to the specifications, but still allowed to remain / be used in the work by the Engineer, due to urgency or some other reasons, shall be considered as substandard and a substandard rate for the particular item of work shall be fixed by the Engineer, and his decision in this respect shall be final and binding on the Contractor.

16. In case any item of the work is to be executed for proper completion of the job, and such item is not described in the bill of quantities, and as such rate for such work is not quoted, such item will be considered as an Extra Item and the rate for it will as far as possible be derived from rates for similar or equivalent items in the tender, and in case this is not possible the rate shall be fixed by mutual agreement as follows: (i) cost of materials (including Transport, Loading, Unloading) + (ii) cost of labour + (iv) 15% Over Head & Profit of total of (i), (ii) and (iii) + Taxes.

17. The Contractor shall be responsible for the true and proper setting out of works in relation to the original points, lines and levels of reference given by the Engineer and for the correctness of position, levels, dimensions and alignment of all parts of the work. The checking of any setting out of any line or level by the Engineer or his representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof. In case at any time during progress of the work any error shall appear or arise in the position, levels, dimensions or alignment, the same shall be rectified by the Contractor at his own expense and to the full satisfaction of the Engineer.

18. Upon completion of the work the Contractor shall remove from the site all constructional plant, temporary works, any unused material provided by him and also all rubbish in a workmanlike manner and leave the whole site clean to the satisfaction of the Engineer, within time specified by the Engineer. Failure by the Contractor to do so within time will entitle the Engineer to dispose it in the manner he deems fit and at the expense of the Contractor.

19. The Contractor shall not sublet whole or any part of the work without the written consent of the Employer and such consent shall not relieve the Contractor from any liability or obligation under the contract and he shall be responsible to the Employer for the acts, defaults and neglects of the subcontractor or his agents, servants or workmen as if they were acts, defaults or neglects of the Contractor or his agents, workmen.

20. The Contractor shall at all times during the continuance of the contract shall fully comply with all laws, regulations enacted or prescribed by the State or Central Government or other local authorities, such as the Minimum Wages Act, Factories Act, Workmen's Compensation Act and other appropriate laws. The payment of any wages to be made by the Contractor to his employees engaged in the execution of the Contract shall be made in the presence of the representative of the Employer.

The Contractor shall be registered with the P.F., and shall provide the Employer with his PF registration number at the time of award of the letter of intent / work order / Contract. He shall pay P.F. and E.S.I. dues of his own employees at the Site and also of the employees of his sub-contractors at the Site. He shall give copies of the challans to the Employer on a monthly basis.

The Contractor shall bear all liability on account of non-fulfillment of Contract Labour (Regulation and Abolition) Act 1970 and Contract Labour (Regulation and Abolition) Central Rules 1971. The submission of Form V to the Contractor, however, does not absolve the Contractor of his liabilities and responsibility regarding Contract Labour Regulation and Abolition Acts.

21. The Contractor shall add to the amount of his tender the amount of GST, Octroi if applicable or any other tax legally payable and it shall be assumed that his rates cover for all taxes and no claim on this account will be entertained. Transit insurance for all materials shall be responsibility of the contractor.

22. The Contractor shall obtain CAR insurance policy and shall indemnify the Employer.

a) Any expenses arising from any injury or damage to persons or property, at the site belonging either to the Contractor or the Employer,
b) Any claim under any Act of Government or otherwise in respect of injury or damage as aforesaid,
c) Any award of compensation or damages upon any claim as above,
d) Any claim against the Employer by any member of public or other third party in respect of anything which may arise in relation to the works or in consequence thereof.
e) The Contractor shall be liable for all injury to persons or things and for all structural and decorative damages to property which may arise out of or in course of or caused by the carrying out of the works, or due to negligence on part of the Contractor or any of his subcontractors, agents, employees.
f) In the event of the Employer being required to pay under law, any levies or dues on behalf of the Contractor, the same shall be recovered from the Contractor's bills or security deposit.

23. The Employer shall provide the Contractor with water at one point at the site. All arrangements for storing and transporting the same to other points at the site shall be done by the Contractor at his own risk and expense. The Employer shall also provide the Contractor with electricity power at one point at the site. All wiring and other arrangements to conduct electricity to other areas of the site shall be carried out by the Contractor at his own expense and risk. The Contractor shall be fully responsible for providing security at the site. (**The Employer will deduct 1% from final bill amount as Water & Electricity charges from each/final Bill).**

24. Certificates:

24.1 Virtual Completion Certificate - As soon as the Works are completed in all respects, the Contractor shall give notice in writing of such completion to the Engineer and the Consulting Engineer, in order to enable the latter to furnish the Contractor with a Certificate of Virtual Completion (within 15 days of receipt of such notice) indicating

a) The date of completion
b) The defects to be rectified and / or

24.2 When separate periods of completion have been specified for items or groups of items, the Consulting Engineer shall issue separate Virtual Completion Certificates for such items or groups of items. **The Defects Liability Period shall be 12 months** & commence from the date of Virtual Completion Certificate.

24.3 Final Certificate - The Contract shall not be considered as completed until Final Certificate shall have been signed by the Consulting Engineer stating that the Works have been completed and maintained to his satisfaction. The Final Certificate shall be given by the Consulting Engineer 28 days after the expiration of the Defects Liability Period.

24.4 No certificate other than the Final Certificate shall be deemed to constitute approval of any work or other matter in respect of which it is issued or shall be taken as an admission of the due performance of the Contract or any part thereof or of the accuracy of any claim or demand made by the Contractor or of additional or varied work having been ordered by the Engineer nor shall any other certificate conclude or prejudice any of the powers of the Engineer.

25. Time will be treated as the essence of this contract. The work shall commence in all respects within one week from the award of the Letter of Intent / Work Order and under all circumstances **completed within 8 weeks,** from the award of the Letter of Intent / Work Order / Contract or within such extended time by the Consulting Engineer.

In case of failure to complete the work in time, the penalty of Rs.1000.00 per day shall be levied to Contractor. However, if the Contractor completes the work in all respects ahead of schedule, he shall not receive any bonus from the Employer.

26. The Contractor before starting of the work shall submit to the Engineer his bar chart of the work giving details of how and in what stages he is going to complete the work, and this bar chart shall be binding on the Contractor. He shall also submit to the Engineer progress report every week showing work to be completed as per program and work actually executed. He shall also submit a cash flow statement based on the above bar chart.

27. Payment Terms:

For Contract upto 3,00,000.00
Only one full & final Bill will be prepared.

For Contract between 3,00,000.00 to 5,00,000.00
Only one bill of 3,00,000.00 & one final Bill will be prepared.

For Contract above 5,00,000.00 & above.
Each bill of value above 3,00,000.00 & one final Bill will be prepared.

The Contractor shall submit this bill to the Consulting Engineer with measurement sheet who after scrutinizing the same shall certify it for payment. Payment for the certified interim bill shall be made to the Contractor by the Employer within fifteen days of certification of the bill by the Consulting Engineer. Final bill shall be settled within a period of thirty days from its certification by the Consulting Engineer. TDS as applicable as per Income Tax Act & WCT shall be deducted from all bills. Any tax as per central & state government can be deducted.

All payments to the Contractor shall be made at Mumbai by cheque.

28. Termination of Contract by Employer:

If the Contractor being an individual or a firm commits any 'Act of Solvency' or shall be declared an insolvent or being an Incorporated Company shall have an order for compulsory winding up made against it or pass an effective resolution for winding up voluntarily or subject to the supervision of the Court or of the official assignee of the Liquidator, then in such acts or insolvency or winding up shall be unable, within seven days after notice to him to do so, to show to the reasonable satisfaction of the Engineer that he is able to carry out and fulfill the Contract and to give security thereof if so required by the Engineer.

Or if the Contractor (whether an individual or firm or Incorporated Company) shall suffer execution to be issued

Or shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractor

Or shall assign or sublet this Contract without the written consent of the Engineer

Or shall charge or encumber this Contract or any payments due or which may be due to the Contractor thereunder.

Or if the Engineer shall certify in writing to the Employer that the Contractor

i. has abandoned the Contract or
ii. has failed to commence the Works or has without any lawful excuse under these conditions suspended the progress of the Works for 14 days after receiving from the Engineer written notice to proceed
iii. has failed to proceed with the Works with such due diligence and failed to make such due progress as would enable the Works to be completed within the time agreed upon or

iv. has failed to remove materials from the Site or to pull down and replace work within seven days after receiving Engineer's written notice that the said works or materials were condemned and rejected by the Engineer under these conditions or

v. has neglected persistently or fragrantly to observe and perform all or any of the acts, matters or things by this Contract to be observed and to be performed by the Contractor, within seven days of receiving Engineer's written notice requiring the Contractor to observe or perform the same, or

vi. has sublet any part of the Contract to the detriment of good workmanship or in defiance of the Engineer's instructions to the contrary.

Then and in any of the said cases, the Employer with the written consent of the Consulting Engineer may, notwithstanding any previous waiver, after giving seven days' notice in writing to the Contractor, determine the Contract but without hereby affecting the powers of the Consulting Engineer, to continue in force in full as if the Contract had not been so determined and as if the Works subsequently executed had been executed by or on behalf of the Contractor.

And further, the Employer under approval of the Consulting Engineer by his agents or servants may enter upon and take possession of the Works and all constructional plant and temporary works and materials lying upon on the Site or the adjoining lands or roads, and the use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the Works or by employing any other Contractor or persons to complete the Works, and the Contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other contractor or other person or persons employed for completing and finalizing or using the constructional plant, temporary works or materials for the Works. When the Works are completed or soon thereafter as convenient, the Engineer shall give a written notice to the Contractor to remove his surplus materials, and should the Contractor fail to do so within a period of 14 days of receiving the notice, the Employer shall sell the same by public auction and shall give credit to the Contractor for the amount realized. The Consulting Engineer shall then ascertain and certify in writing what (if anything) shall be due or payable to or by the Employer for the value of the said constructional plant, temporary works, materials so taken possession of by the Employer, and the expense or loss which the Employer shall have been put to in procuring the Works to be completed, and the amount if any owing to the Contractor, and the amount so certified shall thereupon be paid by the Employer to the Contractor or by the Contractor to the Employer as the case may be, and the certificate of the Consulting Engineer shall be final and conclusive between the parties.

29. Termination of Contract by Contractor:

If payment of the amount payable by the Employer under certificate of the Consulting Engineer with interest as provided for in this Contract shall be in arrears and unpaid for thirty days after written notice from the Contractor to the Employer asking the latter to pay the amount with interest as aforesaid, or the Employer interferes with or obstructs the issue of any such certificate or the Employer commits any 'Act of Solvency' or if the Employer (being an Incorporated Company) shall have an order made against him or pass an effective resolution for winding up either compulsorily or subject to he supervision of the Court or voluntarily or of the official Liquidator or the Employer shall repudiate the Contract, in any such winding up shall be unable within fifteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Contractor that he is able to carry out and fulfill the Contract and to make payments due and to become due there under, and if required by the Contractor to give security for the same, or if the Works be stopped for three months under the order of the Engineer or by an injunction or other order of any Court of Law.

Then and in any of the said cases, the Contractor shall be at liberty to determine the Contract by notice in writing to the Employer through the Consulting Engineer, and he shall be entitled to recover from the Employer payment for all Works executed and for any loss he may sustain upon any constructional plant, temporary works, materials supplied or purchased or prepared

for the purpose of the Contract. In arriving at the amount of such payment, the rates contained in the bill of quantities of the Contract shall be followed.

30. Idling Charges:

30.1 In case of bad weather like rains, flooding, cyclone, strong winds, etc., if the approach to the site is un-motorable and / or if work has to be temporarily stopped, the Contractor shall not levy any idling charges on the Employer. In case of force majeure, no idling charges shall be paid to the Contractor. The Contractor, however, shall be granted suitable extension of time for completion of work, by the Engineer whose decision in this matter shall be final and binding. It is mandatory that the Contractor has, at any point of time, minimum 15 days requirements of construction materials, food, supplies, water, etc., stored at the site.

30.2 In case of evacuation from the site due to bad weather, natural calamities or reasons beyond the control of the Employer and not attributable to him, expenses incurred in shifting labour, machinery, equipment, etc. out from and in to the site, as well loss to manpower, material, machinery, etc. shall be borne by the Contractor. Suitable extension of time for completion of contract work, however, shall be granted by the Engineer whose decision in this matter shall be final and binding.

33. Arbitration:

33.1 All disputes and differences of any kind whatever arising out of or in connection with the Contract or the carrying out of the Works (whether during the progress of the Works or after their completion and whether before or after the termination, abandonment or breach of the Contract) shall be referred to and settled by the Consulting Engineer who shall state his decision in writing. Such decision may be in the form of a Final Certificate or otherwise. The decision of the Consulting Engineer with respect to any of the matters such as quality of materials, workmanship, delay and extension of time shall be final and without appeal.

APPENDIX - II
SPECIAL CONDITIONS

1. **GENERAL**

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

2. **SCOPE OF WORK**

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

a. L.T. Distribution Panels, Prefabricated MCB DBs.

b. L.T. Cables on Cable Trays/Walls/Trenches with cable terminations and all fixing accessories.

c. Earthing (Grounding) System.

d. All conduit work including junction boxes, outlet boxes and wiring for lighting and power points, telephone , data networking.

e. Switches, plug sockets, cover plates and other wiring accessories.

f. Mains and Sub-Mains wiring in PVC conduits.

g. Lighting fixtures and fans.

3. **ASSOCIATED CIVIL WORKS**

Following Civil works associated with Electrical installation are included in the scope of this contract

1. all minor civil work like wall/floor chasing by wall chaser, making holes & making good with Cement mortar & putty etc. for installation of conduits/cables/Earthing Strip.

2. Levelling of Light Fitting with false ceiling.

3. Making of Cutout in partition etc. shall be executed by other agencies in accordance with approved shop drawings of, and under direct supervision of the electrical contractor.

4. PERFORMANCE GUARANTEE

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

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

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

5. BYE-LAWS AND REGULATIONS

The work shall be carried out to the satisfaction of the Owner's site representative/consultant and in accordance with the Specifications, Regulations of the Electric Supply Authority, Indian Electricity Rules and Regulations, latest Indian Standards and as per the fire departments requirement.

6. FEES AND PERMITS

The Contractor shall pay any and all fees and obtain permits required for the installation of this work. On completion of the work, the contractor shall obtain and deliver to the Owner certificate of final inspection and approval by the local electricity authority.

7. DRAWINGS

The Electrical Drawings which may be issued with tenders, are diagrammatic only and indicate arrangement of various systems and the extent of work covered in the contract. These Drawings indicate the points of supply and of termination of services and broadly suggest the routes to be followed. Under no circumstances shall dimensions be scaled from these Drawings. The architectural/interiors drawings and details shall be examined for exact location of equipment, electrical points & fixtures.

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

Maximum headroom and space conditions shall be maintained at all points. Where headroom appears inadequate, the contractor shall notify the Architect/Consultant/Owner's site representative before proceeding with the installation. In case installation is carried out without notifying, the work shall be rejected and contractor shall rectify the same at his own cost.

The contractor shall examine all architectural, structural, plumbing, HVAC and other services drawings and check the as-built works before starting the work, report to the Owner's site representative any discrepancies and obtain clarification. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Architect/Consultant/Owner's site representative without additional cost to the Owner.

Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow Architect/Consultant ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved program.

Manufacturer's drawings, catalogues, pamphlets and other documents submitted for approval shall be in three sets. Each item in each set shall be properly labeled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.

8. **SPECIFICATIONS**

The Specifications shall be considered as part of this contract. The Drawings indicate the extent and general arrangement of power distribution, location of lighting the fixtures, controlling switches, wiring system, cabling and earthing. These drawings are essentially diagrammatic. The Drawings indicate the point of termination of conduit runs and broadly suggest the routes to be followed. The work shall be installed as indicated on the Drawings. However, any change found essential to coordinate the installation of this work with other trades shall be made without any additional cost to the Owner. The data given herein and on the Drawings is as exact as could be secured, but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels shall be governed by the site conditions and the Architectural & Interior layouts.

9. ACCESSIBILITY

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

10. MATERIALS AND EQUIPMENT

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

The Contractor shall be responsible for the safe custody of all materials and shall insure them against theft or damage in handling or storage etc. A list of items of materials and equipment, together with a sample of each shall be submitted to the Owner's site representative within 7 days of the award of the contract. Any item which is proposed as a substitute, the contractor shall state the credit, if any, due to the Owner. In the event the substitution is approved, all changes and substitutions shall be requested in writing and approvals obtained in writing from the Owner's site representative.

11. **MANUFACTURERS INSTRUCTIONS**

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

12. **COMPLETION CERTIFICATE**

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

13. **INSPECTION AND TESTING**

The Owner may carry out inspection and testing at manufacturer's works for this contract. No equipment shall be delivered without prior written confirmation from Engineer. In case factory inspection is carried out then all expenses relating to test including traveling and lodging of two personal from Owner / Consultant shall be borne by contractor. Tests on site of completed works shall demonstrate the following among other things.

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

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

That all circuits are correctly protected and that protective devices are properly co-ordinated.

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

The contractor shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the Owner and shall provide test certificate signed by a property authorised person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the Owner at contractor's expenses unless otherwise called for.

If it is proved that the installation or part thereof is not satisfactorily carried out then the contractor shall be liable for the rectification and resetting of the same as called for by the Owner decision as to what constitutes a satisfactory test shall be final.

The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere. All tests shall be carried out by a test house approved by the Owner.

14. **COMPLETION DRAWINGS**

Contractor shall periodically submit completion drawings as and when work in all respects is completed in a particular area. These drawings shall be submitted in the form of two sets of floppies / CD's and four portfolios (300 x 450 mm) each containing complete set of drawings on approved scale indicating the work as - installed. These drawings shall clearly indicate complete ducting layouts, wiring and other services. Each portfolio shall also contain consolidated control diagrams and technical literature on all controls.

15. **OPERATING INSTRUCTION & MAINTENANCE MANUAL**

Upon completion and commissioning of part Electrical system **t**he contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract. This shall be supplementary to manufacturer's operating and maintenance manuals. Upon approval of the draft, the contractor shall submit four (4) complete bound sets of typewritten operating instructions and maintenance manuals; one each for retention by Consultant and Owner's site representative and two for Owners Operating Personnel. These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 4 year period of maintenance of each equipment.

16 **MAINTENANCE DURING DEFECTS LIABILITY PERIOD**

16.1 Complaints

The Contractor shall receive calls for any and all problems experienced in the operation of the system under this contract, attend to these within 24 hours of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist.

16.2 Repairs

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

17 TEMPORARY POWER AND WATER

One distribution point for temporary water at the tube well or the Municipal supply tap-off location and one point for electricity shall be provided by the Owner at ground level. **However, cost of Electricity & Water will be recovered by IITB from contractor's Bill as under,**

Flat Rate of 1% of Final Bill Amount shall be deducted as Electricity Charges OR as per actual consumption, if contractor arrange approved energy meter, will be deducted from the contractor's bill towards electrical charges.Contractor shall be given electricity at one convenient point. Further distribution shall be done by contractor at his own cost.

Water Charges:- water shall be supplied to contractor free of charge if available on site.

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18 SAFETY

Contractor shall provide and maintain any and all temporary lighting access-ways and / or safety precautions (such as guard rails, temporary covernings for holes in floors etc) that are deemed necessary for the efficient and safe execution of the works ,the cost for same shall be borne by client after certification from the consultant . In the event of disagreement as to the type or extent of such temporary lighting access way and / or safety precautions the Owner decision shall be final and binding. Lack of any direction or instruction by the Owner shall not relieve / limit the Contractor's responsibilities and obligations under this clause. This clause shall enhance and compliment safety measures.

19 METHOD OF MEASUREMENT

The works shall be measured in accordance with relevant IS codes. Notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the contract.

20. DEMONSTRATION TO OWNER

At completion, devices subject to manual operation shall be operated sufficient times in presence of Owner's site representative to demonstrate satisfactory operation.

21. TOOLS AND TACKLES

The Contractor shall provide and install all necessary hoists, ladders, scaffolding, tools, tackles, all transport for labour and materials and plant necessary for the proper execution and completion of the work to the satisfaction of the Owner's site representative.

22. PARTIAL ORDERING

Owner through the Architect/Consultant/ Owner's site representative reserves the right to order equipment and material from any and all alternates, and /or to order high side and /or low side equipment and materials or parts thereof from one or more tenderers**.**

A P P E N D I X - III

GUARANTEE PROFORMA

GUARANTEE FOR ELECTRICAL INSTALLATION

We hereby guarantee the year round Electrical System which we have installed in the Complex described below :

Building :

Location :

Owner :

For a period of ONE YEAR from the date of acceptance of the total installation, we agree to repair or replace to the satisfaction of the Owner, any or all such work that may prove defective in workmanship, equipment or materials within that period, ordinary wear and tear and unusual abuse or neglect excluded, together with any other work, which may be damaged or displaced in so doing. In the event of our failure to comply with the above mentioned conditions within a reasonable time, after being notified in writing, we collectively and separately, do hereby authorize the Owner to proceed to have the defects repaired and made good at our expense, and we shall pay the cost and charges thereof, immediately upon demand.

We also hereby undertake to test the entire installation upon completion and ensure that all units are functioning satisfactorily.

SIGNATURE OF CONTRACTOR
for ELECTRICAL INSTALLATION

DATE SEAL

APPENDIX - IV

LIST OF APPROVED MAKES FOR EQUIPMENT & MATERIALS

1.	Moulded Case Circuit Breaker (MCCB)	Legrand/Hager/ABB/L&T
2.	MCB DB (IP-43)	Legrand/Hager/ABB
3.	Miniature Circuit Breaker (MCB) (C Curve)	Legrand/Hager/ABB
5.	Residual Current Circuit Breaker (RCCB)	Legrand/Hager/ABB
6	LT Cable -FRLS	Polycab/Finolex/RR
7.	Cable Glands	Braco/Jainson
8.	Cable Lug	Dowell's / Jainson / Braco
9	FRLS insulated copper conductor stranded/ flexible wires	Finolex/RRKabel/Havells/Polycab/KEI
10.	PVC Conduit (ISI approved) for Ceiling & Wall ZHFR	Precision/Modi (MMS-White Colour)
11.	Lighting Fixture	Wipro/Regent
12	Ceiling Fan-BLDC	Crompton / Havells / Atemberg
13	Exhaust Fan	Crompton / Havells / GEC
14	PVC Conduit (ISI approved) for Under Flooring ZHFR	Precision/Modi (HMS-White/Grey Colour)
15	Domestic Switch/Socket	Legrand –(Arteor) MK – (Wrapround – Plus) Crabtree (Verona) L&T
16	CAT- 6 Cable	AMP/D-Link
17	Telephone Cable/ Wire	D-Link
18	RJ-45 Socket	AMP/D-Link
19	Industrial Socket/Plug & Box	Legrand/Hager
20	Floor Junction Box	Saurabh/Local
21	Cable Tray	Ajay Industrial / Reputed

APPENDIX - V

LIST OF INDIAN STANDARDS (IS)

IS : 374 - 1979	Ceiling fans and regulators (3rd revision)
IS : 694 - 1990	PVC insulated Electric cable for working voltage upto and including 1100 volts.
IS : 732 - 1989	Code of practice for electrical wiring and installation
IS : 1554 - 1988 (Part - I)	PVC insulated (Heavy Duty) electric cables for working voltages upto and including 1100 volts.
IS : 1646 - 1982	Electrical installation fire safety of buildings (general) Code of practice.
IS : 1885 - 1971	Glossary of items for electrical cables and conductors
IS : 1913 – 1978	General and safety requirements for fluorescent lamps luminaries Tubular.
IS : 2551-1982	Danger Notice Plate.
IS : 3043 - 1987	Code of practice for earthing.
IS : 4615 - 1968	Switch socket outlets.
IS : 5133 - 1969 (Part -I)	Boxes for the enclosure of electrical accessories.
IS : 8130 - 1984	Conductors for insulated electric cables and flexible cords
IS : 8623 -1977 (Part -I)	Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200 V D C.
IS : 8828 - 1996	Miniature Circuit Breakers
IS : 12640 - 1988	Earth Leakage Circuit Breakers
IS : 13947-1989	Moulded Case Circuit Breakers
IS : 13947 - 1993	General requirement for switchgear and control gear for voltage not exceeding 1000 Volts.
IS : 10810 - 1988	Methods of test for cables.

APPENDIX - VI
ABBREVIATIONS

The following abbreviations have been used in the accompanying Specifications, drawings and Schedule of Quantities.

CU	stands for copper.
AL	stands for alluminium.
GI	stands for Galvanised Iron (Mild Steel)
V	stands for Volts
MV	stands for Medium Voltage (110 V ,230 V ,415 V, 600 V)
LV	stands for Low Voltage (32 V & Below)
LT	stands for Low Tension
PVC	stands for Polyvinyl Chloride
AMP	stands for Amperes
KWH	stands for Kilowatt Hours
KW	stands for Kilo Watts
BIS	stands for Bureau of Indian Standards
IS	stands for Indian Standards
IEE	stands for Institution of Electrical Engineers - London
NEC	stands for National Electrical Code
RCCB	stands for Earth Leakage Circuit Breaker
MCB	stands for Miniature Circuit Breaker
MCCB	stands for Moulded Case Circuit Breaker
SP	stands for Single Pole
DP	stands for Double Pole
TP	stands for Triple Pole
TPN	stands for Triple Pole and Neutral
4 Pole	stands for 3 phase and neutral of same capacity (size)
MLTP	stands for Main L.T. Panel
SDB	stands for Sub Distribution Board
NLDB	stands for Normal Lighting Distribution Board
ELDB	stands for Emergency Lighting Distribution Board
NPDB	stands for Normal Power Distribution Board
EPDB	stands for Emergency Power Distribution Board
UDB	stands for UPS Distribution Board

APPENDIX - VII
TECHNICAL SPECIFICATIONS

1. INTERNAL WIRING

1.1 SYSTEM OF WIRING

The system of wiring shall consist of FRLS insulated copper conductor wires in PVC conduits and shall be concealed or surface mounted as called for.

1.2 GENERAL

Prior to laying and fixing of conduits, the contractor shall carefully examine the working drawings prepared by him and approved by the Consultant indicating the layout, satisfy himself about the sufficiency of number and sizes of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found in the drawings shall be brought to the notice of the Engineer In charge. Any modifications suggested by the contractor shall be gotten approved before the actual laying of conduits is commenced.

In laying of conduits it is important that not more than two right angle bends are provided for each circuit as far as possible. Junction box if required can be provided conduit run for drawing of wires.

1.3 MATERIALS

1.3.1 CONDUITS

Conduits and Accessories shall conform to relevant Indian Standards. HMS LHSFT 2.3 mm thick up to 40mm Dia. & 3.8 mm thick above 40 mm conduit as specified in BOQ shall be used. Joints between conduits and accessories shall be proper, using special adhesive for PVC pipes.

Only approved make of conduits and accessories shall be used.

Conduits shall be delivered to the site of construction in original bundles and each length of conduit shall bear the label of the manufacturer.

Note:- Whatever material is brought at site shall be with proper challan with quantity mentioned on it.

Maximum permissible number of 1100 volt grade PVC/FRLS insulated wires that may be drawn into rigid PVC Conduits are given below:

Size of wires Nominal Cross section Area (Sq. mm.)	Maximum number of wires within conduit size(mm)				
	20	25	32	40	50
1.0	7	13	20	--	--
1.5	6	10	14	--	--
2.5	5	10	14	--	--
4	3	6	10	14	--
6	2	5	9	11	--
10	--	4	7	9	--
16	--	2	4	5	6
25	--	--	2	2	6
35	--	--	--	2	5

1.3.2 JOINTS

All jointing shall be subject to the approval of the Project Manager. The couplers and sockets shall be free from grease and oil, Connections between conduit and GI boxes shall be by means of PVC bush fixed outside and PVC bush from inside the box. The joints in conduits shall be smooth to avoid damage to insulation of conductors while pulling them through the conduits.

1.3.3 RECESSED OR EXPOSED CONDUITS

All conduits shall be recessed or exposed as per the direction of the consultant / owner's site engineer.

1.3.4 FLEXIBLE CONDUITS

Flexible conduits shall be made of heavy duty PVC. Both edges of the strip to have interlocking to avoid opening up.

1.4 **BENDS IN CONDUIT**

Where necessary, bends or diversions may be achieved by means of bends and / or circular PVC inspection boxes with adequate and suitable inlet and outlet socket joints. In case of recessed system each junction box shall be provided with a cover properly secured and flush with the finished wall surface. No bends shall have radius less than 7.5 cms or three times the outside diameter of the conduits.

1.5 **FIXING OF CONDUITS**

All conduits, shall be installed so as to avoid steam and hot and cold water pipes & hot Air. After the conduits, junction boxes, outlet boxes and switch boxes are installed in position, their outlets shall be properly plugged or covered so that water, mortar, insects or another foreign matter does not enter into the conduit system. Surface conduits shall be fixed by means of heavy gauge GI/PVC saddles secured at intervals not more than 800 mm, but on either side of couplers or bends or similar fitting, saddles shall be fixed at a distance of 300 mm from center of each fitting. For conduit fixing suitable PVC/Nylon fasteners / plug shall be used.

Recessed conduiting shall be done by making chase in the masonry by chase cutter only, the conduit shall be fixed in the chase by means of GI hooks not more than 600 mm apart. After fixing of conduit the chase shall be filled with cement mortar after fixing of chicken mesh and brought to the original finish level of the surface. The construction chemicals may be added to avoid cracks in the future.

1.6 **SWITCH OUTLETS AND JUNCTION BOXES**

All outlet boxes for switches, sockets and other receptacles shall be rust proof and shall be of 2 mm thick mild steel sheets with HOT dipped galvanizing , having smooth external and internal surfaces to true finish. All outlet boxes for receiving plug sockets and switches shall be fabricated to approved sizes suitable to the wiring accessories to be used. All boxes shall have adequate number of knock out holes of required diameter and earthing terminal screws. Outlet boxes shall be of a minimum depth of 65 mm.

1.7 **INSPECTION BOXES**

50 mm dia. inspection boxes of same material as that of conduit shall have smooth external and internal finish to facilitate removal and replacement of wires, where required.

1.8 **CONDUCTORS**

All FRLS insulated copper conductor wires shall conform in all respects to Standards as listed under sub-head Regulations and Standards and shall be IS approved and ISI marked.

1.9 **BUNCHING OF WIRES**

Wires carrying current shall be so bunched that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not run in the same conduit. All wires shall have ferrules for identification. Lighting, raw power & ups power circuits shall be in separate conduits.

1.10 **DRAWING CONDUCTORS**

The drawing and jointing of PVC insulated copper conductor wires shall be executed with due regard to the following precautions. While drawing wires through conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends. Wire reel stands to be used for pulling of wires to avoid kinks.

Insulation shall be removed by insulation stripper only. Strands of wires shall not be cut for connecting terminals. The terminals shall have sufficient cross sectional area to take all strands and connecting brass screws shall have flats ends. All looped joints shall be connected through terminal block/connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

All light points shall be terminated through connectors. Condutors having nominal cross sectional areas exceeding 4 sq.mm shall always be provided with cable sockets. At all bolted terminals brass flat washer of large area and approved steel spring washer shall be used. Brass nuts and bolts shall be used for all connections.

Only licensed wiremen (Before doing the work or before appointing him on site contractor has to submit his wiring license to Owner) and cable jointers shall be employed to do jointing work. All wires and cables shall bear the manufacturer's label and shall be brought to site in original packing. For all internal wiring. PVC insulated wires of 1100 volts grade shall be used. The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors. No wire shall be drawn into any conduit until all work of any nature that may cause injury to wire is completed. Care shall be taken while pulling the wires so that no damage occurs to wire, the conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction. The minimum size of PVC insulated copper conductor wires for all sub-circuit wiring for light points shall be minimum 1.5 sq.mm copper conductor wire Separate neutral shall be provided for each circuit.

1.11 **JOINTS**

Joints shall be made at main switches, distribution boards. Socket Outlets, lighting outlets and switches boxes only. No joints shall be made in conduits and in junction boxes. Conductors shall be continuous from outlet to inlet.

1.12 **MAINS AND SUB-MAINS**

Mains and sub-mains cable or wires where called for shall be of the rated capacity and approved make. Every main and sub main wires shall be drawn into an independent adequate size conduit. Earthing shall be in conformity with relevant IS codes and calculations shall be submitted for verification. An independent earth wire of the proper rating shall be provided for every single phase sub-main. For every 3 -phase sub-main, 2 Nos. earth wires of proper rating shall be provided along with the sub-main. Where mains and sub-mains cables are connected to switchgear, sufficient extra lengths of cable shall be provided to facilitate easy connections and maintenance.

1.13 **LOAD BALANCING**

Balancing of circuits in three phase installation shall be planned by the Consultants and shall be checked by the contractor before the commencement of wiring and shall be strictly adhered to.

1.14 **COLOUR CODE OF CONDUCTORS**

Colour code shall be maintained as indicated by the Consultant for the entire wiring installations. Red, yellow, blue shall be for three phases, black for neutral and green shall be for earthing.

1.15 **MEASUREMENT OF LIGHT / FAN/BELL POINTS & 6A SOCKET POINTS.**

The Point will be measured in Numbers. The Concept of Half Point will not be applicable.

2 SWITCHES, RECEPTACLES (MODULAR) AND LIGHTING FIXTURES

2.1. **SWITCHES**

All Switches shall be enclosed type flush mounted and modular in design suitable for 240 volts AC. All switches shall be fixed inside the switch boxes on adjustable flat M S strips/plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. Switch controlling the light point shall be connected to the phase wire of the circuit and not more than ten lights shall be connected on one circuit and load shall be restricted to **800 watts**. All wiring accessories shall be BIS approved. Perfect alignment shall be maintained while fixing of the back boxes.

2.2 **WALL SOCKET OUTLET**

All Wall socket outlets shall be enclosed type flush mounted and modular in design suitable for 240 volts AC, and shall be of the three pin. The switch controlling the socket outlet shall be on the phase wire of the circuit. An earth wire shall be provided along with the circuit wires and shall be connected to earthing screw inside the box. All sockets shall be shuttered type.

2.3 **LIGHT FITTINGS, FAN & EXHAUST FAN INSTALLATION**

The light fixtures and fittings shall be assembled and installed in position complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager /Consultants. Pendent fixtures specified with overall stem lengths are subject to change and shall be checked with conditions on the job and installed as directed. All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Project Manager/Consultants. Fixtures shall be suspended true to alignment, plumb level and capable of resisting all lateral and vertical forces and shall be fixed as required.

All suspended light fixtures, fans etc., shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction. Exhaust fans shall be fixed at location shown on drawings. They shall be wired to a plug socket outlet at a convenient location near the fan. All switch and outlet boxes, for fans and light fittings shall be bonded to earth. The recessed type fixtures shall not be supported into the false ceiling frame work (except if directed by the consultant in writing). This shall have independent support from the socket of ceiling using conduit down rods/steel chain with provision for adjusting the level of fitting. Wires shall be connected to all fixtures through connector blocks. Wires brought out from junction boxes shall be encased in flexible pipes for connecting to fixtures concealed in suspended ceiling.

3. LOW VOLTAGE CABLES (1.1 KV GRADE XLPE / PVC)

3.1 GENERAL

Cables shall be copper / aluminum conductor cross linked polyurethane (XLPE) or PVC insulated as per BOQ & shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant standard specifications and cable manufacturer's instructions. The LV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, Specifications, relevant standards and cable manufacturer's instruction.

3.2 MATERIAL

3.2.1 Specifications of PVC insulated aluminum cable shall be as follows:

a Conductor

Stranded compacted circular conductor shall be of electrical grade high conductivity aluminum conductor as per IS 8130 / 84

b. Insulation

The insulation shall be compounded PVC, application shall be by extrusion process insulation type C (85 deg. C) confirming to IS 5831-1984. The thickness of insulation will be as per the relevant codes.

c. Laying-up

Insulated conductors of multi core cables shall be with thermoplastic fillers in the interstices. The phase identification of cores shall be by colored strips.

d. Inner Sheath

Cores shall be surrounded by an extruded PVC sheath or PVC Tapped inner sheath.

The thickness of the inner – sheath shall be as per relevant codes.

e. Armouring

The armouring shall be provided over the inner sheath.

Single core cable shall have non-magnetic ferrous armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip armouing. Steel wires and strips for armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath

Single and multi-core cables are provided with an extruded PVC outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer-sheath shall confirm to Type ST1 of IS 5831. The colour of the outer sheath shall be black.

3.2.2 Specifications for XLPE aluminium / copper cable shall be as follows:

a Conductor
Stranded compacted circular conductor shall be of electrical grade high conductivity Aluminium up to 35 sq.mm and below 35 sq.mm shall be copper conductor per IS 8130/84

b. Insulation
The insulation shall be of natural unfilled chemically cross linked polyethylene conforming to IS 7098. The thickness of insulation shall be as per the relevant codes.

c. Laying-up
Insulated conductors of multi core cables shall be with plastic fibre in the interstices. The phase identification of cores shall be by colored strips.

d. Inner Sheath
The cores shall be surrounded by an extruded PVC sheath.

The thickness of the inner sheath shall be as indicated in the relevant codes.

e. Armouring
The armouring shall be provided over the inner sheath.

Single core cable shall have non-magnetic armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip. Steel wires and strips for armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath
Single and multi core cables are provided with an extruded PVC outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer-sheath shall confirm to Type ST2 of IS 5831. The colour of the outer sheath shall be black.

3.3 INSPECTION
All cables shall be inspected by the contractor upon receipt at site and checked for any damage during transit.

3.4 JOINTS IN CABLES
The Contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoidance of cable jointing. This apportioning shall be got approved by the Owner's Site Representative before the cables are cut to lengths. Where joints are unavoidable Raychem heat shrinkable type joints shall be made. The location of such joints shall be got approved from the Owner's Site Representative and shall be identified through a marker.

3.7 CABLE TERMINATIONS
Cable termination shall be done in cable terminal box using suitable crimping sockets and proper size of glands of heavy duty Siemens type with Earthing facility as indicated in BOQ.

3.9 LAYING OF CABLES
Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks. The relative position of the cables, laid on the cable tray shall be preserved and the cables shall not cross each other. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers. All cables shall be laid with minimum one diameter gap and shall be clamped at every meter to the cable

tray and shall be tagged for identification with aluminum tag and clamped properly. Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings.

3.9 CABLES INSIDE BUILDING

Cables inside buildings shall be laid on the cable trays or with saddle spacer or with Aluminium Strip. All cables passing through walls shall run through PVC Pipes of adequate diameter 50 mm apart maintaining the relative position over the entire length.

3.13 TESTING OF CABLES

Cables shall be tested at works for the following tests before being dispatched to site by the project team.

a) Insulation Resistance Test.

b) Continuity resistance test.

c) Sheathing continuity test.

d) Earth test.(in armoured cables)

e) Hi Pot Test.

Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Owner's Site Representative

a) Insulation Resistance Test(Sectional and overall)

b) Continuity resistance test.

c) Sheathing continuity test.

d) Earth test.

All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Owner's Site Representative.

4. DISTRIBUTION PANELS/BOARDS

Main Distribution Panels, Sub-Distribution Panels and Final Distribution Panels/Boards shall be suitable for operation on 3 Phase/single phase, 415/240 volts, 50 cycles, neutral grounded at transformer. All Distribution panels shall be and manufactured by a approved manufacturer. Before taking up for manufacturing the vendor should take prior approval of drawings and design of all panel from the electrical consultant.

Distribution panels shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-13947-1993.

4.1 CONSTRUCTION FEATURES

Distribution panels shall be 2 mm thick sheet steel cabinet for indoor installation, dead back, floor mounting/wall mounting type. The Distribution panels shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket,

padlocking arrangement and bolted back. All removable/ hinged doors and covers shall be grounded by flexible standard connectors. Distribution panel shall be suitable for the climatic conditions. Steel sheets used in the construction of Distribution panels shall be 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100 V AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. **Self threading screws** shall not be used in the construction of Distribution panels. A base channel of 75 mm x 40 mm x 5 mm thick shall be provided at the bottom for floor mounted panels. Minimum clearance of 275 mm shall be provided between the floor of Distribution panels and the lowest unit.

Distribution panels shall be of adequate size with a provision of spare switchgear as indicated on the Single Line Diagram. Switches shall be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Distribution panels in conformity with the location of cable/conduit connections. Removable sheet steel plates shall be provided at the top/bottom to make holes for additional cable entry at site if required.

Every cabinet shall be provided with Trifoliate or engraved metal name plates. All panels shall be provided with circuit diagram engraved on PVC sheet. All live accessible connections shall be shrouded and shall be finger touch proof and minimum clearance between phase and earth shall be 20 mm and phase to phase shall be 25 mm.

4.2 BUS BAR CONNECTIONS

Bus bar and interconnections shall be of high conductivity electrolytic grade aluminum as indicated in the bill of quantities complying with requirement of IS : 5082 – 1981 and of rectangular cross section suitable for carrying the rated full load current and short circuit current and shall be extendable on either side. Bus bars and interconnections shall be insulated with heat shrinkable sleeve of 1.1 KV grade and shall be colour coded. Bus bars shall be supported on glass fiber reinforced thermosetting plastic insulated supports at regular intervals to withstand the force arising from in case of short circuit in the system. All bus bars shall be provided in a separate chamber and all connections shall be done by bolting. Additional cross sectional area to be added to the bus bar to compensate for the holes. All connections between bus bars and breakers shall be through solid aluminum strips of proper size to carry full rated current and insulated with insulating sleeves.

4.3 CABLE COMPARTMENTS

Cable compartment of adequate size shall be provided in the Distribution panels for easy clamping of all incoming and outgoing cables entering from the top/bottom. Adequate supports shall be provided in cable compartment to support cables.

4.5 MOULDED CASE CIRCUIT BREAKER (MCCB)

MCCB’s shall have a rated operational voltage of 600V AC (50/60Hz). The rated insulation voltage shall be 600V and 660V at 50/60 Hz. for low breaking capacity and high breaking capacity MCCBs respectively. The breaker shall be maintenance free and fully tropicalized. It shall either be 3 poles or 4 poles (switched neutral)..MCCB shall be Extra Current Limiting and comprise of Quick Make - break switching mechanism, preferably Double Break Contact system, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses. All MCCB’s shall be capable of defined

Variable overload adjustment from 80 to 100% of In and Short circuit setting should be fixed at 10In +/- 20% as specified in IEC 947 ans IS 13947 part2.

Thermal overload release adjustment should be done from a single point. MCCB cover need not to be opened for doing such adjustment All MCCB shall have adjustable thermal magnetic releases and magnetic short circuit pickup. Wherever MCCB with earth fault protection mentioned in schedule of quantity or detailed specification of switchboards, the protection shall be an integral part of the release with adjustable magnetic short circuit and earth fault protection with time delay.

The MCCB's shall be provided with rotary handle operating mechanism if asked for in schedule of quantity or detailed specification of switchboards. The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to Disconnection as per the IS/IEC indicating the true position of all the contacts. In case of 4 pole MCCB the neutral shall be defined and capable of offering protection. **All mccbs should be provided with locking arrangement in OFF position**.

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. All MCCB above 63 A shall be provided with extended spreader links on both side in order to make possible termination of Aluminum cable of required size for the defined current carrying capacity .

4.6 MINIATURE CIRCUIT BREAKER (MCB)

Miniature Circuit Breaker shall comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be C curve as per their Tripping Characteristic curves defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar independent to the external operating handle.

4.7 EARTH LEAKAGE CIRCUIT BREAKER / RESIDUAL CURRENT CIRCUIT BREAKER CURRENT OPERATED TYPE (ELCB / RCCB)

I. <u>System of Operation</u>

ELCB / RCCB shall work on the principle of core balance transformer. The incoming shall pass through the 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 predetermined critical value. ELCB/RCCB shall be current operated independent of the line voltage; current sensitivity shall be of 30 mA at 240/415 volts AC and shall have a minimum of 20,000 electrical operations.

II. <u>Mechanical Operation</u>

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

III. 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 breaks last after allowing the phases to open first. This is an important safety feature which is also required by regulations.

IV. Testing Provision

A test device shall be incorporated to check the integrity of the earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test knob shall trip the ELCB / RCCB and the operating handle shall move to the "OFF" position. **All RCCBs/RCBO's should be provided with locking arrangement in OFF position**.`

4.8 **EARTHING**

Earthing shall be provided as per IS:3043-2017.

4.9 **PAINTING**

All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivating (seven tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/outside shall be as per BOQ confirming to IS Code No.5.

4.10 **LABELS**

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

4.11 **METERS**

i. All voltmeters and indicating lamps shall be through MCB's.
ii. Meters and indicating instruments shall flush type.
iii. All CT's connection for meters shall be through Test Terminal Block (TTB).
iv. CT ratio and burdens shall be as specified on the Single line diagram.

4.12 **CURRENT TRANSFORMERS**

Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondaries for operation of associated metering.

The CTs shall confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 and measurement CTs shall be of accuracy class I.

4.13 **POTENTIAL FREE CONTACTS**

Potential free contacts shall be provided for connection to Building Automation System in panels indicated in Schedule of Quantities.

4.14 **INDICATING PANEL**

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/MPCB as per relevant fault level and toggle switch.

4.15 **TESTING**

Testing of panels shall be as per following codes:

I. IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.
II. IS: 13947 : 1993 Degree of protection

III. IS: 5578 & 11353:1985 Arrangement of bus bars.

4.16 **WIRING**

In wiring a distribution panel it shall be insured that total load of various distribution panel and/or consuming devices is divided evenly between the phases and number of ways as per Consultants drawing.

4.18 **DB DRESSING**

On Installation of the distribution board, and before Painting of walls is started the distribution board should be completely cleaned of all dust/dirt etc. MCB's ,RCCB's Connectors etc. must be fixed as per consultants requirement from Single line diagram and BOQ. All the wires of three phases must be completely separated from each other (including neutrals). Neatly bunched with the help of PVC Belt & Buttons Or PVC Cable Ties.
The cable ends must then be crimped to copper lugs and then connected to the MCB / RCCB.

6. EARTHING

6.1 **EARTHING**

The system shall be TNS with four wire supply system (R,Y,B,N and 2 Nos. E) brought from the main L T Panel. All the non-current carrying metal parts of electrical installation and all metal conduits trunking, cable sheaths, switchgear, distribution panels, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system.

All metal work such as pipe lines, ducts, cable trays, stair case railing etc shall be bonded to earth.All earthing shall be in conformity with IS:3043 1987, and the basic system of earthing shall be TNS.

6.2 **EARTHING CONDUCTORS**

Earthing conductors shall be of copper / GI as mentioned in BOQ and shall be protected against mechanical injury and corrosion.

6.4 **CONNECTION OF EARTHING CONDUCTORS**

Main earthing conductors shall be taken from the earth connections at the main L T panel to an earth electrode with which the connection is to be made. All joints in tapes shall be with four rivets and shall be brazed in case of copper and by welding bolting in case of GI, wires shall be connected with crimping lugs, all bolts shall have spring washers. Sub- mains earthing conductors shall run from the main distribution panel to the sub distribution panel. Final distribution panel earthing conductors shall run from sub-distribution panel.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution panel. Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to distribution panel at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord. Switches, accessories, lighting fitting etc. which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

6.5 **PROHIBITED CONNECTIONS**

Neutral conductor, sprinkler pipes, or pipes conveying gas, water or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lightning protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system. The electrical resistance measured between earth connection at the main L T panel and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate or circuit breakers, and shall not exceed **5 ohm**.

All switches carrying medium voltage shall be connected with earth by two separate and distinct connections.

6.6. **EARTHING**

The following must always be ensured in earthing system.

- All earths must be interconnected for same application. This includes generator power, Normal Power, UPS earths etc.

6.7 The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.

6.8 **RESISTANCE TO EARTH**

Under any circumstances the combined effective resistance of earthing system shall not exceed 5 ohm.

6.9 **SPECIFICATION FOR HOT DIP GALVANIZING PROCESS FOR MILD STEEL USED FOR EARTHING FOR ELECTRICAL INSTALLATION.**

GENERAL REQUIREMENTS

I. Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209-1992.

II. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 86 micron.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.

Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing. Jointing of earthing tape shall be by welding. All joints and cut ends shall be properly painted with aluminium paint.

6.10 **TESTING**

On the completion of the entire installation, the following tests shall be conducted and no earth electrode shall have ohmic resistance of more than 5 ohm.

a) Earth resistance of electrodes
b) Impedance of earth continuity conductors as per IEE regulations.
c) Effectiveness of earthing as per IEE regulations.

All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in triplicate to the Architects for approval.

DETAILED TESTS ON VARIOUS EQUIPMENTS

TESTING & COMMISSIONING

After installation of all the electrical equipment of the electrical system of the building commissioning test for the equipment shall be done as described below.

A **LOW VOLTAGE SWITCHGEAR**

Tightness check of all bolts, nuts and clangs
Checking and lubrication of the moving parts.
Checking and breakers electrical and mechanical operation.
Checking of all wiring in accordance with diagram
Checking of earth connection
Checking that no tools or loose materials are left in and around switchgear
Checking whether arc chutes are fitted in position
Insulation resistance of main circuit by 1000 V megger.
Insulation resistance of auxiliary and control circuit by 500V megger.
High voltage test for main circuit.
High Voltage test for auxiliary and control circuit.
Operation check with interlocks (if any).
Through check of protection scheme
The closing and opening time of the breaker.
Contact resistance of main and isolator contacts shall be measured.

B **L.T. CABLES**

The following test should be carried out.

Before laying the IR value of the cable in length in roll or drum shall be checked.

After laying and dressing and before termination jointing the insulation resistance shall be measures with 1000V megger.

After termination / joining and before commissioning following test shall be carried out.

a) Insulation resistance.

C **EARTHING PROTECTION**

Resistance of the total earthing network shall be measured for body earthing.

D Supply and installation of all safety equipment such as rubber mats, sand buckets, and fire extinguishers etc. at the relevant positions as per IE rules and IS code of practice.

E Liaison work with supply authority, Electrical inspector, pollution control board etc. required for getting approval of installation of electrical system and diesel generators and

preparation of all documents and test reports to get clearance certificates from the aforesaid authorities.

F Preparation of all As Built Drawings and documents and approval of the same from consultants after satisfactory trial run of the System and submission of the same during handing over of the Total Electrical System.

APPENDIX –VIII

FORM OF TENDER & SCHEDULE OF FISCAL ASPECTS

1. Having examined the Instructions to Tenderers, Drawings, Standard Conditions of Contract, Safety Codes, Specification and Bill of Quantities for INTERNAL ELECTRICAL works, we offer to execute, complete and maintain the whole of the said works in conformity with the said Instructions, Drawings, Standard Conditions of Contract, Specification and Bill of Quantities for the sum of or such other sum as may be ascertained in accordance with the said conditions.

2. We have undertake if our Tender is accepted to commence the Works within 7 days of receipt of the Engineer's order to commence, and complete and deliver the whole of the works comprised in the order within 6 weeks, including mobilization from date of issue of letter of intent.

3. We have deposited as Earnest Money Of Rs. -------/-(Rupees ----------Only) by Demand Draft in favour of M/s. Registrar IIT Bombay which amount is not to bear any interest. We do hereby agree that this sum shall be forfeited by you in the event our tender is acceptable and we fail to execute the contract when called upon to do so.

4. If our Tender is accepted we will obtain the guarantee of a locally registered Bank to be jointly and severally bound with us in the sum of 5% of the Contract Value for the due performance of the Contract under the terms of a Performance Bond to be approved by you.

5. We agree to abide by this Tender for a period of 90 days from the date fixed prepared and executed this Tender, together with you written acceptance thereof, shall constitute a binding obligation upon us.

6. In the event of our Tender being accepted and until a formal Agreement is prepared and executed this Tender, together with you
written acceptance thereof, shall constitute a binding obligation upon us.

7. We understand that you are not bound to accept the lowest or any Tender you may receive.

8. We confirm, that we have read, understood and accept that the work carried on site will conform to all relevant Indian Standards on Health and Safety.

9. We acknowledge receipt of the following circular letters :-

Reference number of letter	Date
……	……
……	……
……	……
……	……

and confirm we have taken account thereof in our Tender.

FORM OF TENDER

S. No.	Description	Requirement
1	Ruling Language	English
2	Security Deposit	5% of the Contract Value, valid till contract period or extended period if any. To be exchanged against contract. For Contract Value of Rs. 5,00,000.00, as per Tender clause. 5% of the Contract Value, valid till contract period or extended period if any. To be exchanged against contract. For Contract Value of Rs. 5,00,000.00
3	Minimum Amount of Third Party Insurance	Rs. 1,00,000.00 per person per Occurrence for Rs. 5,00,000.00 valid up to the end of defects liability period.
4	Times of Completion	The installation shall be completed within 6 weeks.
5	Extension of time	Change of contract valid only through change orders.
6	Period of Commencement from Letter of Intent	Immediately upon receipt of Letter of Intent by Owner.
7	Liquidated Damages and delay charges	Rs. 1000.00 per day of delay.
8	Limit of LD charges	5% of the contract value
9	Period of Maintenance	12 months
10	Quantities	Estimated
11	Escalations	Escalation Free
12	Advance Payment	per IIT Norms
13	Recovery of Advance	As per IIT Norms
14	Minimum Amount of R. A. Bills Certificate	**For Contract upto 5,00,000.00** Only one full & final Bill will be prepared. **For Contract between 5,00,000.00 to**

		10,00,000.00 Only one bill of 5,00,000.00 & one final Bill will be prepared. **For Contract above 10,00,000.00 & above.** Each bill of value above 5,00,000.00 & one final Bill will be prepared.
15	Time within which the Payment is to be made	As per IIT Norms
16	Percentage of Retention	Not Exceeding 10% of Contract Value.
17	Electrical & Water Charges	1% of Final Amount will be deducted as electrical charges as per IIT Norms. Water will be free.
18	Payment of Retention Money	After the Expiry of Period Maintenance of 12 Months
19	TAXES	TDS and GST – TDS any other taxes as per govt. rules will be deducted and the certificate will be issued.
20	Insurance to be done	CAR policy, Workmen's Compensation, Third Party Insurance.
21	Terms of Payments	1. Up to 80% of contract value against RA Bills with due pro rata upon installation, recovery of advance duly certified. 2. 10% of the contract value after de-snagging/clearing of punch list, successful handing over of the installations to the IIT. 3. Balance 10% will be retained till the end of Defects Liability Period of 12 Months Retention. At discretion of owner, the retention amount may be released against Bank Guarantee of equal amount valid till completion of Defects Liability Period.

Dated this …… day of.....2023
Signature …… in capacity of.....Duly authorized to sign Tenders for and on behalf of …….

(IN BLOCK CAPITALS)

Address : ……

Witness :……

LGF					1 conduit/casing capping						1 conduit/casing capping						1 conduit/casing capping								
					Circuit-1			Circuit-2			Circuit-3			Circuit-4			Circuit-5								
Sr. No.	Fitting No.	Make	Model	W	Circuit-1	W	15 HRS TO 7 HRS	Circuit-2	W	15 HRS TO 23 HRS	Circuit-3	W	15 HRS TO 7 HRS	Circuit-4	W	15 HRS TO 23 HRS	R3	W	15 HRS TO 23 HRS	Y3	W	15 HRS TO 7 HRS	B3	W	15 HRS TO 23 HRS
					R1			Y1			B1			R2			R3			Y3			B3		
1	D-1/1	Delta	FRAX M (B)	25	R1	25	FN																		
2	D-1/2	Delta		25				Y1	25	PDN															
3	D-1/3	Delta		25	R-1-Loop	25	FN																		
4	D-1/4	Delta		25				Y1-Loop	25	PDN															
5	D-1/5	Delta		25	R1-Loop	25	FN																		
6	D-1/6	Delta		25				Y1-Loop	25	PDN															
7	D-1/7	Delta		25	R1-Loop	25	FN																		
8	D-1/8	Delta		25				Y1-Loop	25	PDN															
9	D-1/9	Delta		25	R1-Loop	25	FN																		
10	D-1/10	Delta		25				Y1-Loop	25	PDN															
11	D-1/11	Delta		25				Y1-Loop	25	PDN															
12	D-2/1	Delta	FOX	8	R1-Loop	8	FN																		
13	D-2/2	Delta		8	R1-Loop	8	FN																		
14	D-2/3	Delta		8	R1-Loop	8	FN																		
15	D-1/12	Delta	FRAX M (B)	25							B1	25	FN												
16	D-1/13	Delta		25										R2	25	PDN									
17	D-1/14	Delta		25							B1-LOOP	25	FN												
18	D-1/15	Delta		25										R2-LOOP	25	PDN									
19	D-1/16	Delta		25							B1-LOOP	25	FN												
20	D-1/17	Delta		25										R2-LOOP	25	PDN									
21	D-1/18	Delta		25							B1-LOOP	25	FN												
22	D-1/19	Delta		25										R2-LOOP	25	PDN									
23	D-1/20	Delta		25							B1-LOOP	25	FN												
24	D-1/21	Delta		25										R2-LOOP	25	PDN									
25	D-1/22	Delta		25							B1-LOOP	25	FN												
26	D-1/23	Delta		25										R2-LOOP	25	PDN									
27	D-1/24	Delta		25							B1-LOOP	25	FN												
28	D-1/25	Delta		25										R2-LOOP	25	PDN									
29	D-1/26	Delta		25										R2-LOOP	25	PDN									
30	D-1/27	Delta		25										R2-LOOP	25	PDN									
31	D-1/28	Delta		25							B1-LOOP	25	FN												
32	D-1/29	Delta		25							B1-LOOP	25	FN												

LGF					1 conduit/casing capping						1 conduit/casing capping						1 conduit/casing capping								
					Circuit-1			Circuit-2			Circuit-3			Circuit-4			Circuit-5								
Sr. No.	Fitting No.	Make	Model	W	Circuit-1	W	15 HRS TO 7 HRS	Circuit-2	W	15 HRS TO 23 HRS	Circuit-3	W	15 HRS TO 7 HRS	Circuit-4	W	15 HRS TO 23 HRS	R3	W	15 HRS TO 23 HRS	Y3	W	15 HRS TO 7 HRS	B3	W	15 HRS TO 23 HRS
					R1			Y1			B1			R2			R3			Y3			B3		
29	E-1/1	ERCO	7577 OPTEC Track Spot 2279000_V06	23																			B3	23	
30	E-1/2	ERCO		23																			B3	23	
31	E-1/3	ERCO		23																			B3	23	
32	E-1/4	ERCO		23																Y3	23				
33	E-1/5	ERCO		23																			B3	23	
34	E-1/6	ERCO		23																			B3	23	
35	E-1/7	ERCO		23																			B3	23	
36	E-1/8	ERCO		23																Y3	23				
				933		**149**	FN		**150**	PDN		**225**	FN		**225**	PDN					**46**	FN		**138**	PDN

Ground Floor									Circuit-1			Circuit-2			Circuit-3			Circuit-4			Circuit-5			1 conduit/casing capping								Circuit-6								Fitting Sections						
Bay Number	Column	Make	Model	Length	Unit	Fitting Length	W		R1			Y1			B1			R2			Y2			R3	W	15 HRS TO 23 HRS	Y3	W	15 HRS TO 7 HRS	B3	W	15 HRS TO 23 HRS								3912	4212	2306	5412	0	1.106	Total Length
																								R3			Y3			B3															
Corridor																																														
1	1 to 2			2709	mm	2306	61		FDNN	R1	61																														1					2306
2	2 to 3			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
3	3 to 4			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
4	4 to 5			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
5	5 to 6			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
6	6 to 7			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
7	7 to 8			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
8	8 to 9			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
9	9 to 10			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
10	10 to 11			2709	mm	2306	61		FDNN	R1-LOOP	61																														1					2306
11	11 to 12			2709	mm	2306	61	LEFT				PN	Y1	61																										1					2306
12	12 to 13			2709	mm	2306	61															FN	Y2-LOOP	61																1					2306
13	13 to 14			2709	mm	2306	61					PN	Y1-LOOP	61																										1					2306
14	14 to 15			2709	mm	2306	61															FN	Y2-LOOP	61																1					2306
15	15 to 16			2709	mm	2306	61					PN	Y1-LOOP	61																										1					2306
16	16 to 17			2709	mm	2306	61															FN	Y2-LOOP	61																1					2306
17	17 to 18			2709	mm	2306	61					PN	Y1-LOOP	61																										1					2306
18	18 to 19			2709	mm	2306	61															FN	Y2-LOOP	61																1					2306
19	19 to 20			4509	mm	4212	111					PN	Y1-LOOP	111																											1					4212
20	20 to 21			4509	mm	4212	111															FN	Y2-LOOP	111																	1					4212
21	21 to 22			4509	mm	4212	111					PN	Y1-LOOP	111																											1					4212
22	22 to 23			4509	mm	4212	111	Lift Room (Centre)														FN	Y2-LOOP	111																	1					4212
23	23 to 24			5810	mm	5412	142								FN	B1	142																										1				5412
24	24 to 25			4245	mm	3912	103											PN	R2	103																				1						3912
25	25 to 26			2720	mm	2306	61								FN	B1-LOOP	61																										1				2306
26	26 to 27			2720	mm	2306	61											PN	R2-LOOP	61																								1				2306
27	27 to 28			2720	mm	2306	61								FN	B1-LOOP	61																										1				2306
28	28 to 29			2720	mm	2306	61											PN	R2-LOOP	61																								1				2306
29	29 to 30			2720	mm	2306	61	RIGHT							FN	B1-LOOP	61																										1				2306
30	30 to 31			2720	mm	2306	61											PN	R2-LOOP	61																								1				2306
31	31 to 32			2720	mm	2306	61								FN	B1-LOOP	61																										1				2306
32	32 to 33			1235	mm	1106	30											PN	R2-LOOP	30																										1	1.106
33	33 to 34			2555	mm	2306	61								FN	B1-LOOP	61																										1				2306
34	34 to 35			2585	mm	2306	61											PN	R2-LOOP	61																								1				2306
35	35 to 36			2610	mm	2306	61								FN	B1-LOOP	61																										1				2306
36	36 to 37			1180	mm	1106	30											PN	R2-LOOP	30																										1	1.106
Lobby Area																																														
37	E-2/1						23																			FN		23																	
38	E-2/2						23																			FN		23																	
39	E-2/3	ERCO	7577 with 20311000_V06				23																								PN	23													
40	E-2/4						23																			FN		23																	
41	E-2/5						23																			FN		23																	
42	E-2/6						23																								PN	23													
43	D-1/1						25															FN	Y2-LOOP	25																					
44	D-1/2						25											PN	R2-LOOP	25																											
45	D-1/3						25															FN	Y2-LOOP	25																					
46	D-1/4	DELTA	FRAX M (B)				25															FN	Y2-LOOP	25																					
47	D-1/5						25											PN	R2-LOOP	25																											
48	D-1/6						25															FN	Y2-LOOP	25																					
49	D-1/7						25															FN	Y2-LOOP	25																					
50	D-1/8						25											PN	R2-LOOP	25																											
51	D-1/9						25															FN	Y2-LOOP	25																					
							2820		FDNN	10	610	PN	6	466	FN	7	508	PN	10	482	FN	12	616			FN	4	92		PN	2	46		1	4	28	1	0	2	90742.212
											2.65			2.03			2.21			2.10			2.68									1	4	28	1	0	2	
																																						1	4	21	1	0	2	
																																						1	4	28	1	0	2	
																																						4	16	105	4	0	8	

First Floor																																	Fitting Sections						
Bay Number	Column	Make	Model	Length	Unit	Fitting Length	Wattage		Circuit-1			Circuit-2			Circuit-3			Circuit-4			Circuit-4			3912	4212	2306	5412	0	1.106	Total Length
									R1			Y1			B1			R2			Y2					M	M	M	M	M
1	1 to 2			2709	mm	2306	61		FDNN	R1	61															1				2306
2	2 to 3			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
3	3 to 4			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
4	4 to 5			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
5	5 to 6			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
6	6 to 7			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
7	7 to 8			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
8	8 to 9			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
9	9 to 10			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
10	10 to 11			2709	mm	2306	61		FDNN	R1-Loop	61															1				2306
11	11 to 12			2709	mm	2306	61	LEFT				PN	Y1	61												1				2306
12	12 to 13			2709	mm	2306	61								FN	B1	61									1				2306
13	13 to 14			2709	mm	2306	61					PN	Y1-Loop	61												1				2306
14	14 to 15			2709	mm	2306	61								FN	B1 Loop	61									1				2306
15	15 to 16			2709	mm	2306	61					PN	Y1-Loop	61												1				2306
16	16 to 17			2709	mm	2306	61								FN	B1 Loop	61									1				2306
17	17 to 18			2709	mm	2306	61					PN	Y1-Loop	61												1				2306
18	18 to 19	Regent	Imeria	2709	mm	2306	61								FN	B1 Loop	61									1				2306
19	19 to 20			4509	mm	4212	111					PN	Y1-Loop	111											1					4212
20	20 to 21			4509	mm	4212	111								FN	B1 Loop	111								1					4212
21	21 to 22			4515	mm	4212	111					PN	Y1-Loop	111											1					4212
22	22 to 23			4520	mm	4212	111	Lift Room (Centre)							FN	B1 Loop	111								1					4212

Bay Number	Column	Make	Model	Length	Unit	Fitting Length	Wattage		Circuit-1			Circuit-2			Circuit-3			Circuit-4			Circuit-4			3912	4212	2306	5412	0	1.106	Total Length
		First Floor																									Fitting Sections			
									R1			Y1			B1			R2			Y2					M	M	M	M	M
23	23 to 24			5810	mm	5412	142														PN	Y2	142				1			5412
24	24 to 25			4245	mm	3912	103											FN	R2	103				1						3912
25	25 to 26			2720	mm	2306	61														PN	Y2-Loop	61			1				2306
26	26 to 27			2714	mm	2306	61											FN	R2 Loop	61						1				2306
27	27 to 28			2709	mm	2306	61														PN	Y2-Loop	61			1				2306
28	28 to 29			2709	mm	2306	61											FN	R2 Loop	61						1				2306
29	29 to 30			2709	mm	2306	61														PN	Y2-Loop	61			1				2306
30	30 to 31			2709	mm	2306	61	RIGHT										FN	R2 Loop	61						1				2306
31	31 to 32			2709	mm	2306	61														PN	Y2-Loop	61			1				2306
32	32 to 33			1235	mm	1106	30											FN	R2 Loop	30									1	1.106
33	33 to 34			2555	mm	2306	61														PN	Y2-Loop	61			1				2306
34	34 to 35			2585	mm	2306	61											FN	R2 Loop	61						1				2306
35	35 to 36			2610	mm	2306	61														PN	Y2-Loop	61			1				2306
36	36 to 37			1180	mm	1106	30											FN	R2 Loop	30									1	1.106
Lobby																														
37	D-1/1						25								FN	B1 Loop	25													
38	D-1/2						25								FN	B1 Loop	25													
39	D-1/3	DELTA	FRAX M (B)				25														PN	Y2-Loop	25							
40	D-1/4						25								FN	B1 Loop	25													
41	D-1/5						25								FN	B1 Loop	25													
42	D-1/6						25														PN	Y2-Loop	25							
				106.014		Wattage	2607		FDNN	10	610	PN	6	466	FN	10	566	FN	7	407	PN	9	558	1	4	28	1	0	2	90742.212
											2.7			2.026		Current - A	2.46						2.43							
						Primary	4																							
						Secondary	38																							
										Hrs																				
						FDNN	FULL DAY & NIGHT ON			24																				
						FN	FULL NIGHT ON			12																				
						PN	PARTIAL NIGHT OFF			5																				
							Curve	**AMP**																						
						R1	C	16																						
						Y1	C	16																						
						B1	C	16																						
						Y2	C	16																						

Second Floor																					Fitting Sections									
Bay Number	Column	Length	Unit	Make	Model	Fitting Length	Wattage		Circuit-1			Circuit-2			Circuit-3			Circuit-4			3912	4212	2306	5412	0	1.106	Total Length		Beam	Length
									R1			Y1			B1			R2												
8	8 to 9	2709	mm			2306	61		FN	R1	61												1				2306		8 to 9	2709
9	9 to 10	2709	mm			2306	61								PN	B1	61						1				2306		9 to 10	2709
10	10 to 11	2709	mm			2306	61		FN	R1-LOOP	61												1				2306		10 to 11	2709
11	11 to 12	2709	mm			2306	61								PN	B1-LOOP	61						1				2306		11 to 12	2709
12	12 to 13	2709	mm			2306	61		FN	R1-LOOP	61												1				2306		12 to 13	2709
13	13 to 14	2709	mm			2306	61								PN	B1-LOOP	61						1				2306		13 to 14	2709
14	14 to 15	2709	mm			2306	61	LEFT	FN	R1-LOOP	61												1				2306		14 to 15	2709
15	15 to 16	2709	mm			2306	61								PN	B1-LOOP	61						1				2306		15 to 16	2709
16	16 to 17	2709	mm			2306	61		FN	R1-LOOP	61												1				2306		16 to 17	2709
17	17 to 18	2709	mm			2306	61								PN	B1-LOOP	61						1				2306		17 to 18	2709
18	18 to 19	2709	mm			2306	61		FN	R1-LOOP	61												1				2306		18 to 19	2709
19	19 to 20	4509	mm			4212	111								PN	B1-LOOP	111					1					4212		19 to 20	4509
20	20 to 21	4509	mm			4212	111		FN	R1-LOOP	111											1					4212		20 to 21	4509
21	21 to 22	4509	mm			4212	111								PN	B1-LOOP	111					1					4212		21 to 22	4515
22	22 to 23	4509	mm	Regent	Imperia	4212	111	Lift Room (Centre)				FN	Y1	111								1					4212		22 to 23	4520
23	23 to 24	5810	mm			5412	142											PN	R2	142				1			5412		23 to 24	5810
24	24 to 25	4245	mm			3912	103					FN	Y1-LOOP	103							1						3912		24 to 25	4245
25	25 to 26	2720	mm			2306	61											PN	R2-LOOP	61			1				2306		25 to 26	2720
26	26 to 27	2714	mm			2306	61					FN	Y1-LOOP	61									1				2306		26 to 27	2714
27	27 to 28	2709	mm			2306	61											PN	R2-LOOP	61			1				2306		27 to 28	2709
28	28 to 29	2709	mm			2306	61					FN	Y1-LOOP	61									1				2306		28 to 29	2709
29	29 to 30	2709	mm			2306	61	RIGHT										PN	R2-LOOP	61			1				2306		29 to 30	2709
30	30 to 31	2709	mm			2306	61					FN	Y1-LOOP	61									1				2306		30 to 31	2709
31	31 to 32	2709	mm			2306	61											PN	R2-LOOP	61			1				2306		31 to 32	2709
32	32 to 33	1235	mm			1106	30					FN	Y1-LOOP	30												1	1.106		32 to 33	
33	33 to 34	2555	mm			2306	61											PN	R2-LOOP	61			1				2306		33 to 34	
34	34 to 35	2585	mm			2306	61					FN	Y1-LOOP	61									1				2306		34 to 35	
35	35 to 36	2610	mm			2306	61											PN	R2-LOOP	61			1				2306		35 to 36	
36	36 to 37	1180	mm			1106	30					FN	Y1-LOOP	30												1	1.106		36 to 37	
37	D-1/1						25		FN	R1 Loop	25																			
38	D-1/2						25		FN	R1 Loop	25																			
39	D-1/3						25								PN	B1-Loop	25													
40	D-1/4			DELTA	FRAX M (B)		25		FN	R1 Loop	25																			
41	D-1/5						25		FN	R1 Loop	25																			
42	D-1/6						25								PN	B1-Loop	25													
						76.81	3		FN	11	577	FN	8	518	PN	7	577	PN	9	508	1	4	21	1	0	2	74600.212			

Third Floor																																		
																									Fitting Sections										
Bay Number	Column	Length	Unit	Make	Model	Fitting Length	Wattage		Circuit-1			Circuit-2			Circuit-3			Circuit-4			3912	4212	2306	5412	0	1.106	Total Length										
									R1			Y1			B1			R2					M	M	M	M	M								
1	1 to 2	2720	mm			2306	61		FN	R1	61												1				2306								
2	2 to 3	2720	mm			2306	61					PN	Y1	61									1				2306								
3	3 to 4	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
4	4 to 5	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
5	5 to 6	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
6	6 to 7	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
7	7 to 8	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
8	8 to 9	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
9	9 to 10	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
10	10 to 11	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
11	11 to 12	2720	mm			2306	61	LEFT	FN	R1-LOOP	61												1				2306								
12	12 to 13	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
13	13 to 14	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
14	14 to 15	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
15	15 to 16	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
16	16 to 17	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
17	17 to 18	2720	mm			2306	61		FN	R1-LOOP	61												1				2306								
18	18 to 19	2720	mm			2306	61					PN	Y1-LOOP	61									1				2306								
19	19 to 20	4520	mm	Regent	Imeria	4212	111		FN	R1-LOOP	111											1					4212								
20	20 to 21	4520	mm			4212	111					PN	Y1-LOOP	111								1					4212								
21	21 to 22	4520	mm			4212	111		FN	R1-LOOP	111											1					4212								
22	22 to 23	4520	mm			4212	111	Lift Room (Centre)				PN	Y1-LOOP	111								1					4212								
23	23 to 24	5810	mm			5412	142								FN	B1	142							1			5412								
24	24 to 25	4245	mm			3912	103											PN	R2	103	1						3912								
25	25 to 26	2720	mm			2306	61								FN	B1-LOOP	61						1				2306								
26	26 to 27	2720	mm			2306	61											PN	R2-LOOP	61			1				2306								
27	27 to 28	2720	mm			2306	61								FN	B1-LOOP	61						1				2306								
28	28 to 29	2720	mm			2306	61											PN	R2-LOOP	61			1				2306								
29	29 to 30	2720	mm			2306	61								FN	B1-LOOP	61						1				2306								
30	30 to 31	2720	mm			2306	61	RIGHT										PN	R2-LOOP	61			1				2306								
31	31 to 32	2720	mm			2306	61								FN	B1-LOOP	61						1			0	2306								
32	32 to 33	1235	mm			1106	30											PN	R2-LOOP	30						1	1.106								
33	33 to 34	2555	mm			2306	61								FN	B1-LOOP	61						1				2306								
34	34 to 35	2585	mm			2306	61											PN	R2-LOOP	61			1				2306								
35	35 to 36	2610	mm			2306	61								FN	B1-LOOP	61						1				2306								
36	36 to 37	1180	mm			1106	30											PN	R2-LOOP	30						1	1.106								
37	D-1/1			DELTA	FRAX M (B)		25								FN	R1 Loop	25																		
38	D-1/2						25								FN	R1 Loop	25																		
39	D-1/3						25											PN	B1-Loop	25															
						92.952	2.457		FN	11	771	PN	11	771	FN	11	558	PN	9	432	1	4	28	1	0	2	90742.212								

			List of Contact Person for Product Selection				
	Sr no	Make	Company Name	Name	Designation	Contact number	email ID
	1	Ligman	Ligman India Illumination Systems Private Limited www.ligman.com	Mohan Raj	Senior Manager - South	9741097419	mohanraj.m@ligman.co.in
				Kashyap	National Head India Mumbai	99205 32144	kashyap.b@ligman.co.in
	2	Regent	Regent Lighting Asia Pvt Ltd www.regent.ch	Gaurav Parikh	Sales Manager - West	99676 24177	gaurav.parikh@regent-lighting.in
				Sandeep Singh	National Head India Noida	85888 50496	sandeep.singh@regent-lighting.in
	3	ERCO	Erco Lighting Pte Ltd www.erco.com	Avishek Sengupta	Business Development Manager - South	98333 20923	a.sengupta@erco.com
				Kishor Shetty	Regional Manager India	99209 83828	k.shetty@erco.com
			ERCO Agent Architectural Lighting Concepts Pvt. Ltd.	Preetham Gowda	Design and Sales Manager	90666 75300	designsupport@alclighting.com
	4	Deltalight	DELTALIGHT India Private Limited www.deltalight.com	Apeksha B Ronad	Assistant Sales Manager – South	97386 16717	ApekshaB.Ronad@deltalight.com
				Rahul Natarajan	Regional Manager	70227 54007	rahul.natarajan@deltalight.com
	5		Reliance Switchgears	Mr. Ramnarayan Yadav	Partner	82860 60603	rel_swg@hotmail.com
				Y.I. Zagral	Partner	99301 32040	

				Make
	Floor Lighting Panels			Reliance Switchgears
Fabrication	CRCA Sheet			
	Gland Plate - 3 mm Thickness			
	Body - 2 mm Thickness			
	Doors - 1.6mm Thickness			
Panel Mounting	Wall Mounting			
Colour	Powder Coated with 7 Tank Process of Metal Cleaning & Colour Shade - RAL - 7032 (or as per client choice)			
Gasket	Neoprene Gasket - Fire Retardent			
Cable Entry	Top & Bottom			
Construction	IP-42 - Double Door			
Incomer	63A,4P,10KA, MCCB with ROH with Over Current & Short Circuit of Thermal Magnetic Type	1	No.	L&T/ABB/Schneider
	Spreader Link & Phase Barriers	1	Set	L&T/ABB/Schneider
	Unervoltage & Overvoltage 3 Phase Relay	1	Set	Select
Metering & Indication	RYB LED Indication Lamp with control MCB	1	Set	Teknik
	96 x 96 mm, Counter Type KWH (Enegy) Meter with Class 1 & RS 485	1	No.	L&T/ABB
	Control MCBs	1	Set	L&T/ABB
	3P+N,40KA, Type 2,440V AC, SPD with Pluggable Module,Remote Sensing Contact	1	No.	L&T/ABB/Legrand/Citel
	Remote Indication Lamp for SPD	1	No.	L&T/ABB
	63/5A, Class - 0.5 Cast Resin CT for Metering	3	Nos.	AE
Outgoings				
Outgoing Control	Astronomical Day & Night Year Timer MULTI Channel	3	Nos	GIC/L&T
	Auto-Manual Switch	1	Set	Salzer
	Pushbuttons	1	Set	Teknik
	Control MCB	1	Set	L&T/ABB
	Control Contactors	1	Set	L&T/ABB

Outgoing Switchgears - 1				
(Time Sunset to Sun Rise)-Full Night	25A,FP,10KA,30mA, RCCB	1	No	L&T/ABB
	20A,SP,10KA,C Curve, MCB	8	Nos.	L&T/ABB
	18A,4P,AC3 Duty Contactor for Lighting Load Switching	1	Nos.	L&T/ABB
	POWER Wiring MCB to Terminal	1	Set	Polycab/RR
	4 mm2 Clip On Terminals for Each Outgoing including - P,N & Earthing	1	Set	Connectwell/Elmex
Outgoing Switchgears - 2				
(Sunset to 23 Hrs. IST ON) & Week End (OFF)	25A,FP,10KA,30mA, RCCB	1	No	L&T/ABB
	20A,SP,10KA,C Curve, MCB	8	Nos.	L&T/ABB
	18A,4P,AC3 Duty Contactor for Lighting Load Switching	1	Nos.	L&T/ABB
	POWER Wiring MCB to Terminal	1	Set	Polycab/RR
	4 mm2 Clip On Terminals for Each Outgoing including - P,N & Earthing	1	Set	Connectwell/Elmex
Outgoing Switchgears - 3				
(Dark Area Lighting & Emergency Lighting)	25A,FP,10KA,30mA, RCCB	1	No	L&T/ABB
	20A,SP,10KA,C Curve, MCB	8	Nos.	L&T/ABB
	POWER Wiring MCB to Terminal	1	Set	Polycab/RR
	4 mm2 Clip On Terminals for Each Outgoing including - P,N & Earthing	1	Set	Connectwell/Elmex
Busbar	63A,4P,E91E grade Aluminium Busbar with 1A/mm2 Current Density with RYBN colour coded Sleeve	1	Set	
Earthing	25 x 6 mm E91E grade Aluminium Busbar for Earthing with Green Sleeve	1	Set	
Support	SMC / DMC Supports as per requirements	1	Set	
Control Wiring	1.5mm2 / 1 mm2 Based on Terminal Size & Drawing Approval	1	Set	Polycab/RR
Neutral Link		1	Set	