E -Tender Document

PROPOSED ELECTRICAL, INTERIORS & ALLIED WORKS OF 2nd, 3rd & 4th FLOOR AT MPCB OFFICE, SION, MUMBAI.

Tender No.:- MPCB/EE/PT/e-Tender-1/2018-19

Maharashtra Pollution Control Board

Kalpataru Point, 3rd& 4thFloor, Sion Matunga Scheme Road No.8

Opp.SionCircle,Sion (East), Mumbai-400 022

Website:http//:mpcb.gov.in

Price: Rs.5000/-

(Non Refundable)

(2018 – 2019)

Maharashtra Pollution Control Board

Kalpataru Point, 3rd& 4thFloor, Sion Matunga Scheme Road No.8
Opp.SionCircle,Sion (East), Mumbai-400 022
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E – Tender for Proposed Electrical, Interiors & Allied Works Of 2nd, 3rd & 4th Floor At MPCB Office, Sion, Mumbai.

Maharashtra Pollution Control Board

Kalpataru Point, 3rd& 4thFloor, Sion Matunga Scheme Road No.8

Opp.Sion Circle,Sion (East), Mumbai-400 022

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Tender Notice

1) Tender Notice Details

Tender Reference no.	MPCB/EE/2/2018-19 Date :05/02/2018
Name of Work / Item	**Proposed Electrical, Interiors & Allied Works of 2nd, 3rd & 4th Floor At MPCB Office, Sion, Mumbai**
Cost of blank tender document & Mode of Payment	**Rs. 5,000/- (Rupees Five Thousand Only) (Non Refundable) to be paid through Online Payment Modes i.e. Net Banking, Debit Card and Credit Card during Tender Document Download Stage.**
EMD Amount & Mode of Payment	**Rs.1,00,000/- (Rupees One Lakhs Only) to be paid through Online Payment Modes i.e. Net Banking, Debit Card, Credit Card and NEFT/RTGS during Bid Preparation Stage.**
Date ,Time and Place of Pre Bid Meeting	**09th March. 2018 11:30** Hrs at MPCB Conference Hall,Kalpataru Point, 4th Floor, SionMatunga Scheme Road No.8,Opp. Sion Circle. Sion (E), **Mumbai-400 022**
Date of Completion	**02 Months**
Venue of online opening of tender	MPCB Conference Hall, Kalpataru Point, 4th Floor, SionMatunga Scheme Road No.8, Opp. Sion Circle,Sion (East), **Mumbai - 400 022**
Address for Communication	Member Secretary MPC Board, Kalpataru Point, 4th Floor, SionMatunga Scheme Road No.8, Opp. Sion Circle,Sion (East), **Mumbai - 400 022**
Contact Telephone & Fax Numbers	Tel.No. - 022- 240 87 295, 022- 240 10437 Fax - 022- 240 87 295 Email - ee@mpcb.gov.in
e-Tendering Helpline Support: **Monday-Friday: 09:00 AM - 08:00 PM** **Saturday - 09:00 AM - 06:00 PM**	**Telephone:** **020 - 3018 7500** **Email: support.gom@nextenders.com**

2) E – TENDER TIME SCHEDULE

Please Note: All bid related activities (Process) like Tender Document Download, Bid Preparation, and Bid Submission will be governed by the time schedule given under Key Dates below:

Sr. No	Activity	Performed By	Start		Expiry	
			Date	Time	Date	Time
1	Release of Tender	Department	27-02-2018	11.00	27-02-2018	17.00
2	Tender Download	Bidders	27-02-2018	17.01	07-03-2018	17.00
3	Bid Preparation		27-02-2018	11.01	12-03-2018	17.00
4	Superhash Generation & Bid Lock	Department	14-03-2018	11.01	14-03-2018	17.00
5	Control Transfer of Bid	Bidder	14-03-2018	17.01	16-03-2018	17.00
6	Envelope 1 Opening	Department	17-03-2018	14.00	17-03-2018	17.00
7	Envelope 2 Opening		22-03-2018	14.00	22-03-2018	17.00

Dates mentioned here, are scheduled dates for Bid Opening Activities. Any changes in dates of opening of technical and commercial bids shall be notified in 'Press Notice / Corrigendum' section on the e-Tendering sub portal of the department before opening of the same.

3) INSTRUCTION TO BIDDERS

3.1 General Instruction:-

The bidders are requested to familiarize themselves with the use of the e - Tendering portal of Government of Maharashtra well in advance.

To view- Tender Notice, Detailed Time Schedule, Tender Document for this Tender and Subsequently purchase the Tender Document and its supporting documents, kindly visit following e-Tendering website of Government of Maharashtra https://maharashtra.etenders.in

The Contractors/suppliers participating first time for e-Tenders on GoM e-tendering portal will have to complete the Online Registration Process for the e-Tendering portal. A link for enrollment of new bidders has been provided on **https://maharashtra.etenders.in**

All bidders interested in participating in the online e-tendering process are required to procure Class II or Class III Digital e-Token having 2 certificates inside it, one for Signing/Verification purpose and another for Encryption/Decryption purpose. The tender should be prepared & submitted online using individual's Digital e-Token.

e -Tendering Tool Kit for Bidders (detailed Help documents, designed for bidders) has been provided on e-Tendering website in order to guide them through different stages involved during e-Tendering such as online procedure for Tender Document Purchase, Bid Preparation, Bid Submission.

Bidders will have to pay cost of **Tender Document** through online modes of payment such as **Net Banking, Debit Card and Credit Card** during **Tender Document Download stage**. This payment will not be accepted by the department through any offline modes such as Cash, Cheque or Demand Draft.

Similarly, Bidders will have to pay **Earnest Money Deposit** through online modes of payment such as Net Banking, Debit Card, Credit Card and NEFT/RTGS during Bid Preparation stage. This payment will not be accepted by the department through any offline modes such as Cash, Cheque or Demand Draft.

The interested contractors / bidders will have to make online payment (using credit card/debit card/net banking) of Rs. **5000/-** (inclusive of all taxes) per bid per tender to online service provider of e-Tendering system (SifyNexTenders) at the time of entering **Online Bid Submission** stage of the tender schedule.

If any assistance is required regarding e-Tendering (registration / upload / download) please contact GoM e-Tendering Help Desk on number: **020 – 3018 7500 (Pune Helpline), Email: support.gom@nextenders.com**

For a bidder, online bidding process consists of following 3 stages:

1. Online Tender Document Purchase and Download
2. Online Bid Preparation
3. Online Bid Submission

All of 3 stages are mandatory in order for bidders to successfully complete Online Bidding Process.

4) TENDER DOCUMENT PURCHASE AND DOWNLOAD:-

4.1. The tender document is uploaded / released on Government of Maharashtra,(GOM) e-tendering website **https://maharashtra.etenders.in**. Tender document and supporting documents may be purchased and downloaded from following link of **Organizations of Government of Maharashtra** on e-Tendering website of Government of Maharashtra, **https://allgom.maharashtra.etenders.in** by making payment through **Online Payment Modes i.e. Net Banking, Debit Card and Credit Card**.

4.2. If for any reason a bidder fails to make this payment through online modes, system won't allow the bidder proceed further for next stage resulting in his/her elimination from Online Bidding Process.

4.3. This payment will not be accepted by the department through any offline mode such as Cash, Cheque or Demand Draft.

4.4. Subsequently, bid has to be prepared and submitted online ONLY as per the schedule.

4.5. The Tender form will be available online only. Tender forms will not be sold / issued manually from **Maharashtra Pollution Control Board (MPCB)** office.

4.6. The bidders are required to download the tender document within the pre-scribed date & time mentioned in online tender schedule. After expiry of the date and time for tender document download, Department / Corporation will not be responsible for any such failure on account of bidders for not downloading the document within the schedule even though they have paid the cost of the tender to the Department / Corporation. In such case the cost of the tender paid by the bidders will not be refunded.

5) PREPARATION & SUBMISSION OF BIDS:-

Both the Bids (Technical as well as Commercial) shall have to be prepared and subsequently submitted online only. Bids not submitted online will not be entertained.

6) ONLINE BID PREPARATION:-

6.1. EARNEST MONEY DEPOSIT (EMD)
Bidders are required to pay Earnest Money Deposit (if applicable) through Online Payment modes i.e. **Net Banking, Debit Card, Credit Card and NEFT/RTGS** during Bid Preparation Stage.

This payment will not be accepted by the department through any offline modes such as Cash, Cheque or Demand Draft.

If for any reason a bidder fails to make this payment through online modes, system won't allow the bidder to complete Bid Preparation stage resulting in his/her elimination from Online Bidding Process.

In case EMD is mandatory to all the bidders for a tender, offers made without EMD shall be rejected.

In Bid Preparation stage, bidders get access to Online Technical and Commercial Envelopes where they require uploading documents related to technical eligibility criteria and quote commercial offer for the work / item in respective online envelopes.

7) <u>TECHNICAL BID:-</u>

Following documents should be uploaded in Online Technical Envelope (T1) in PDF format, if required can be zipped as well and then uploaded during **Online Bid Preparation stage**.

The list of documents for Technical Envelope is as follows:

Sr. No	List of Document	Compulsory (C) / Additional (A)
	Pre-Qualification Documents to be submitted as per schedule – I:	
1	The Contractor should posses Valid Electrical Contractor's Licence	**C**
2	The Contractor shall submit experience certificate for execution of single Electrical works of similar nature consisting of Electrical works not less than Rs. 80 Lakhs OR Two similar works not less than 60lacs Or Three similar works not less than 50 lacs in any Government/ Semi Government Department / local bodies such as MIDC/MJP/CIDCO etc in last five financial years signed by an officer not below the rank of Executive Engineer OR Similar works in Private Offices in last five years signed by the authorized representative of Client whose work has been executed.(Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs , then the same shall be considered as 50 lacs for the purpose of evaluation.)	**C**
3	Professional Tax Registration Certificate for employees in E category for tenders without PQ and both i.e. 'E' & 'R' category for tenders where PQ is applicable.	**C**
4	Registration Certification with GST Tax Deptt. under GST Act 2017, of Govt. of Maharashtra.	**C**
5	Income Tax Returns for last 3 years & Certified copy of PAN card	**C**
6	The photo copies duly attested, of the above certificates will have to be uploaded in Envelope No.1. Original shall be produced in the office of for verification on the day of opening of the tender as mentioned elsewhere	**C**
7	Goods & Service Tax Registration	**C**

8) COMMERCIAL BID:-

All commercial offers must be prepared online (An online form will be provided for this purpose in Online Commercial Envelope (C1), during **Online Bid Preparation** stage).

Any bidder should not quote his offer any where directly or indirectly in Technical Envelope (T1), failing which the Commercial Envelope (C1) shall not be opened and his tender shall stand rejected.
Note: During Online Bid Preparation stage, bidders are allowed to make any changes or modifications in the bid data uploaded by them in Technical (T1) as well as Commercial (C1) envelope

Towards the end of Bid Preparation, once verification of EMD payment is successful, bidder completes the Bid Preparation stage by generating the Hash Values for T1 and C1. Post this, system won't allow him/her to make any further changes or modifications in the bid data.

9) ONLINE BID SUBMISSION:-

In this stage, bidders who have successfully completed their Bid Preparation stage are required to transfer the data, already uploaded by them during Bid Preparation stage, from their custody to department's custody.

Note: During this stage, bidders won't have any capability to make any kind of changes or editing into technical as well as commercial data.

10) INSTRUCTION TO BIDDERS FOR ONLINE BID PREPARATION & SUBMISSION:-

Bidders are required to pay Earnest Money Deposit (if applicable to them) through Online Payment modes i.e. **Net Banking, Debit Card, Credit Card and NEFT / RTGS** during Bid Preparation Stage.

If for any reason a bidder fails to make this payment through online modes, system won't allow the bidder to complete Bid Preparation stage resulting in his/her elimination from Online Bidding Process.

Hence, it is strongly recommended to bidders to initiate this payment well in advance prior to expiry of Bid Preparation stage in order to avoid elimination from Online Bidding Process on grounds of failure to make this payment.

During the activity of Bid Preparation, bidders are required to upload all the documents of the technical bid by scanning the documents and uploading those in the PDF format. This apart, bidders will have to quote commercial offer for the work / item, for which bids are invited, in an online form made available to them in Commercial Envelope. This activity of Bid Preparation should be completed within the pre-scribed schedule given for bid preparation.

After Bid Preparation, the bidders are required to complete Bid Submission activity within pre-scribed schedule without which the tender will not be submitted.

Interested contractors / bidders will have to make online payment (using credit card/debit card/net banking/Cash Card) of Rs. 5000/- (inclusive of all taxes) per bid per tender to online service provider of e-Tendering system (SifyNexTenders) at the time of commencing Online Bid Submission stage of the tender schedule.

Non-payment of processing fees will result in non submission of the tender and Department will not be responsible if the tenderer is not able to submit their offer due to non- payment of processing fees to the e-tendering agency.

Detailed list of different modes of online payment to e-tendering service provider **(E-Payment Options)** has been provided under **E-Tendering Toolkit for Bidders** section of **https://maharashtra.etenders.in**

The date and time for online preparation followed by submission of envelopes shall strictly apply in all cases. The tenderers should ensure that their tender is prepared online before the expiry of the scheduled date and time and then submitted online before the expiry of the scheduled date and time. No delay on account of any cause will be entertained. Offers not submitted online will not be entertained.

If for any reason, any interested bidder fails to complete any of online stages during the complete tender cycle, department shall not be responsible for that and any grievance regarding that shall not be entertained.

Any amendment to the tender will be placed on sub portal of the Department, who have invited the bids, on e-tendering portal of the Govt. of Maharashtra. The tenderer will not be communicated separately regarding the amendment.

11) OPENING OF BID:-

The bids that are submitted online successfully shall be opened online as per date and time given in detailed tender schedule (if possible), through e-Tendering procedure only in the presence of bidders (if possible).

Bids shall be opened either in the presence of bidders or it's duly authorized representatives. The bidder representatives who are present shall sign a register evidencing their attendance. Only one representative per applicant shall be permitted to be present at the time of opening the tender.

12) TECHNICAL ENVELOPE (T1):-

First of all, Technical Envelope of the tenderer will be opened online through e-Tendering procedure to verify its contents as per requirements.

At the time of opening of technical bid the tenderer should bring all the original documents

that have been uploaded in the Online Technical Envelope (T1) so that same can be verified at the time of opening of technical bid.

If the tenderer fails to produce the original documents at the time of opening of technical bid then the decision of the committee taken on the basis of document uploaded will be final and binding on the tenderer.
If the various documents contained in this envelope do not meet the requirements, a note will be recorded accordingly by the tender opening authority and the said tenderer's Commercial Envelope will not be considered for further action but the same will be recorded. Decision of the tender opening authority shall be final in this regard.

The right to accept or reject any or all tenders in part or whole without assigning any reason thereof is reserved with Tender Opening Authority and his decision(s) on the matter will be final and binding to all.

The commercial bids shall not be opened till the completion of evaluation of technical bids.

The commercial Bids of only technically qualified Bidders as mentioned above will be opened.

13) COMMERCIAL ENVELOPE (C1):

This envelope shall be opened online as per the date and time given in detailed tender schedule (if possible), through e-Tendering procedure only.

14) Final List of Commercial Documents to be uploaded Online:

The following documents related to commercial envelope should be uploaded by the bidders in the form of PDF Files in the same order as mentioned below, on the e-Tendering website during **Online Bid Preparation** stage.

15 SUBMISSION OF TECHNICAL BID: COVER - 1

15.1 CRITERIA FOR MINIMUM ELIGIBILITY AND BID RESPONSIVENESS:

The Bidder shall fulfill all of the following Minimum Eligibility Criteria to participate in the bidding process. The Bidder should provide necessary documentary evidences of compliance as follows. Failure to do so for any of the Criteria mentioned below shall result in disqualification of the Bidder.

Contractors should possess Valid Electrical Contractor's License. The Contractor shall submit experience certificate for execution of single renovation and refurbishment work of similar nature consisting of Electrical works costing not less than Rs. 80 Lakhs OR Two works of similar nature consisting of Electrical works costing not less than Rs. 60 Lakhs OR Three works of similar nature consisting of Electrical works costing not less than Rs. 50 Lakhs in any Government/ Semi Government Department / local bodies such as MIDC/MJP/CIDCO etc in last five financial years signed by an officer not below the rank of Executive Engineer. OR Private Offices in last five years signed by the authorized representative of

Client whose work has been executed.(Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs , then the same shall be considered as 50 lacs for the purpose of evaluation.)

Professional Tax Registration Certificate for employees in E category for tenders without PQ and both i.e. 'E' & 'R' category for tenders where PQ is applicable.

Registration Certification with GST Deptt. under GST Act 2017, of Govt. of Maharashtra.

Income Tax Returns for last 3 years & Certified copy of PAN card

The photo copies duly attested, of the above certificates will have to be uploaded in Envelope No.1. Original shall be produced in the office of for verification on the day of opening of the tender as mentioned elsewhere

Goods & Service Tax Registration

15.2 TECHNICAL BID: EVALUATION CRITERIA & PROCESS

The Bidder shall necessarily submit in Cover 1 of the Bid Document, the Technical Bid detailing his credentials for executing this project and the highlights of the equipment & services offered by him with respect to scope of work defined in the Bid Document and the benefits that would accrue to MPCB. The Screening Committee appointed for this purpose will do this evaluation. The Technical Bid will contain all the information required to evaluate the bidder's suitability to MPCB for the purpose of this project.

The guidelines for evaluation have been designed to facilitate the objective evaluation of the Technical Bid submitted by the bidder. The information furnished by the bidders in the technical bid shall be the basis for this evaluation. In case any of the information is not made available, the Committee will assign zero (0) marks to that item.

While evaluating the Technical Bid, MPCB reserves the right to seek clarifications from the Bidders. Bidders shall be required to furnish such clarifications in a timely manner.

MPCB also reserves the right to seek additions, modifications and other changes to the submitted Bid. Bidders shall be required to furnish such additions / modifications / other changes in a timely manner.

16.0 EVALUATION OF PRICE BID: COVER 2

16.1 PRICE BID PARAMETERS

Bidders are required to offer their best prices in terms of cost of the work including all taxes and levies as on the last date of submission of bid (detailed break-up of all applicable taxes and levies over and above the quoted price should be mentioned)

16.4 AWARD CRITERIA

Final choice of MPCB to award this project to a suitable bidder to execute this project shall be made on the basis of composite scoring arrived as per formula mentioned above.

16.5 NOTIFICATION OF AWARD

MPCB will notify the successful bidder in writing that his bid has been accepted. Upon the successful bidder's furnishing of performance security, MPCB will promptly notify each unsuccessful bidder and will discharge their bid security.

GENERAL CONDITIONS OF CONTRACT (GCC)

1. **DEFINITIONS AND INTERPRETATIONS:**

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires.

A. The client / Employer shall mean **Maharashtra Pollution Control Board (MPCB)** having its office at Kalpataru Point, Sion Circle – East, Mumbai – 400022 Or any other place as modified subsequently and shall include its Manager or other officers authorized to deal with these presents are concerned on his behalf posted in the any of the Offices of Client and shall also include client's successors and assignees. Wherever the words "Client", "Employer" appear, these shall be deemed to mean MPCB and these words shall convey the same meaning.

B. The Tender shall mean the tender including addendum and drawings submitted by the tenderer for acceptance by Employer.

C. The **Project in-charge** shall mean the Head of the Project of the employer, or his successor in office or authorized representative nominated by the employer.

D. The **Contractor** shall mean the person or persons, firm or company whose tender has been accepted by Client and includes the Contractor's legal representatives, its successors and permitted assigns.

E. The **Sub-contractor** shall mean any person or firm or company (other than the Contractor) to whom any part of the work has been entrusted by the Contractor, with the written consent of the Consultants & / or the legal representatives, successors and permitted assigns of such person, firm or company.

F. The **Architect / Consultants** shall mean M/s. ARK Designs Pvt. Ltd. or any other consultant / the person nominated by the employer from time to time and shall include those who are expressly authorized by the client to act for and on his behalf for all functions pertaining to operation of this Contract.

G. **Consultant's Representative** shall mean any Engineer or Architect of the Consultants appointed from time to time to perform the duties set forth in the Tender Document whose authority shall be notified in writing to the Contractor.

H. The Works shall mean and include all works to be executed in accordance with the Contract or part there of as the case may be and shall include all extras, addition, altered, or substituted works as required for the purpose of the Contract.

I. The Contract shall mean the agreement between the client and the Contractor for the execution of the works including there in all documents such as the invitation to Tender, Instructions to Tenders, General and Special Conditions of Contract, Specifications, General Requirements, addendum, Time Schedule of Completion of Job, Drawings, Letter of Intent awarding the work, Agreed Variations, if any etc.

J. The Contract **"Document**" shall mean collectively the Tender Documents, addendum if any, Designs, Drawings, Specifications, agreed variations if any and other documents constituting the E-Tender and acceptance thereof.

K. **Construction Plant** shall mean all appliances or things of whatsoever nature required in or about the execution, completion or maintenance of the works or temporary works (as hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.

L. **Temporary Works** shall mean all temporary works of every kind required in or about the execution, completion or maintenance of the works.

M. **Specifications** shall mean all directions, various technical specification, provisions and requirements attached to the Contract, which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the contract for the work or works, as may be amplified or modified by the client or the Consultants during the performance of Contract in order to provide for the unforeseen conditions or in the best interest of the work or works. It shall also include the latest edition including all addenda/corrigenda of relevant Indian Standard Specifications and other relevant codes.

N. **Plans** shall mean all maps, sketches and layouts as are incorporated in the Contract in order to define broadly the scope and specifications of the work or works and all reproductions thereof.

O. **Drawings** shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the Consultants/ Architects and such other drawings as may, from time to time, be furnished or approved in writing by the Consultants.

P. **Site** shall mean the lands, buildings and other places on, under, in or through which the permanent works are to be carried out and any other lands or places provided by the client for the purpose of the Contract.

Q. **Notice in writing or written notice** shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been noticed) by registered post to the last known private or business address or registered office of the addresses and shall be deemed to have been received in the ordinary course of post it would have been delivered.

R. The **Completion Certificate** in relation to the work shall mean the certificate to be issued by the Consultants /Architects and countersigned by the Representative of client, when the works have been completed to their satisfaction.

S. The **Final Completion Certificate or No dues certificate** in relation to the work shall mean the certificate regarding the satisfactory compliance of the various provisions of the Contract to be issued by the Consultants/ and the Architects countersigned by the representative of client, after the period of defects liability is over. (Defect Liability period is 12 months from the date of completion).

T. **Approved** shall mean approved in writing including subsequent written confirmation of previous verbal approval.

2. Employer‘s decision regarding interpretation of drawings etc., shall be final

In the event of there being any discrepancy, ambiguity or omission or any error or difference of opinion regarding the interpretation or granting of any specification designs, drawings, description or instructions relating to the works to be executed the decision of the Project-in-charge thereon shall be final and binding on the Contractors and the Contractors shall not be entitled to claim any additional or extra payment or claim any other benefit or advantage for the same.

3. Liability of Contractors:

In any case in which any of the power conferred upon Employer shall have become exercisable and the same shall not have been exercised, the non exercisable portion thereof shall not constitute a waiver of any of the conditions thereof and such powers shall not withstanding the same be exercisable in the event of future case of default by the Contractors and the liabilities of the Contractors shall remain unaffected thereby.

4. Completion of Work:

On completion of the works, the Contractors shall be issued the Completion Certificate jointly by the authorized representative of Client and the Consultants, but no such certificate shall be given nor shall the works be considered to be completed until the Contractors shall have removed from the premises in which the work shall have been executed all scaffoldings, surplus materials and rubbish and shall have cleaned of all dirt from such works or other parts of any building in or upon which the work have been executed.

If the Contractors shall fail to comply with the requirement of this clause as to removal of scaffolding, surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion of the works, the Client may at the expense of the Contractors remove such scaffoldings, surplus materials and rubbish and dispose of the same as it thinks fit and clean of such dirt as aforesaid, and the Contractors shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials aforesaid, except for any sum actually realized by the sale thereof.

5. Extension of time:

If the Contractors shall desire an extension of time for completion of the work on the ground of his having been unavoidably hindered in its execution or on any other ground he shall apply in writing to the Client through the Consultants within 15 days of the schedule date of completion on account of which he desires such extensions as aforesaid and the Client shall if in his opinion (which shall be final) finds reasonable grounds, authorizes such extension of time if any as may deem in his opinion necessary and proper. Any extension of time even if granted shall be without prejudice to Client's right to recover loss or damages suffered from delay in waiver thereof. Any application for extension of time made by the Contractor after the expiry of due date for completion of the work as per Terms of Contract and the Work Order shall not be entertained or be deemed to be valid. The contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not. Liquidated damages at the rates specified in Appendix to form of tender shall be levied on the Contractor for the period of delays attributed to him.

6. Contractors to supply plant, ladders, scaffoldings etc:

The Contractors shall supply at their own cost materials, plant, tools, appliance, implements, ladders cordage, tackle, scaffoldings and temporary works requisite or proper for the execution of the work.

7. Execution of additional work:

The Contractors shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and in every other respect in strict accordance with the specifications. The Contractors shall also conform exactly, fully and faithfully, to the designs, drawings and instructions in writing relating to the work. Any additional work which the Contractors may be directed to do as the part of the original work shall be carried out by the Contractors on the same basis in all respects on which they have agreed to do the main work at the same rates as are specified in the Tender for the main work provided that if any additional or altered work includes any class of work for which no rate is specified in this Contract, then such class of work shall be carried out at the rate mutually agreed upon between the Client/Consultants and the Contractors having regard to the nature of the said work and the rates of the main work. The rate of such item shall be derived on the basis of rate analysis considering prevailing market rates for labour and material and as per CPWD method. The Contractors shall however, have no claim or compensation by reason of any alternations having been made in the original specification etc., which may entail any curtailment of the work as originally contemplated.

8. No compensation for alternation in or reconstruction of work to be carried out:

If at any time after the commencement of the work the Consultants shall, for any reason whatsoever, not require the whole or any part of the work as specified in the Tender to be carried out, the Consultants shall give notice in writing thereof to the Contractors who shall have no claim to any payment of compensation whatsoever on account of any profit or advantages which he may have derived from the execution of the work in full but which he did not derive in consequence of the full amount of work not having been carried out and having been cancelled by the Client. Neither shall they have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall be involve any curtailment of the work as originally contemplated.

9. Work to be done to the satisfaction of the Consultants and Client:

The Contractors shall carry out and complete the work in accordance with this Contract and the directions, in every respect, to the entire satisfaction of the consultants and Client. If the Contractors shall find any discrepancy in or divergence between the Contract, Drawing and/or Schedule of quantities, they shall have to apply in writing for any necessary instructions from the Consultants/client in relation thereto.

10. Defective work and materials:

If at any time before the Security Deposit is refunded to the Contractors it shall appear to Client or the Consultants that any work has been executed with unsound, improper or unskillful workmanship or with materials of inferior quality or not otherwise in accordance with the Contract, it shall be lawful for the Client or the Consultants to intimate this fact in writing to Contractors either in the site order book or by letter thereupon. The Contractors shall be bound forthwith to rectify or remove and reconstruct the work so specified in whole or in part and provide with proper and suitable materials at their own charge and cost to the entire satisfaction of the Consultants. In the event of the Contractors failing to do so within a period to be specified by the Consultants. The Contractors shall be liable to pay compensation at the rate of one percent of work order value per day, not exceeding ten days of the value of the Whole Work Order. In the case of any such failure the Consultants may rectify or remove and re-execute the work or remove and replace with others the materials or articles complained of, as the case may be, at the risk and expense in all respects of the Contractors.

11. Client not to be liable for temporary suspension in work:

The Contractors shall on being so directed by the Consultants postpone any work to be executed under this contract and/or suspended further progress of all or any part of the work and shall not resume execution of the same until they receive written orders from the Consultants to proceed. The Contractors shall not be entitled to claim any payment from Client for damages arising from the postponement or suspension of such work.

12. **Measurement of work to be covered:**

The Contractors shall give at least 15 days notice in writing to the Consultants and their authorized site representatives / Client before covering or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof taken before the said work is so covered or placed beyond the reach of measurement. Without such notice having been given or consent obtained the same shall be uncovered at the Contractors expense, for taking such measurements and dimensions. In default thereof Client shall not make any payment or allowance for such work or the materials with which the same is executed.

13 Measurement / Assessment of work:

All work to be done under this Contract shall be in accordance with the mode of measurement mentioned in the tender. Any item not mentioned in the tender shall be measured as per the procedure laid down in relevant ISI standards (Bureau of Indian Standards - latest edition). Detailed measurements of works carried out shall be taken jointly by the representatives of the client / Consultants, in the presence of the Contractor's representative and final payment will be made as per measured quantities and not as per the tender quantities.

14. Defect Liability Period:

The Contractors has to maintain the work for 12 months after the work has been completed (the date of completion shall be one as recorded in virtual completion Certificate) the

Contractors shall maintain and uphold the same in an efficient condition and shall be bound to remove any omission or defects discovered or appearing in the work during such time as directed by the Consultants. The Security Deposit will be released to the Contractors only after the expiry of the aforesaid period and subject to it being ascertained that there is no defective work or material requiring repairs or maintenance under any conditions herein provided.

If the Contractors or their work people or servants shall break, deface, injure or destroy any part of the building in which they may be working or any building road, kerbs, fence enclosure, water pipes, cables drains, electric or telephone post or the work wires, trees, grass land or cultivated ground contiguous to the premises on which the work or any part of it is being executed or if any damage shall happen to the work, while in progress, from any cause whatsoever, or any imperfection become apparent in it within 24 months after completion date of entire works covered by the works order as indicated in the Final Measurement Certificate, the Contractors shall make the same good at their own expenses or, in default, the Consultants may cause to be made good through alternative means and deduct the expense from any sums that may be then or at any time thereafter may become due to the Contractors, balance Security Deposit / BG for RMD of the Contractors shall not be refunded before the expiry of twenty four months from the completion date indicated in the Completion Certificate.

15. Prevention of fire and insurance of works against fire etc.

The Contractors shall take all measures for prevention of fire to the proposed works building and any other buildings or other structures adjacent there to. Should any injury irrespective of whether it results in death or not to any life or damage to the property occur as a result of Contractors negligence to observe the preventive measures the Contractors shall be held responsible for the consequences thereof. If as a result of any fire the work under construction is in any event lost, damaged or destroyed, then irrespective of whether the Client may have made payment in respect of the said work or not, the Client will be entitled to claim compensation, reimbursement or further amount by reason of such reinstatement to the extent of the insurance money payable under the policy or up to a reasonable extent the cost of such reinstatement, if the cost exceeds the quantum of insurance money payable under the policy as may be considered reasonable by the Consultants.

The Contractors will be required to take out without claim to any extra a proper and effective insurance policy CAR POLICY from any nationalized Insurance Company approved by the Client fully insuring against loss or damage by fire, storm tempest, lightning flood, earthquake, aircraft or anything dropped there from, aerial objects, riots and civil commotion or other risks as indicated by the employer and it's satisfaction for:

(a) CAR POLICY for 125% of the Contract Value. (Contract Value plus 25% of the Contract Value).

(b) Work man compensation policy – 100% of contract value.

(c) Third party Liability - Rs. 10.00 Lakhs

Should the Contractor fail to take out such insurance cover, the Client may itself insure against the said risks and deduct a sum equivalent to the amount paid by the Client towards premium from any moneys due to or become due to the Contractor. The benefit of any such insurance

policy shall be assigned in favor of the Client and such assignment shall be duly registered with said Insurance Company. The Contractor agree that the insurance moneys payable under such insurance policy shall be utilized by Client for reinstating the work affected by such fire or other risk.

The Contractor shall indemnify Client against all claims made against Client by any member of the public or other third party in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain until the Completion of the works, a policy of Insurance with an approved office, in the joint names of Client and the Contractor (clients name will appear 1st of the policies) against such risks and deposit such policy or policies with the Client from time to time. All the policies shall be valid till the date of completion and handing over of the work to the Employer.

16. Transfer or assignment of Contract:

This contract shall not be assigned or transferred or sublet in any manner whatsoever without the previous written approval of Client. If the Contractors shall assign or transfer or sublet or attempt to do so, Client may by notice in writing rescind the Contract and in that event the security Deposit of the Contractors shall stand forfeited and be absolutely at the disposal of the Client and the same consequences shall ensure as if this Contract had been rescinded under clause 24 hereof and in addition thereto the Contractors shall not be entitled to recover or to be paid for any work thereto performed under this Contract.

17. Insolvency attempts to bribe etc.:

If the Contractors become insolvent or commence any insolvency proceedings or make any compensation with their creditors or attempt to do so, or if any bribe, gratuity, gift, loan requisites reward or advantage whether pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Contractors or any of their servants or agents to any officer or persons in the employment of Client in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the Contract, Client on behalf of the Chairman shall have the power to adopt any of the courses specified in clause 24 shown as he may deem best suited to the interest of the Bank and in the event of any of these courses being adopted the consequences specified in the said clause 24 shall ensue.

18. Change in Constitution:

Where the Contractors are a Partnership Firm, the previous approval in writing of Client shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu Undivided Family business concern, such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the work hereby undertaken by the Contractors. If previous approval as aforesaid is not obtained, the Contractors shall be deemed to have been assigned in contravention of clause mention in contract hereof and the same action may be taken and the same consequence shall ensue as provided in the said Clause in works contract. The Contractors shall hand over to Client a certified true copy of the Deed of Partnership, which is entered into by the Contract or to with Client as evidence of the names of

the partners and of their shares in the said partnership. In the event of the Contractors being a Joint Hindu Undivided Family business concern the Contractor shall also hand over the full names, address and ages of the co-partners or members concerned and duly satisfy Client that such Joint Hindu Undivided Family has authority and power in law to enter into the said Contract. These Documents and particulars aforesaid shall be handed over by the Contractors to Client along with the quotations and offer placed by the Contractors in response to the notice inviting tenders.

19. Engagement of Apprentices:

The Contractor shall during the currency of the Contract when called upon by the Consultants engage and also ensure engagement by subcontractors and other employed by the Contractor in connection with the works, such number of apprentices in the categories mentioned in the Act 1961 and the Rules made there under and shall be responsible for all obligations of the employer under or as required under the said Act.

20. Workmen's Compensation liability:

The Contractors shall be responsible for and pay any compensation as specified in the Workmen's Compensation Act, 1923 and 1933 and amendments thereto for injuries caused to the workmen. The Contractor shall be responsible for and pay the expenses for providing medical treatment to any workmen who may suffer any bodily injury as a result of any accident. The Contractors shall be liable for all payments to their staff, labourers and workmen employed for the performance or carrying out the said work and the Client shall in no event be liable or responsible for any payment and the Contractors shall keep Client indemnified against the same and from all proceedings in respect thereof. The Contractors shall at his own expense effect and maintain during the currency of the Contract, a policy of Insurance with an approved office, in the joint names of Client and the Contractor against risks under the Workmen's compensation Act or any other statute in force during the currency this Contract and Deposit such policy or policies with Client from time to time.

21. In every case in which by virtue of the provisions of Section 12, Subsection (1) of the Workmen's Compensation Act, 1923 Client is obliged to pay compensation to a workmen employed by the Contractors in execution of the works, Client will recover from the Contractors the amount of the compensation under subsection (2) of section 12 of the said Act and Client shall be at liberty to recover such amount or any part thereof by deducting it from the Security Deposit or from any sum due by the Client to the Contractors, whether under this Contract or otherwise. Client shall not be bound to contest any claim made against it under sub-section (1) of Section 12 of the said Act, except on the written request of the Contractors and upon their giving to Client full security for all costs for which Client might become liable in consequence of contesting such claim. The contractor shall also submit an Indemnity Bond to the client on the approved proforma regarding workman compensation.

22. The Consultants may require the Contractors to dismiss or remove from the site of the work any person or persons in the Contractors' employment who in the opinion of the Consultants may be incompetent or misconduct himself or themselves and the Contractors shall forthwith comply with such requirements

23. Indemnity:

The Contractors shall assume all liability for and give to Client a complete indemnity against all actions, suits, proceedings, claim or demands arising out of or in connection with the carrying out of the work by or from any person whomsoever. In this connection the contractor shall submit an Indemnity Bond on the proforma approved by employer covering Indemnity for all claims or demands including workman compensation.

24. Determination of contract on account of abandonment of work:

The Consultants may without prejudice to the rights of Client against the Contractors mentioned in clause of the Agreement or in respect of any delay or inferior workmanship or otherwise or to any claim for damages in respect of any breach of Contract and without prejudice to any rights or remedies under any of the provisions of the Contract or otherwise and whether the date for completion of the works has or has not expired by a notice in writing absolutely, determine the Contract in any of the following cases:

(i) If the Contractor having been given by the Consultants a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner and shall omit to comply with the requirements of such notice for a period of seven days of such notice thereafter or if the Contractor shall delay or suspend the execution of the work with the judgment of the Consultants (which shall be final and binding) they will be unable to secure completion of the work by the date for completion or he has already failed to complete the work by that date.

(ii) If the Contractor being a company shall pass a resolution or the Court shall make an order that the company shall be wound up or if a receiver or a liquidator on behalf of a creditor shall be appointed or if circumstances shall be appointed or if circumstances shall arise which entitle the Court to make a winding up order.

(iii) If the Contractor commits breach of any of the Terms and Conditions of this Contract.

(iv) If the Contractors commit breach of any acts mentioned in clauses 16 to 19 hereof.

When the Contractor have made themselves liable for action under any of aforesaid cases or in any case in which under any Conditions of this Contract the Contractors shall have rendered themselves to forfeiture of their Security Deposit or in cases of abandonment of work by the Contractors for any cause whatsoever, the Consultants on behalf of Client shall have a power to adopt any of the following courses as Client may deem best suited to their own manufacture:

(a) To rescind the Contract (of which recession notice in writing to the Contractor under the hand of the Consultants shall be conclusive evidence) and in that case the Security Deposit of the Contractors shall stand forfeited and be absolutely at the disposal of Client.

(b) To employ labour and to get supply of materials to carry out the work or any parts of works, debiting the Contractors with the cost of the labour and the price of the materials as to correctness of which costs and price of the materials as per the certificate of the Consultants which shall be final and conclusive against the Contractors.

(c) To order that the work of the Contractors be measured by and to take such part thereof as shall be unexecuted out of their hands and to give it to another Contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been payable to the original Contractors if the whole work had been executed by them (as to the amount of which excess of expense, the certificate in writing of the Consultants shall be final conclusive) shall be borne and paid by the original Contractors and shall be deducted from any money due to them by Client under the contract or otherwise or from the Security Deposit or a sufficient part thereof.

In the event of any one or more of the above courses being adopted by the Consultants, Contractors shall have no claim to compensation for any loss sustained by them by reason of their having purchased or procured any materials or entered into any engagements or made any advance on account or with a view to the execution of the works or the performance of Contract. And in case action is taken under any of the provisions aforesaid, the Contractor shall not be entitled to recover or be paid any sum for any work actually performed under this Contract unless and until the Consultants has certified in writing the performance of such work value payable in respect thereof and the Contractors shall be entitled to be paid the value so certified subject to the claims if any of Client against the Contractors.

25. Termination of contract in the event of death of Contractor:

Without prejudice to any of the rights or remedies under this Contract, if the Contractor being an individual dies, the Consultants shall have the option to terminate the contract without any liability on the Client for compensation or damages to the Contractors. Measurement of work done till the death of the Contractor will be recorded by Client which shall be final and binding on the legal representative of the Contractor.

26. Substitution of Contractors:

Client may if desired may take possession of all or any of the machines, tools, plants, materials and stores in or upon the works or the site thereof or belonging to the Contractors or procured by them and intended to be used for the execution of the works or any part thereof by paying or allowing for the same an amount at the Contract rates or in the case of Contract Rates not being applicable at current market rates to be certified by the Consultants and the certificate thereof shall be final. The Contractor shall not have any claim on the materials that have not been actually brought on site of work irrespective of the fact that the Contractor may have purchased the same for use under this Contract. Client shall have also full power by giving notice in writing by the Consultants or through the Consultants to the Contractors or any of their representatives or authorized agents to require them to remove such machines, tools, plants, materials and stores from the premises within time to be specified in such notice and in the event of the Contractor failing to comply with any such requisition the Client may remove them at the Contractor's expenses or sell them by auction or private sale at the risk and on account of the Contractors in all respects and the certificates of the Consultant as to the expenses of any such removal and the amount of proceeds and expense of any such sale shall be final and conclusive.

27. Any breach or violation or non-observance of any of the Terms and Conditions and provisions contained in the agreement or the General Terms or otherwise in relation to the Contract or

Works Order shall be deemed and considered as a breach of the entire Contract and entitle the Client to exercise and enforce the various rights and powers conferred on Client under the Contract.

28. Infringement of Patents:

The Contractor shall assume all liability and fully indemnify and save harmless, Client, their successors or assigns from and against all claims, suits, proceedings, damages, losses, expenses, fees, any royalties, arising from any infringement, real or claimed, of any patent on any articles, machine manufacture, structure, composition, arrangement, improvement, design, device, methods or progress embodied or used in the performance of this contract. The Client and their successors and assigns will give written notice of all such claims and patent infringement suits or proceedings instituted against them to the Contractor who will defend the same and will give the Contractor authority, assistance and all available information to enable them to do so.

29. Escalation :

No escalation is allowed /permitted in quoted rates in the tender the same should be valid at least for completion of the project from the date of awarding the job to the successful contractor.

29A.Contract Agreement:

Contractor shall execute the contract agreement on the proforma given in Annexure I to this document immediately after issue of work order. Employer shall not make any payment to the Contractor before execution of contract agreement..

30. Initial Security Deposit

The Contractors shall within seven days of issue of acceptance letter (LOI) or before the execution of this Agreement deposit with the client a sum of equivalent to 2.5 % of accepted contract value by demand draft in favour of MPCB. The client shall not be liable to pay any interest to the Contractors on the amount of such Security Deposit and shall hold this amount as a guarantee for timely and proper performance of the said work by the Contractors. The said amount shall be liable for forfeiture in addition to all other rights and remedies which are available to the client under the said General Conditions of Contract.

31. Retention Money Deposit (RMD)

An amount equivalent to 10% of the value of each interim bill shall be deducted from interim bills of the contractor towards RMD, subject to a maximum limit of 10% of contract value inclusive of Initial Security Deposit.

32. Appropriation of Security Deposits towards The client's Dues.

All sums by way of damages, Compensations or otherwise howsoever and all other sums of money payable by the Contractors to The client under the terms of this Agreement or the said Work Order may be deducted from the cash amount of the Security Deposit or be realized from the Demand Draft of the Initial Security Deposit lying with The client under this

Agreement or from any sums which may be due or may become payable by the client to the Contractors on any account whatsoever and in the event of the Contractor's Security Deposit being reduced by reason of any such deduction or as aforesaid, the Contractors shall, within 15 days thereafter, make good in cash or DD / Government securities approved by The client and endorsed as aforesaid any sum or sums which may have been deducted from, or raised by the DD, cash or Security Deposit or any part thereof. Subject to the other provisions of this Agreement and the General Conditions of Contract relating to the right of the client to retain and deduct any amount that may be due to The client on any Payment for Work done account whatsoever the 50% of total Security Deposit made by the Contractors shall be refunded after the completion of the work in all respects. This date will be the same as indicated in the completion Certificate. Balance 50% of SD (i.e 5% of contract value) retained in cash shall be refunded after completion of defects liability period of 12 months and on issue of final completion certificate. The client on the request of Contractor may release this balance SD (RMD) of 5% against Demand Draft from a nationalized Bank valid for defects liability period of 12 months on the proforma approved by the Client.

33. The client will pay to the Contractors in respect of the said work mentioned in the said contract document on the basis of the rates specified therein at the times and in the manner specified in the said Work Order and/or in the General Conditions of Contract.

34. Manner and period in which the work is to be carried out

The Contractors agree and undertake to duly perform and execute and complete the said work set forth in the contract documents and the subsequent amendments, if any, issued from time to time thereto in the manner authorized by and under the General Conditions of Contract. The said work shall throughout the stipulated period of the Contract be proceeded with all due diligence, promptness, care and accuracy and in a workman like manner to the satisfaction of Consultants and The client and would be completed in accordance with the said Specifications, Designs, Drawings, Schedule of quantities and instructions on or before the due date mentioned in the said Contract agreement, time being the essence of the Contract on the part of the Contractors.

35. Compensation for delay for unfinished work

Without prejudice to the rights and remedies of the client against the Contractors under any of the provisions of this agreement and the General Conditions of Contract or the said Work Order or otherwise if the Contractors commit any default or breach of the Terms and Conditions of this Agreement and/or the General Conditions of the Contract and/or the said Work Order or fail in the due performance thereof within the time fixed by the Contract (which is the essence of the Contract) and do not complete the entire work on the stipulated due date, The client shall be entitled to recover from the Contractors and the Contractors hereby agree to be bound to pay to the client as and by way of Compensation or liquidated damages, an amount calculated at the rate of 1% (1 percent) of the contract value per week or part there of subject to maximum 10 % (Ten percent) of the contract value for delay beyond stipulated date of completion as mentioned in the Contract / Work Order and both the parties hereby confirm, record and declare that the amount of compensation or liquidated damages fixed as above represent the genuine, fair and reasonable pre-estimate thereof considering all the facts and circumstances as the loss and damages that would be likely suffered by The client on account thereof. It is further hereby agreed and confirmed that the

sum payable by the Contractors under this provision shall be considered as reasonable compensation irrespective of whether actual loss or damage has or has not been sustained and The client would not be required to render any proof in support thereof. Liquidated damages / compensation for delay shall not be recovered for the delays which are not attributed to the Contractor and client has authorized extension of time for such delays.

It is further specifically declared that any extension of time granted by The client shall not amount to abandonment, waiver against The client of its claim for compensation or liquidated damages under this provision and the acceptance of delivery of any item of the work by The client will not be deemed to constitute any waiver of The client's right nor shall be deemed to be executed completely only when full and final measurements duly certified by The client and the Consultants have been made and till then the Contractors shall not be deemed to be discharged or absolved from all their obligations in terms of the Contract including specifically the provision relating to the payment of reasonable compensation and damages as aforesaid. It is specifically agreed and declared that in the event of the Contractors not completing the work even after the stipulated date, the aforesaid provision shall not be deemed to prevent or stop The client from exercising any other rights or remedies available to The client against the Contractors including the completion of the work through any other Contractor or agency or otherwise however at the risk and the account of Contractors and The client shall be entitled to recover and the Contractors shall bound to pay all such losses and damages to The client rights and remedies which are available to The client under clause of works contract of the General Conditions of the Works Contract.

36. Supervision of work

In addition to adequate number of technical supervisory staff, the Contractors shall keep constantly at the work site a competent Engineer or such other competent person as may be required to set the work. Any direction or explanation given by The client's or the Consultant's authorized representative to such person in writing shall be held to have been given to the Contractors.

37. Inspection of Work

Site engineers deputed by the consultant shall supervise the work constantly and inspection will be made periodically during the progress of the work by the representative / representatives of The client as well as by the senior representative of the Consultants and all materials and workmanship must be of acceptable quality and efficiency to the said representatives. The decision of the Consultants in this respect will however be final and binding on the Contractors. If the progress of any particular portion of the work is unsatisfactory, The client shall notwithstanding the fact that the general progress of the work is satisfactory, be entitled to take action after giving the Contractors 15 days notice in writing and the Contractors will have no claim for compensation for any loss sustained by them owing to such action. All works under or executed in pursuance of this contract shall at all times be open to the inspection and supervision of The client and their authorized representatives and agents as well as the Consultants or their representatives.

38. (a) It is specifically and distinctly understood and agreed to between The client and Contractors that the Contractors shall have no right, title or interest in the site made available by The client for execution of the works or in the building structures or works executed on the

said site by the Contractors or in the goods, articles, materials, etc., brought on the said site (unless the same specifically belongs to the Contractors) and the Contractors shall not have or deemed to have any lien whatsoever charge for unpaid bills nor will be entitled to assume or retain possession or control of the site or structures and The client shall have an absolute and unfettered right to take full possession of the site and to remove the Contractors, their servants, agents and materials belonging to the Contractors and lying on the site.

(b) The Contractors shall be allowed to enter upon the site for execution of the works only as a licensee and shall not have any claim, right, title or interest in the site or the structures erected thereon and The client shall be entitled for such license at any time without assigning any reason.

39. Measurement of work

As soon as the item of work is completed, notice thereof should be given forthwith by the Contractors to the Consultants. A representative of the Consultants / Site Engineer representative will then measure the work completed and record the measurements in measurement books (MB) supplied by the client which will constitute the basis for payment of such works by The client to the Contractor. The Contractor shall sign each and every Measurement sheet and Certificate in token of acceptance thereof. Client's representatives / Engineer shall have right to check / verify the measurements jointly recorded by the contractor and consultant's representative. The contractor shall submit the bills in duplicate on the proforma approved by the consultant / client along with all supporting papers to consultant for certification.

40. Provisional Payment

No payment shall be made for any item of works till the whole of the item shall have been completed and certified by the consultant. The client may however at their option and on recommendation of consultant pay to the Contractors provisional amount (part rate) proportionate to the part of the work as approved and passed by Consultants. The certificate of such approval and passing of the part sums so payable shall be final and conclusive against the Contractors.

41. Final payment

The final measurement Certificate / Bill shall be prepared by the Consultants and Contractors within three months from the date of completion of the work subject to the claim of The client against the Contractors for compensation or liquidated damages or otherwise as provided in the said Contract, agreement and the General Conditions of Contract. (50% of the total security deposit (including initial security deposit) shall be refunded to the contractor on issue of completion certificate.

42. Bills to be in The client's prescribed form

The Measurement Certificate/Bill shall be prepared jointly by the Consultants' representative and Contractors and shall be submitted in duplicate along with all the supporting documents to the consultants for certification.

43. Liability for payment of taxes, duties etc.

The Contractors shall be bound and liable to pay GST, work contract tax, income tax or any taxes to Govt. / other public authorities. Under no circumstances shall The client be liable to pay any such taxes, ceases, duties etc. on the work order or any part or component thereof or any materials or stores bought by the Contractors or supplied by The client or otherwise howsoever to the end and intent that all such liabilities shall be borne and discharged solely by the Contractors who shall keep indemnified The client against the same.

44. Settlement of dispute and Differences

a) The Contractor shall try to settle all matters pertaining to this contract first with the Consultant. The decision of the Consultant may be in the form of a certificate, instruction or otherwise. The decision, opinion, direction, certificate for payment with respect to all or any of the accepted matters (which are indicated hereinafter), of the Consultant shall be final and conclusive and binding on the Contractor and shall be without appeal.

b) All other disputes and differences of any kind whatsoever between the Contractor and the Consultant arising out of or in connection with the contract or carrying out the works (whether during progress of work or within defects liability period and whether before or within 365 days of determination / abandonment / breach of the contract) shall then be referred by the Contractor to the Employer giving interalia full details of matter under dispute and the reasons thereof. The Employer shall within a period of 60 days from the receipt of such reference from the Contractor, give his decision in writing. If the Contractor is dissatisfied with the decision of the Employer, or if the Employer does not convey his decision within 60 days, he can refer the matter for arbitration by serving a written notice on the Employer, through the Engineer within a period of 28 days of such decision. The notice shall specify the matters with full details and amount which are in dispute and referred for arbitration. However if the Contractor does not make any demand for arbitration in respect of any claims within 60 days of receiving the intimation from the Employer that the final bill is ready for payment, the claim if any received after 60 days period shall be absolutely barred from reference to the arbitration.

45. Arbitration

The disputes and differences between the Contractor and the Employer arising out of this contract shall be referred to a sole arbitrator. The sole arbitrator shall be selected by the Contractor from a panel of 3 arbitrators suggested by the Employer. The arbitration proceedings shall strictly be according to the Arbitration and Conciliations Act-1996 or any statutory modification thereof. The place of arbitration shall be at Mumbai.

The arbitrator shall have power to open up, review and revise any certificate, opinion, decision, requisition or notice and any matter required in his opinion, save in regard to excepted matters referred to in the Clause no. 46 and to determine all matters in dispute which shall be submitted for arbitration.

The arbitrator shall make his award within 1 year (or such further expected time as may be decided by him with the consent of the parties) from the date of entering on the reference. In case, during the arbitration proceedings the parties mutually settle / compromise or compound their dispute or difference, the reference to arbitration and the appointment of the Arbitrator shall deemed to have been revoked and the arbitration proceedings shall stand withdrawn or

terminated, with effect from the date on which the parties file a joint memorandum of settlement thereof, with the Arbitrator.

This submission shall be deemed to be a submission to arbitration within the meaning of the Arbitration & Conciliation's Act – 1996 or any statutory modification thereof.

It is agreed that the Contractor shall not delay the carrying out of the works by reason of any such matter, question or dispute being referred to arbitration, but shall proceed with the works with all due diligence and shall, until the decision of the Arbitrator is given, abide by the decision of the Consultant and no award of the Arbitrator shall relieve the Contractor of his obligations to adhere strictly to the Consultant instructions with regard to the actual carrying out of the works. The Employer and the Contractor hereby also agree that arbitration under this Clause shall be a condition precedent to any right of action under the contract.

46. Excepted matters

Following matters referred in General Conditions (GCC) and special conditions of contract

(SCC) shall be considered as excepted matters.

GCC –	Clause no 4 (Completion of work)
	Clause no 5 (Extension of time)
	Clause no 10 (Defective work and material.)
	Claues no 13 (Measurement of work)
	Clause no 16 (Assignment)
	Clause no 35 (Compensation for Delay)
SCC-	Scope of work
	Clause no 9 (Testing of work and material)
	Clause no 11 and 12 (Measurement and dimensions)
	Clause no 25 (Mock up)

47. Extra items

The contractor is required to execute the tender items only at site as per the requirements of client. Non-tender items i.e. extra items shall not be executed under any circumstances before taking approval from client/consultants. Incase it is required to execute such items on sites, contractor shall intimate the same to the consultant & client & will have to produce the expected quantity of that particular item after taking site measurements & the lowest possible

rate supported with rate analysis along with necessary supporting invoices, quotations duly certified by Consultants. The contractors OH & profit shall be 10 %, + Work contract tax @ 4 % of final rate to be added. The Project-in-charge from clients end shall reserve the right of checking, correcting & certifying the rate jointly with Consultants representative & permission of executing such items shall be given after entire satisfaction of rate analysis produced by contractor. As far as possible, the rates for extra items shall be derived from the rates quoted by the contractor for other similar item in the tender.

48. Deviated Items

Contractor shall not execute any deviated item without the written permission from the consultant / client. The rates for such deviated items shall be derived from the tender items.

49. Mobilization Advance

A mobilization advance up to 10 % of the contract value can be paid by the client on request of the Contractor against Bank guarantee. This advance shall carry a simple interest of 10% p.a. and secured against Bank guarantee issued by a Nationalized / Scheduled Bank of principal plus interest. The mobilization advance shall be recovered proportionately from interim bills so that the entire amount and interest thereon shall be recovered when 80% of the work is completed and billed or within 4 months from date of commencement.

50. Secured Advance against materials brought at site.

The Contractor will be paid secured advance against materials brought and stacked at site for use in permanent work and in the opinion of Consultant are required to be procured in advance. The advance paid shall be maximum up to 65% of the item rate as decided by the Consultant or 75% of the net cost of material stacked at site upon submission of "Indenture for Secured Advance" as per proforma given in Annexure – at the discretion of Consultant and the Contractor shall produce necessary vouchers / invoices in support of cost of each materials. Such advance shall not be paid on materials which are perishable and consumable in nature.

The advance granted on materials as above shall be adjusted / recovered from the bills after the materials are used in the work. The Contractor cannot remove the materials from site without written consent of the Consultant and Contractor shall be liable for loss or damages to such material.

Grant of advance against material stacked at site shall not be deemed to imply any approval by the Consultant for materials and so it shall not prevent the Consultant for rejection of any material at any time.

51. The cost of each item shall be quoted after deducting the discount and inclusive GST , transportation, loading ,unloading at site, wastage and any other levies etc.

52. No extra charges shall be paid for Insurance, Transportation etc.

53. The bidder is expected to examine all instructions mentioned in tender documents forms and terms & conditions.

54. Failure to furnish all information required by the tender documents or submission of all documents, not substantially responsive to the tendering document in every respect will be at

the risk and may result in the rejection of bid.

55. This call of e-tender does not bind the M.P.C.B. to place order. The offer/Bids submitted in response to this invitation may be rejected without assigning any reasons.

56. The Board at its discretion may extend the last date of submission of tender and opening of tenders. The authority does not bind itself to accept the lowest e-tender and is vested with authority to reject any or all of the tenders received without assigning any reason.

57. Documents enclosed in the e-tender, shall become the property of M.P.C.B. without any payment.

58. In case of dispute, the decision of Member Secretary, Maharashtra Pollution Control Board shall be final.

59. The proposal from the firms / Bidders putting their own terms and conditions will be rejected.

60. The validity of the tender will be for the duration of 03Months

61. Each folio of the tender document shall be signed by the bidder otherwise the bid will be treated as rejected.

62. The e-tender must be filled in English and all the entries must be made by hand written in ink or may be typed. If any of the document is missing, or unsigned tender will be considered invalid.

63. The prospective bidder shall have not been disqualified by the Maharashtra Pollution Control Board for any reason for specific period.

64. The price bid of only those bidders will be opened whose Pre-qualification Criteria (schedule - I) are found to be acceptable.

65. The e-tender shall contain no interlineations erasures or overwriting of words except as necessary to correct errors made by e-tenders, in which case such correction shall be initialized by the person or persons.

66. Bids received after due date and time mentioned in the tender notice shall not be accepted.

67. In no case hard copy of tender should be handed over to any employee of the Board.

68. Canvassing in any form will disqualify the tender.

69. All tenders shall be addressed to:

The Member Secretary,
Maharashtra Pollution Control Board, Kalpataru Point, 3fd & 4th Floor, Sion Matunga Scheme Road No.8, Opp. Sion Circle.
Sion (East), Mumbai - 400 022, Tel No. 24010437, 24086916.

70. Earnest Money of the unsuccessful bidder will be refunded without any interest after the tender is finalized or within one month whichever is earliest and that of successful bidder will be refunded without any interest after 04 months of the finalization tender or can be readjusted as a security deposit, on their request.

71. The successful bidder shall deposit Rs. 1,00,000 as a security deposit in the form of D.D. drawn in favour of **Maharashtra Pollution Control Board** which will be refundable, without interest, after the successful completion of the contract period.

72. In case of any dispute, the Mumbai is the jurisdiction.

Date:-

Place: - (Name & Seal & Signature of Bidder)

SPECIAL CONDITIONS OF CONTRACT (SCC)

Scope of Work

The scope of work consist of the work of addition & alteration in the existing 2nd, 3rd & 4th floor office with the existing set-up i.e. SITC of Electrical Panels , Distribution Boards, Electrical fittings/fixtures/lights etc, under floor raceway, LAN networking, Earthing, Cabling and cable trays, Fire Alarm and detection system, Public Address system, CCTV wiring, Rodent repellant system, interior work etc.

1. **Time Limit**

   The entire work shall be completed within the stipulated days as per the tender notice from date of commencement (i.e 02 Months).

2. **Terms of Payment**

   The following terms of payment shall apply:

a) MPCB may pay 10% of the Contract value as mobilization advance against Bank Guarantee, on acceptance of work order. The mobilization advance shall be interest bearing (@ 10% simple interest).

b) 10% mobilization advance paid will be adjusted on pro-rata basis from certified bill amount.

c) Entire amount of advance together with interest will be recovered by the time bill for 80% of contract value is certified or within four months from the date of commencement.

d) Any work done at factory will not be counted in the 75% running account bills until the material is brought to the site of work.

e) Minimum value of first and second running bills shall be at least 10% of work order value and subsequent bills shall be15% of the work order value. Any bill of lesser amount shall be processed or rejected as per Project-in-charge's description.

f) Retention money @10 % shall be retained from every running bill subject to a maximum of 10% of contract value including ISD and the 50% of total SD shall be released on completion of work and balance 50% shall be released after completion of defects liability period of 12 months and on issue of Final Completion Certificate.

g) No payment shall be made to the Contractor unless the contract agreement is executed and all insurance policies as stipulated in the tender are taken and submitted to the Employer.

4. **Right to distribute work**

   The Consultants/Client reserve all rights to divide, distribute the tender items to more than one agency, delete any item or operate items quoted as rate only.

   After Consultants / client’s approval, the manufacturing of loose furniture can be carried out at the Contractors factory/premises and the rates quoted should be inclusive of free delivery to the site.

5. **Identity Cards**

The Contractor shall be given approved identity cards to all his workers, which will have to be produced by the Contractors' workmen as and when demanded by the Consultants / Client's representatives or Security men.

6. **Electric Supply & water supply**

The contractor shall make his own arrangement for power and water required for the work and pay the charges for the same. In case the power is provided by client, contractor shall install a Electrical sub meter and pay the bill as per actual power consumed in the works.

7. **Program of work and progress reports.**

The successful Contractor will have to submit a detailed Bar Chart indicating the schedule of various activities from the date of commencement till completion and get the same approved by the Consultants/Client. Once the Bar Chart is approved by Client, Contractor shall strictly adhere to the same. This program shall form part of the Contract and shall be binding on the Contractor. However, the Client reserves the right to alter the program, if necessary, from time to time. No claim whatsoever of any nature by the Contractor on his account shall be entertained by Client. They shall also have to indicate their requirements about co-ordination from other agencies working at site. In addition to this, following further information should also be furnished by the contractor.

(1) Nature of labour force required for the work.

(2) Material procurement program.

(3) Details of machinery/equipment to be used.

(4) Details of work to be executed at site and in Contractor's factory/shop.

(5) Requirements of electric power at site.

(6) Arrangements made for Contractor's own security.

(7) Requirement of funds requirement from time to time to be intimated in advance.

The Contractor will also have to furnish weekly progress report incorporating necessary details of work under execution.

8. **Office/Stores on the site**

The Contractor shall provide for all necessary storage on the site in a specified area for all materials, which is likely to deteriorate by the action of the sun, rain or other material causes due to exposure, in such a manner that all such materials, tools, etc., shall be duly protected from damage by whether or any other cause. All such stores shall be cleared away and the ground left in good and proper order on completion of this Contract unless otherwise expressly mentioned therein.

9. **Testing of works and materials and preparation of samples**

The Contractor shall, as required by the Consultants, arrange to test materials and/or portions of the works at his own cost in order to prove their soundness and efficiency. If after any such test, the work or portions of the works are found, in the opinion of the Consultants to be defective or unsound, the Contractor shall pull down and re-erect the same at his own cost. Samples of each class of materials and workmanship shall be submitted by the Contractor for the approval of the Consultants/Client before procurement and execution.

10. **Notice**

The Contractor shall comply with all acts and regulations for the successful completion of the Contract works and shall pay necessary attention to all notices and pay all fees / charges.

11. **Measurement to be recorded before work is covered up**

The Contractor shall take joint measurements with the Consultants' representative before covering up or otherwise placing beyond the reach of measurement any item of work. Should the Contractor neglect to do so, the same shall be uncovered at Contractor's expense or in default thereof, no payment or allowance shall be made for such work or the materials with which the same was executed.

12. **Dimensions**

Figured dimensions are to be followed in all cases. Large scale details take precedence over small scale drawings. In general, the drawings shall indicate the dimensions, positions and type of construction; the specifications shall indicate the qualities and methods, and the bill of quantities shall indicate the quantum and rate for each item of work.

Any work indicated in the drawings and not mentioned in the specifications or vice-versa, shall be furnished as though fully set forth in both. Any ambiguity, conflict of interpretation, errors or inconsistencies discovered in the drawings/documents shall be promptly brought to the attention of the Client and the Consultants. Generally, the provisions giving more rigorous interpretation shall prevail, but in the event of disagreement between the Contractors and the supervisor, decision of Project-in-charge shall be final. In case of any discrepancy, the Contractor is to ask for an explanation before proceeding with the work.

13. **Action where there is no specification**

In case of any class of work over which there is no specification mentioned, the same shall be carried out in accordance with the latest Indian Standard Specifications subject to the approval of the Consultants and Client.

14. **Clearing the site of works**

The Contractor shall clear the site of works as per the instructions of the Consultants. The site of works shall be cleared of all men, materials, sheds etc., belonging to the Contractor. The site shall be delivered back to the Client in a clean and neat condition as required by the Consultants within a period of one week after the job is completed. In case of failure by the

Contractor, the Client will have the right to get the site cleared at the risk and cost of the Contractor

15. **Occupation of partially completed portion by the Client**

The Client shall be entitled to and will be at liberty to occupy even the partially completed portion of the work by themselves or through their agents and servants if they so desire. Necessary extension of time for completing the work shall, however, be granted to the Contractor but he shall have no claim for any compensation whatsoever due to the delay, if any, involved in completing the work on account of partial occupation.

16. **Typographical or Clerical Errors**

The Consultants clarifications regarding partially omitted particulars or typographical or clerical errors shall be final and binding on the Contractor.

17. **Information to be furnished to Client on completion of work**

The Contractor, on completion of work shall furnish in a tabulated form, all pertinent and necessary information regarding the material, hardware, metal work, glass etc., used in the items of work. The information also to contain the names of such agencies who are specialized for certain items like melamine polishing, exclusive hardware etc. This tabulated information is to help the Client in maintaining their office after defects liability period is over.

18. **Performance Guarantee for all bought out items**

Contractor shall submit written performance guarantee for all bought out items from him as well as from manufacturers.

19. **As Built Drawings**

Contractor shall within one month of completion of work submit `As Built' drawings (original tracings and 3 sets of prints) of all the works carried out by him. Contractor will not receive final payment in case of failure to comply with this condition.

20. **Language of Tender**

"English" is the official language of Tender.

21. **Documents to be complementary**

All Sections of Contract Documents and working drawings shall be complementary to each other. In case of ambiguities, discrepancies or contradictions between any two sections, Client / Consultants' decision shall be final and binding on the Contractor for interpretation of same.

22. **Contractors Superintendence**

The Contractor shall appoint technically qualified and experienced persons to supervise the work at site. The Contractor shall obtain the approval from Client/Consultants about competence of such persons.

23. **Inspection by Contractor**

The Contractor shall inspect all the works and satisfy himself before same is offered for inspection to the Client/Consultants.

24. **Removal of Debris**

Contractor shall arrange to dispose off debris, wood shaving and any other waste product created while carrying out the work, outside Client's premises. The Contractor shall take due care while disposing of such waste materials and ensure that any rules/regulations laid down by Municipal / Client or any other statutory Body are not violated. The Contractor shall be responsible and answerable to any complaint arising out of improper disposal of wastage. Quoted rate shall include the cost of same and no extra payment shall be made towards this account.

25. **Mock-up**

The Contractor shall prepare a mock-up of each item, if required, strictly in accordance with the specifications **free of cost,** for approval of Consultants and Client. The work on these items shall proceed further only after the approval of the mock-up.

26. Rates quoted by the Contractor for the works to be carried out shall be valid for all floors including basement.

27. The Contractor shall submit original copies of invoices, order forms for any materials purchased for project work, to Client/Consultants.

28. The Contractor shall calculate realistic quantities after receipt of drawings and after submitting first interim bill but before submitting the second interim bill to Client/Consultants.

29. **Works at Night**

If the Contractor is required to work at night in order to complete the work within the time schedule, the Contractor shall provide and maintain at his own cost sufficient lights to enable the work to proceed satisfactorily without danger. Approach road to the site also shall be sufficiently lighted by the Contractor. No extra payments will be made for night work.

30. The rates quoted by the tenderer in the schedule of quantities will be deemed to be for the finished work and shall include all charges for:

a) Materials, Labour, maintenance, fixing, arranging, cleaning, making good, hauling etc.

b) Plant, double scaffolding, frame work, English ladders, ropes, nails, spikes, tools, materials and workmen, protection from weather, temporary supports, platform and the maintenance of the same.

c) Covering for the walling and other works during inclement weather or strikes or whenever directed, as necessary.

d) All temporary canvas, lights, tarpaulin, barricade, water shoots etc.

e) All measures required to be taken for protection of existing works.

f) All such temporary weather-proof sheds at such places and in a manner approved by the Consultants for the storage and protection of materials against the effects of sun and rain.

g) All testing of materials.

h) No tools and plants shall be issued by the Client under the Contract.

i) All present and future taxes, levies, duties, fees etc.

31. **Rates to valid for additional scope of work**

Rates quoted by the tenderer shall be valid for a period of 90 days from the date of awarding the tender or till completion of work whichever is later. If client decides to place work order for additional scope of work in the same premises or to amend the original work order for additional scope of work in the same premises, the contractor shall be bound to accept the same at rates contained in the original tender; provided such work order or amendment is issued prior to completion of the work contained in the original tender. However, any decision in this regard shall be taken by the client only.

32. **Dimensions written on drawings are to be followed. No scaling of any drawings shall be carried out at site by workmen/labor during execution of work. The clarifications, if any, required for the execution of any item shall be timely given by the client/consultants in weekly co-ordination site meetings.**

33. The running bills whenever submitted to the consultant for certification process should accompany the running measurement sheets containing those items which are billed in that particular running bill. The measurement sheets produced by the contractor should be jointly checked fully/partly as desired by the client/consultants.

34. No disturbances should be observed/ noticed in measured quantities written in measurement sheets & billed quantity for which the measured quantity takes precedence on billed quantity & the bill shall be corrected & certified accordingly.

35. No escalation is allowed/ permitted in quoted rates in the tender which should be valid at least for 90 days from the date of awarding the job to the successful contractor, or till the completion date, whichever is later.

36. Weekly site co-ordination meetings shall be conducted for the contractors working on site & proper intimation should be given to the client/consultants in order to monitor the project more efficient way. The relative decision for the execution of tender items shall be given in these meetings by client/consultants by producing working drawings/hand-made sketches if any. Contractors's, senior representatives / partner / director shall attend these meetings.

37. **Working on holidays**

The contractor is required to take permission from local authorities of client/consultants for working of extra hours at night & on public holidays by ensuring no inconvenience to inhabitants of the premises & other offices as well as neighbours. For timely completion of project, contractor is required to produce more labors & regular material supply as required on site as directed by consultants.

38. The contractor shall submit test report from the manufacturers of various materials used in the work as instructed by the consultant / client.

ADDITIONAL TERMS AND CONDITIONS OF CONTRACT

1. The work covered by the contract shall be carried out in accordance with the relevant specifications contained in the specifications Book-IS sttandards, published by Govt. of Maharashtra, P.W.D. department, as per the latest edition of the same (hereinafter called the standard Book of Specifications) subject further to the attached specifications. Where these two contradict, the latter holds good.

2. A work order will be maintained by Department, on the site of the work, and the Contractor will sign orders given therein by the Engineer in charge, his representative and his superior officers and comply with them.

3. The site of work shall be cleared by the Contractor before starting the work & after completing it to the satisfaction of the Engineer (which means the Engineer-in-charge or his representative). This will include cutting of trees, shrubs and removing grass, dismantling and removing remains of old masonry, loose boulders and stone etc. The cost of this will be deemed to have been included in the tendered rate for the several items.

4. The Contractor shall provide free of charge all labour and material required for lining out, surveying and measurement of work etc. He will similarly provide such aids as decided by Engineer in Charge, as are considered necessary for the proper and systematic execution of the work.

5. Where the proper measurement of work, it is necessary to have an initial setup levels taken, the same as recorded in the authorized field book by the Engineer in charge or his authorized representative will be signed by the Contractor who will be entitled to have a true copy of the same on demand. Any failure on the part of the Contractor to get such levels before starting the work will tender him liable to accept the decision of the Executive Engineer as to the basis of taking measurements. Likewise the Contractor will not cover any work which will render its subsequent measurement difficult or impossible, without first getting the same jointly measured by himself & the authorized representative. The record of such measurements on to department's side will be signed by the Contractor and he will be entitled to have a true copy of the same on demand.

6. All work before being finally taken over by MPCB will be entire liability of the Contractor for guarding, maintaining & making good any damage of any magnitude interim payments made for such work will not alter this position. The handing over by the Contractor & taking over by the Member Secretary, or his authorized representative, will be always in writing, of which copies will go to the member secretary, his authorized representative & the Contractor. It is, however, to understand that before taking over such work MPCB will not put it to its regular use distinct from casual/incidental one.

7. Orders issued by the member secretary of MPCB from time to time regarding the conduct of the work shall be binding on the Contractor.
8. The quantities, specified in the Contract are only approximate & may vary on either to any extent. No claims/demand for compensation/increased rate, shall be entertained for variation in quantities on higher/lower side to any extent.

9. It will be deemed that the Contractor before tendering has thoroughly inspected the work site & carried out his own investigations to arrive at the rates quoted in the tender. In this regard he will be given necessary information to the best of the knowledge of the Department but without any guarantee about its full Proofness.

10. Excavation items include, if met with, dewatering, whether specified or not and the rates quoted are deemed to be inclusive of this.

11. The material supplied or used in the work under this contract will be according to the following and other specifications herein the tender and those specified in the Standard Book of specification for the relevant items. Where these two contradict, the former holds good.

12. The tendered rates for supply of materials are for delivery of materials properly stacked in regular heaps or otherwise as directed for facility of measurement before use. In case of road materials the same will be stacked by the roadside as directed.

13. No material shall be removed from the road/land, except for excavation of gutters, or any other adjoining land unless permitted in writing subject to such conditions as the Exe. Engineer may specify. The Contractor is liable for the damages/compensation arising out of this condition.

14. Material will not be stacked at places where they are likely to be damaged or lost. The Contractor will have no claim for any loss on this account. If such material has been paid for and is subsequently lost before use in the work the Contractor will make good the loss.

15. Before staking any approved material, the same shall be freed from all foreign materials, if any. The material shall be stacked on cleared and leveled ground.

16. The order of collection and utilization of materials will be decided by Engineer in charge so as to ensure orderly work.

17. The materials will be stacked in a natural way without any attempt whatever to leave voids.

18. The measurement of the road and building materials shall be without any deduction for voids.

19. For the item so indicated, no materials will be used without first having been measured by regular stacks. The whole of the quantity of a particular material required for a sizeable section of work shall have been first collected before it can be measured & used. The same material will either have been all collected/the collection will not have been started at all before the material collected in the section under reference has been all used.

20. All materials used and supplied under the contract items shall conform to the specifications in the Standard Book on Specification and those given herein, if any, and in every case, a sufficiently large sample will be got approved from the Engineer in charge before hand before bringing any further quantities on site for use on work & these samples shall be maintained for all the time for verification of materials brought thereafter on the site.

21. Any material not conforming the approved sample shall be removed from the site forthwith & in any case not later than time specified by the Engineer in charge failing which the same will be removed & disposed of by Engineer in charge at the risk and cost of the Contractor, as he deems fir and the Contractor will have no claim whatsoever for the same. If at any time it is found that under specification materials (and also workmanship) have been used in the work notwithstanding the fact that the work has been carried out under the supervision of the department the Executive Engineer's decision as to how the case is to be disposed off will be final; he may get such work entirely removed or may accept it at any reduced rate in his unfettered discretion, including no payment whatever.

22. The Contractor will have to construct a shed for storing controlled and valuable materials issued to him under Schedule 'A' of the agreement, at work site, having double locking arrangement. The material will be taken for use in the presence of the departmental person. No material will be allowed to be removed from site of work.

23. Under no circumstances shall any Contractor be entitled to claim enhanced rates for any items in this contract.

24. The contractor shall study all the plans, specifications & other items & conditions of the contract carefully before tendering & shall also inspect the site & get self acquainted with nature of work & local conditions regarding the availability of labour, material, source & sufficiency of water supply required for the execution of the work and site conditions rivers, nalla's topography etc. existing roads, means of communications & access to site of work etc.

25. The Contractor shall, if necessary, construct temporary roads & maintain these in proper condition till the completion of work at his own cost. If necessary, he shall also at his own cost, make necessary arrangement for acquisition of land for construction of such temporary road or for any other purpose in connection with the execution of work.
26. The Contractor shall comply with all proper and legal orders & direction of local/public authority/municipality & abide by their rules & regulations and pay all such fees and charges which he may be liable to. No reimbursement of such fees and charges will be made by the Department.

27. The Contractor shall inform the Engineer-in-charge in writing when any portion of the work is ready for inspection giving him sufficient notice to enable him to inspect the same without regarding the further progress of work. The work shall not be considered to have been completed in accordance with terms of contract until the Engineer – In - Charge shall have certified in writing to the effect.

28. If Contractor desires to use any design/material/process covered by letter “patent” or “Copy Right”, it shall be responsibility of the Contractor to observe all legal formalities for the use of the same.
29. In the event of there being reasonable doubt as to the quality of workmanship & material used in the construction, the Engineer-in-charge may order to the contractor to satisfy the Dept. by carrying out suitable test of electrical materials or thereof.

30. The Contractor shall take all precautions, due care against by floods, rains, storms, out break of fire & accidents. No compensation will be allowed to the Contractor for his plants/materials lost, damaged by way of the above cause or other cause which in charge of the Contractor.

SAFETY CODE

1. First aid appliances including adequate supply of sterilized dressings and cotton wool shall be kept in a readily accessible place.

2. An injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates hospitalization.

3. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from ground.

4. No portable single ladder shall be over 8 meters in length. The width between the side rails shall not be less than 30 cm.(clear) and the distance between two adjacent rungs shall not be more than 30 cm. When a ladder is used an extra mazdoor shall be engaged for holding the ladder.

5. Every opening in the floor of a building or in a working platform is provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be one meter.

6. No floor, roof or other part of the structure shall be so overloaded with debris or materials as to render it unsafe.

7. Workers employed on mixing and handling material such as asphalt, cement mortar or concrete and lime mortar shall be provided with protective footwear and rubber hand gloves.

8. Those engaged in welding works shall be provided with welder's protective eye-shields and gloves.

9. (i) No paint containing lead products shall be used except in the form of paste or readymade paint.

   (ii) Suitable facemasks should be supplied for use by the workers when the paint is applied in the form of spray or surface having lead paint dry rubbed and scrapped.

10. Overalls shall be supplied by the Contractor to the painters and adequate facilities shall be provided to enable the working painters to wash during the periods of cessation of work.

11. Hoisting machines and tackles used in the works, including their attachments, anchorage and supports shall be in perfect condition.

12. The ropes used in hosting or lowering material or as a means of supervision shall be of durable quality and adequate strength and free from defects

Maharashtra Pollution Control Board

Schedule· I

PRE-QUALIFICATION CRITERIA

Following Signed & Sealed documents should be submitted:

1) The bidder should have at least 5years of experience in Government Organization / Private for the Electrical & Allied Services works.

2) The Electrical Contractor should possess Valid Electrical Contractor's Licence.

3) Average Annual Turnover of Rs. 150 Lakh in at last three financial years.

4) The Electrical Contractor should submit Work order and Work Completion Certificate executed in the past 5 years for Electrical and Allied works for Government/Semi Government/Local bodies OR Private parties (Note: The value of work executed for Private parties shall be considered as 50% for evaluation purpose ie. If the Electrical Contractor has executed similar Electrical works for Private parties worth 100lacs then the same shall be considered as 50lacs for the purpose of evaluation)-

   a. One number of similar works not less than 80 lacs
   b. Two number of similar works not less than 60 lacs each
   c. Three number of similar works not less than 50 lacs each

5) The bidder has to give following self-declaration on his letter head addressed to Executive Engineer Mumbai.

"This is to certify that the details furnished above are true to the best of my /our knowledge and records. I / We give undertaking that if at any stage of scrutiny of tender or currency of contract, any information is found incorrect, the Board shall have the right to terminate the contract at its discretion and I / We shall have no claim for any compensation what so ever there of.".

6) Certified copies of S.T., Excise Registration No, PAN No.

7) Bidders shall give undertaking as per enclosed format at schedule – II.

Date:-

Place: -

(Signature of Bidder)
(Name & Designation)

SUBMITTALS

A 1. Technical Qualification Criteria

Sr.	Description
1.	Electrical jobs executed during last 5 years.
a)	Electrical & Allied works executed
i)	Electrical works for office building/Corporate office/ Banks / Hospital
ii)	Electrical Works for Private.
b)	Similar nature jobs during the last 5 years, like Office/Laboratories /Hospitals or any Health Care facilities
2.	Value of the jobs currently handling,
a)	Electrical Works : (Value of work Should be at least equivalent to the value For the work agency wants to compete
3.	Establishment of the firm
4.	**Solvency certificate**
5.	Annual turnover during last three years (Information must be supported with Latest Income Tax Certificate /Audited Balance Sheet
6	Whether the party has Valid Electrical Contractors License
7	Permanent Employed Technical staff (Should be working in the firm from Last 2 years)

Note: - All the statements must be supported by documentary evidence, copies of work orders, registration of the firm, names of different works handled, value of jobs, clients name and the performance / completion certificate obtained from different clients.

PRICE SCHEDULE

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Sub Estimate No. 1 - Civil Cum Interior Works				
	Demolition & Civil works				
1	Removing false ceiling in all types of ceiling i.e. Gypsum, Accoustical, Calcium silicate board, metal etc. including stacking the materials as directed with all leads & lifts.	225.00	Sqm		
2	Dismalting old existing electrical works including swith, socket, wire etc with all lift & leads etc. complete as per directed.	1.00	Job		
3	**POP Wall Punning**	100.00	m^2		
	Providing & Applying **Plaster of Paris Punning** in average 12 to 25mm thickness to walls, ceiling, beams & columns to bring the surface in plumb Line & Level including making the surface smooth, providing required grooves on top of skirting etc. complete as per directions of Engineer - In - Charge.				
4	Providing & Applying superior quality of Luster Paint of approved make & shade, using roller to get approved textured surface in 3 or more coats including preparation of surfaces, applying cement primer of approved make & shade etc. complete as per directions & manufacturer's specifications & instructions of Engineer - In - Charge.	100.00	m^2		
5	Providing and applying plastic emulsion paint conforming to IS:5411-1991 part I of superior quality of approved make, colour and shade to the old & new surfaces in two coats over primers, including scaffolding, preparing the surfaces to receive the paint and applying putty etc. complete.	200.00	Sqm		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
6	Providing and applying two coats of Exterior Acrylic paint of approved make and of approved colour to the plastered surfaces including cleaning, prepairing the plaster surface ,applying primer coat as per manufacturer's specifications, , scaffolding if necessary, etc.complete.	100.00	Sqm		
7	Providing & fixing Trap Doors made out of required framework, 19mm thk plywood finished with material 1.5 mm thk laminate from outside and 1mm thk laminate from inside. Site modification as per requirement has to be undertaken without any extra cost.	5	Sqm		
8	Providing & fixing in position Coffered Gypsum Board False Ceiling as per manufacturer's specifications & instructions with 12.5mm thick 'Gypboard' Screw-fixed to the underside of suspended G.I. grid. G.I. grid should be constructed & suspended from the main ceiling as per manufacturer's instructions & specifications.G.I.grid should consist of ceiling sections at maximum centre to centre distance 450mm, Perimeter channel intermediate channels at maximum centre to centre distance 1200mm. The ceiling sections should be fixed to intermediate channels with connecting clips. G.I.grid should be fixed to **R.C.C. slab /M.S.FRAME** above with the help of 25mm x 0.5mm strap hanger & soffit cleat. The joints between soffit cleat & strap hanger and G.I.grid & strap hanger should be with 6.4 x 12.7 mm nut & bolt. Soffit cleats should be fixed to R.C.C.ceiling with W.E. type 12mm dia, 17/16" long steel Rawl plug maximum center to center distance (both ways) of strap hangers should be 1200mm. The Gypboard should be fixed to G.I.grid with 25mm long Drawall screws.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	The 'Gypboard' to be used should be 12.5mm thk tapered edge boards. The boards should be taped & filled from underside to ceiling. Item to be completed as per manufacturer's specification & instructions. Note: No extra will be paid for ceiling drops and it will be considered as flat ceiling and if there is projected drop ceiling curved as per design in different level it will also be paid as addition to that but only average bottom surface area will be considered. No extra will be paid for light cuttings, cutting for glass or stainglass manufacturer's specification & instructions. Note : No extra will be paid for ceiling drops and it will be considered as flat ceiling and if there is projected drop ceiling curved as per design in different level it will also be paid as addition to that but only average bottom surface area will be considered. No extra will be paid for light cuttings, cutting for glass or stainglass.				
	12.5 mm thk Gypsum Ceiling	200	Sqm		
9	**Acoustical Ceiling**				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Providing & Fixing of Armstrong Mineral Fibre Acoustical Suspended Ceiling System with Optra (Microlook) EDGE TILES WITH ARMSTRONG 15mm Exposed GRID. The tiles should have Humidity Resistance (RH) of 95%, NRC 0.9 - 1.0, Light Reflectance ≥85%, Colour White, Fire Performance UK Class 0 / Class 1 (BS 476 pt - 6 &7) in module size of 600 x 600 x 15mm with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 66% GW & 74% RW%. The tile shall be laid on Armstrong Silhouette profile grid system with 15mm white flanges incorporating a 6mm central reveal in white/black colour and with a web height of 45mm and a load carrying capacity of minimum 15.68 Kgs/M2. Silhouette, Main Runners & Cross Tees to have mitred ends & "birdsmouth" notches to provide mitred cruciform junctions. The T Sections have a Galvanizing of 90 grams per M2 & passed through 500 hrs of Salt test. The Tile & Grid system used together should carry a 15 year warranty. (Contractor should submit a performance certificate from Armstrong /Ecophone/AMF).	350.00	Sqm		
10	Providing and fixing Single glazed modular system Otic Particion or equivalent approved with 10 mm Toughen glass consist of Aluminium section of 25*40*2.5 mm thick. All sections duly anodised up to 15-20 microns with 6063-T6 grade and required accessories ie glass to glass aluminium I sections, T section & 90 degree sections & Glass packing to adjust the floor level. Ceiling profile, Floor profile and wall profile are 25 mm visible face and 40 mm wide with insertion of silicon gasket to adhere the glass firm & airtight. etc complete as per direction of Engineer - in - charge.	**20.00**	Sqmt		
11	**Fully glazed door on floor spring (Size 1200 x 2400mm)**	**3.00**	Sqmt		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Providing & Fixing of Fully Glazed door (Slimline Otic Particion Door System or equivalent) 6063-T6 Virgin grade Anodized Aluminium Sections having sizes of 55*40 mm, 10 mm Toughened Glass including Floor Spring Geze TS500NV / Dorma BTS80 closing force adjustable size 2 - 4 acc. to EN 1154, latching action and closing speed adjustable, with fixed back check, overall height 42mm, for double action and single action door, Half moon door stoper dia 42mm x 25mm , Top/Bottom Patch, Pivot, Offset pull handle GEZE 98163072 / Dorma TG 9356 of size dia 25mm x 450 width of SS 304 finish SS & SS Bottom Lock etc complete as per direction of Engineer - in - charge.				
	Total For Sub Estimate No 1				
	Sub Estimate No. 2 - Electrical and Allied Works				
	Electrical Panels and Distribution boards				
	General Specification for Power Panels				
	Notes:				
	i)The Electrical panels should be procured from Central Power Research Institute(CPRI) approved Panel manufacturer.				
	ii)All the Electrical panels shall be subjected to Megger tests and HV tests at site in the presence of Client/ Consltant as per the requirement of Client/Consultant.				
	iii)The Contractor should submit 3 sets of as built drawings of the Electrical panels.				
	iv)The Electrical panel's feeders should be properly labelled using engraved black anodized labels.Also, night glow radium labels shall be provided for each feeder specifying the name of the load.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	v)The detailed specifications missing in the BoQ should be followed from the Specifications and Electical Single line diagram in ACAD format.				
	vi)Contractor should submit the fabrication drawing, single line diagram and control logic system to Consultant/Client for approval before fabrication of all panels.				
	vii)The Electrical panel's main body, doors, partitions should be fabricated out of 2mm thick MS steel sheet.				
	vii)Appropriate size knock out holes should be provided in the panels as per the size of the incomming and outgoing cables.				
	viii)Transient Voltage Surge Suppressor(TVSS) should be installed in all the electrical panels.				
	Design as per technical specifications and obtain approval of drawings, prior to manufacturing, manufacture, insure, pack with PVC sheets, transport to site, store, erect in proper position, testing and commissioning of Indoor Duty and having IP 52 Rating LT panel cubicle and extendible type front and back operated having Top/Bottom Bus-Bars and Top/bottom Cable/Bus Duct entry, & fabricated using 14 gauge, CRCA sheet steel for main frame, door and partitions, dust and vermin proof lockable doors and carrying the control wiring using approved make FRLS colour coded Wires of minimum 2.5 sq.mm and using approved make push on terminals. The panel shall be wall mounting type, all complete with interconnections by using electrolytic grade tinned copper Bus Bars of 99.95% purity for all the other panels, colour coded heat shrinkable PVC sleeves.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	The Panel shall be painted with Powder Coated granular finished painting with 7 tank painting process with shade No. RAL 7032 from inside and outside all complete as per drawings, technical specifications and final approval of Consultant.				
	AIR CIRCUIT BREAKER. 4Pole , Electrical Draw out type ,Micro processor based Air circuit braker with over-current, short circuit and earth fault releases and the RS 486 Communication Port and the Necessary Control Module with by default display of fault history. The Breaker shall be suitable for 35kA 415 Volts 50 Hz., AC supply				
	MCCB. 125 A and above MCCB shall have Micro processor release with overload,short circuit,Earth fault and Neutral protection with fault rating of appropriate KA.Below 125 A MCCB shall have Thermo magnetic release with overcurrent and short circuit protection with fault rating of appropriate KA.Three/Four Pole Moulded Case Circuit Breaker with built in over current and short circuit The MCCB shall be suitable for 415 Volts 50 Hz., AC supply .				
	BUS BAR Uniformly rated, continuous duty, 415 V AC, 3 Phase and 100% fully rated Neutral electrolytic grade 99.95% Purity tinned Copper with colour coded heat sink sleeves supported on SMC type grip supports. The Horizontal / Vertical sections of the busbars should all be uniformly rated for specified current rating.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	All panels shall be Cubicle type with front operated and cable end boxes at the rear complete factory wired and tested in Cubicle type design with powder coated and paint process as per technical specifications and the pnale board fabricated as per technical specifications all complete and as per final direction and final approval of the Consultant/ Owners.				
1	**Main LT Panel as per SLD- 4th Floor**	1	No		
	Supply, installation, testing and commissioning of **Main LT Panel-4th Floor,** floor mounted with frame of suitable M.S channel duly painted to accomodate the following MCCBs/MCBs and made out of min 2 mm thick CRCA sheet powder coated complete with required MCB, MCCBs, pilot lamps, selector switches, hylem sheets,interconnections, internal wiring, earthing, TPN Cu busbars etc as required with below given components and as detailed in Technical Specifications and drawing.				
	Incoming Section:				
	Main Incomer 1 : 200Amps, 4Pole ,Micro processor based MCCB with over-current, short circuit and earth fault releases and the RS 486 Communication Port .The Breaker shall be suitable for 25kA 415 Volts 50 Hz., AC supply				
	Load manager, 500V AC supply with necessary PVC wire leads and lugs and mounting hardware, including 6A MCB for protection, on provided panel complete with calibration certificate - 1 no.				
	Metering:				
	3Nos of 200/5 Amps Current transformers for Load Manager.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1No of 200/5 Amps Current transformers for APFC Relay sensing.				
	Protection:				
	1No of Surge protection device.				
	3Nos of 200/5 Amps Current transformers along with Restricted Earth fault relay.				
	Indicating lamps:				
	R,Y and B LED lamps for phase indication and Red/Green /Amber lamps for Supply ON , OFF and TRIP Indications.				
	Outgoings				
	WORKING FEEDERS				
	4 Nos of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1 No of 80A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	2 Nos of 100A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).The feeder should also consist of 3 Nos of 100/5Amps CT's along with Load Manager.				
	SPARE FEEDERS				
	1 No of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1No of 100A, 4P, Moulded case Circut breaker at 16 KA .				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Busbars:				
	The TPN Copper busbars should be uniformly rated to carry 200Amps current at 25 KA.The busbars should be tinned.				
2	**Main LT Panel as per SLD- 3rd Floor**	1	No		
	Supply, installation, testing and commissioning of **Main LT Panel- 3rd floor,** floor mounted with frame of suitable M.S channel duly painted to accomodate the following MCCBs/MCBs and made out of min 2 mm thick CRCA sheet powder coated complete with required MCB, MCCBs, pilot lamps, selector switches, hylem sheets,interconnections, internal wiring, earthing, TPN Cu busbars etc as required with below given components and as detailed in Technical Specifications and drawing.				
	Incoming Section:				
	Main Incomer 1 : 200Amps, 4Pole ,Micro processor based MCCB with over-current, short circuit and earth fault releases and the RS 486 Communication Port .The Breaker shall be suitable for 25kA 415 Volts 50 Hz., AC supply				
	Load manager, 500V AC supply with necessary PVC wire leads and lugs and mounting hardware, including 6A MCB for protection, on provided panel complete with calibration certificate - 1 no.				
	Metering:				
	3Nos of 200/5 Amps Current transformers for Load Manager.				
	1No of 200/5 Amps Current transformers for APFC Relay sensing.				
	Protection:				
	1No of Surge protection device.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	3Nos of 200/5 Amps Current transformers along with Restricted Earth fault relay.				
	Indicating lamps:				
	R,Y and B LED lamps for phase indication and Red/Green /Amber lamps for Supply ON , OFF and TRIP Indications.				
	Outgoings				
	WORKING FEEDERS				
	4 Nos of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1 No of 100A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	2 Nos of 100A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).The feeder should also consist of 3 Nos of 100/5Amps CT's along with Load Manager.				
	SPARE FEEDERS				
	1 No of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1No of 100A, 4P, Moulded case Circut breaker at 16 KA .				
	Busbars:				
	The TPN Copper busbars should be uniformly rated to carry 200Amps current at 25 KA.The busbars should be tinned.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
3	**Main LT Panel as per SLD- 2nd Floor**	1	No		
	Supply, installation, testing and commissioning of **Main LT Panel- 2nd Floor,** floor mounted with frame of suitable M.S channel duly painted to accomodate the following MCCBs/MCBs and made out of min 2 mm thick CRCA sheet powder coated complete with required MCB, MCCBs, pilot lamps, selector switches, hylem sheets,interconnections, internal wiring, earthing, TPN Cu busbars etc as required with below given components and as detailed in Technical Specifications and drawing.				
	Incoming Section:				
	Main Incomer 1 : 160Amps, 4Pole ,Micro processor based MCCB with over-current, short circuit and earth fault releases and the RS 486 Communication Port .The Breaker shall be suitable for 25kA 415 Volts 50 Hz., AC supply				
	Load manager, 500V AC supply with necessary PVC wire leads and lugs and mounting hardware, including 6A MCB for protection, on provided panel complete with calibration certificate - 1 no.				
	Metering:				
	3Nos of 160/5 Amps Current transformers for Load Manager.				
	1No of 160/5 Amps Current transformers for APFC Relay sensing.				
	Protection:				
	1No of Surge protection device.				
	3Nos of 160/5 Amps Current transformers along with Restricted Earth fault relay.				
	Indicating lamps:				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	R,Y and B LED lamps for phase indication and Red/Green /Amber lamps for Supply ON , OFF and TRIP Indications.				
	Outgoings				
	WORKING FEEDERS				
	2 Nos of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1 No of 63A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	1 No of 100A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection.The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).The feeder should also consist of 3 Nos of 100/5Amps CT's along with Load Manager.				
	SPARE FEEDERS				
	1 No of 40A, 4P, Miniature Circut breaker at 10 KA .				
	1No of 100A, 4P, Moulded case Circut breaker at 16 KA .				
	Busbars:				
	The TPN Copper busbars should be uniformly rated to carry 160Amps current at 25 KA.The busbars should be tinned.				
4	**APFC PANEL (55 KVAR) -Third Floor**	1	No		
	Incomer Sections.:-				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1 No of 100A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection..The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	Metering , Indication and CTs Section				
	1 No. 6 step, APFC Relay all complete and wired up with CTs. on Main LT Panel.				
	3 Nos. 100/5 Amps Current transformer having 10 VA burden, wired up with 144 sq.mm., Ammeter with selector switch.				
	1 No. 0-500 Volts range, 144 sq.mm Voltmer with selector switch.				
	Auto Manual selector Switch for operating the Panel Manually.				
	Current Transformers For Incoming Section :				
	3 Nos. 100/5 amps rated Cast Resin Current transformers , bar primary, having 10 VA burden and class 1 Accuracy all complete.				
	Busbars.				
	100 Amps uniformly rated, continuous duty, 415 V AC, 3 Phase and 100% fully rated Neutral electrolytic grade Copper Bus-bars				
	Out goings :-				
	All outgoings shall have Feeder rated 2 Nos.Push Button station colour coded for operating manually along with ON / OFF ie RED and GREEN LED type Lamps.and as shown in the line diagram				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1 No. 63 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	1No. TP Thyristor module of approved make suitable for switching operation of 15 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	1 No. 7% detuned reactors suitable for 15 KVAR Operation with copper coils				
	1 set of 15 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 15 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
	3 Nos. 40 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	3 Nos. TP Thyristor module of approved make suitable for switching operation of 10 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	3 Nos. 7% detuned reactors suitable for 10 KVAR Operation with copper coils				
	3 sets of 10 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 10 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	2 Nos. 20 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	2 Nos. TP Thyristor module of approved make suitable for switching operation of 5 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	2 Nos. 7% detuned reactors suitable for 5 KVAR Operation with copper coils				
	2 sets of 5 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 5 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
5	**APFC PANEL (45 KVAR) -4th Floor**	1	No		
	Incomer Sections.:-				
	1 No of 80A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection..The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	Metering , Indication and CTs Section				
	1 No. 6 step, APFC Relay all complete and wired up with CTs. on Main LT Panel.				
	3 Nos. 80/5 Amps Current transformer having 10 VA burden, wired up with 144 sq.mm., Ammeter with selector switch.				
	1 No. 0-500 Volts range, 144 sq.mm Voltmer with selector switch.				
	Auto Manual selector Switch for operating the Panel Manually.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Current Transformers For Incoming Section :				
	3 Nos. 80/5 amps rated Cast Resin Current transformers , bar primary, having 10 VA burden and class 1 Accuracy all complete.				
	Busbars.				
	80 Amps uniformly rated, continuous duty, 415 V AC, 3 Phase and 100% fully rated Neutral electrolytic grade Copper Bus-bars				
	Out goings :-				
	All outgoings shall have Feeder rated 2 Nos.Push Button station colour coded for operating manually along with ON / OFF ie RED and GREEN LED type Lamps.and as shown in the line diagram				
	1 No. 63 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	1No. TP Thyristor module of approved make suitable for switching operation of 15 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	1 No. 7% detuned reactors suitable for 15 KVAR Operation with copper coils				
	1 set of 15 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 15 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	2 Nos. 40 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	2 Nos. TP Thyristor module of approved make suitable for switching operation of 10 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	2 Nos. 7% detuned reactors suitable for 10 KVAR Operation with copper coils				
	2 sets of 10 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 10 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
	2 Nos. 20 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	2 Nos. TP Thyristor module of approved make suitable for switching operation of 5 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	2 Nos. 7% detuned reactors suitable for 5 KVAR Operation with copper coils				
	2 sets of 5 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 5 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
6	**APFC PANEL (25 KVAR) -2nd Floor**	1	No		
	Incomer Sections.:-				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1 No of 63A, 4P,16 KA Microprocessor based MCCB with built in overload, short circuit and instantaneous short circuit protection..The feeder should consist of RYB LED lamps for phase indication and ON/ OFF/TRIP LED lamps (Red , Green and Amber color).				
	Metering , Indication and CTs Section				
	1 No. 6 step, APFC Relay all complete and wired up with CTs. on Main LT Panel.				
	3 Nos. 63/5 Amps Current transformer having 10 VA burden, wired up with 144 sq.mm., Ammeter with selector switch.				
	1 No. 0-500 Volts range, 144 sq.mm Voltmer with selector switch.				
	Auto Manual selector Switch for operating the Panel Manually.				
	Current Transformers For Incoming Section :				
	3 Nos. 63/5 amps rated Cast Resin Current transformers , bar primary, having 10 VA burden and class 1 Accuracy all complete.				
	Busbars.				
	63 Amps uniformly rated, continuous duty, 415 V AC, 3 Phase and 100% fully rated Neutral electrolytic grade Copper Bus-bars				
	Out goings :-				
	All outgoings shall have Feeder rated 2 Nos.Push Button station colour coded for operating manually along with ON / OFF ie RED and GREEN LED type Lamps.and as shown in the line diagram				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	1 No. 40 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	1 No. TP Thyristor module of approved make suitable for switching operation of 10 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	1 No. 7% detuned reactors suitable for 10 KVAR Operation with copper coils				
	1 set of 10 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 10 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
	3 Nos. 20 Amps rated TPN Miniature circuit breaker of approved make with built in thermo magnetic type releases for overcurrent and short circuit, all complete wired up withThyristor module				
	3 Nos. TP Thyristor module of approved make suitable for switching operation of 5 KVAR Gas filled Capacitors wired with the respective feeder MCCB in the incomer and Capacitor bank in the outgoing.				
	3 Nos. 7% detuned reactors suitable for 5 KVAR Operation with copper coils				
	3 sets of 5 KVAR Gas filled MD Capacitor banks with appropriate rated individual capaitors of approved make to form 5 KVAR , 480 Volts AC.Capacitor banks complete with interconnection with AC 6 B duty class contactor and series discharge resistors.				
	Lighting Distribution Boards				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Supply installation testing and commissioning of the following Miniature Circuit Boards in MS enclosure of Industrial design with double door design-IP -43 Class. All the MCBs to be providded shall be 10 KA rating and with C Curve.				
7	**8 way ETPN DB-LDB's/UPSBD's/PDB's/ELDB's**	18	No		
	Incomer :				
	40 Amps , 4 Pole MCB complete and suitable for 500 Volts rating.				
	Busbars.				
	100 Amps rated , 415 Volts AC , 50 Hz. TP and N tinned Copper busbars.				
	Outgoings				
	3 Nos of 25A DP ELCB at 30mA				
	18 Nos of 10 /16 Amps Single Phase Miniature Circuit breakers at 10 KA, C Curve All complete with inter wired with incomer all complete.				
9	**VRV DB- 8 way VTPN DB**	5	No		
	Incomer :				
	100 Amps , 4 Pole MCB at 10 KA all complete and suitable for 500 Volts rating.				
	Busbars.				
	100 Amps rated , 415 Volts AC , 50 Hz. TP and N tinned Copper busbars.				
	Outgoings				
	3 Nos of 40 Amps TP Miniature Circuit breakers at 10 KA, C Curve , 3Nos of 25Amps TP MCB at 10KA and 6Nos of 10Amps SP MCB's at 10KA . All complete with inter wired with incomer all complete.				
10	**UPS Distribution DB- 4 way VTPN DB**	3	No		
	Incomer :				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	100 Amps , 4 Pole MCB at 10 KA all complete and suitable for 500 Volts rating.				
	Busbars.				
	100 Amps rated , 415 Volts AC , 50 Hz. TP and N tinned Copper busbars.				
	Outgoings				
	4 Nos of 40 Amps TP Miniature Circuit breakers at 10 KA, C Curve. All complete with inter wired with incomer all complete.				
11	Supply,Installation,Testing and Commissioning of 40 Amps,4Pole,MCB at 10 KA in Enclosure for VRV ODU Isolation all complete with mounting accessories-IP 65 enclosure	16	No		
12	Supply,Installation,Testing and Commissioning of 25 Amps,4Pole,MCB at 10 KA in Enclosure for VRV ODU Isolation all complete with mounting accessories-IP 65 enclosure	8	No		
	CABLES & CABLE TERMINATIONS, TRAYS				
	Supply, handling, laying effecting proper connections testing and commissioning of following sizes of 1.1 KV grade XLPE insulated FRLS Aluminium /Copper conductor cables laid over MS supports cable racks or fixing on walls including clamping the cable to supports in an approved manner as required complete with Copper earthing as specified for continuous earthing along with cable . (Earthing will be measured separately and need not be quoted under this item). All complete as required and as per final instruction as given by Owners/ Consultants. and as per Technical specifications.				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
13	3.5 Core x 95 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	80	Mtr		
14	3.5 Core x 70 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	30	Mtr		
15	3.5 Core x 50 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	10	Mtr		
16	3.5 Core x 35 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	10	Mtr		
17	4 Core x 16 sq.mm., XLPE Insulated copper Conductor Armoured Cable	75	Mtr		
18	4 Core x 10 sq.mm., XLPE Insulated copper Conductor Armoured Cable	10	Mtr		
19	4 Core x 6 sq.mm., XLPE Insulated copper Conductor Armoured Cable	600	Mtr		
20	4 Core x 4 sq.mm., XLPE Insulated copper Conductor Armoured Cable	240	Mtr		
21	3 Core x 6 sq.mm., XLPE Insulated copper Conductor Armoured Cable	10	Mtr		
22	3 Core x 4 sq.mm., XLPE Insulated copper Conductor Armoured Cable	10	Mtr		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Supply and making **terminal joints** for the following sizes of 1.1KV grade XLPE Insulated armoured/Unarmoured Aluminium/Copper conductor cables including providing heavy duty tinned coper terminal lugs, crimping type, insulation tape, heavy duty single compression type brass glands effecting terminal connection to the equipment/Panel complete as required as per final direction and approval of the Owner/Consultant.				
23	3.5 Core x 95 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	4	No		
24	3.5 Core x 70 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	2	No		
25	3.5 Core x 50 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	2	No		
26	3.5 Core x 35 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	2	No		
27	4 Core x 16 sq.mm., XLPE Insulated copper Conductor Armoured Cable	12	No		
28	4 Core x 10 sq.mm., XLPE Insulated copper Conductor Armoured Cable	4	No		
29	4 Core x 6 sq.mm., XLPE Insulated copper Conductor Armoured Cable	40	No		
30	4 Core x 4 sq.mm., XLPE Insulated copper Conductor Armoured Cable	20	No		
31	3 Core x 6 sq.mm., XLPE Insulated copper Conductor Armoured Cable	2	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
32	3 Core x 4 sq.mm., XLPE Insulated copper Conductor Armoured Cable	2	No		
33	Supply,Installation,Testing and Commissioning of 300mm X 50 mm X 1.6 mm thick GI Perforated cable tray alond with bends,drops,joints,angles,tees,elbows,level adjust step wereever required along with supports,anchor fasteners to support the tray all complete to suspend the tray properly.	40	Mtr		
34	Supply,Installation,Testing and Commissioning of 300mm X 50 mm X 1.6 mm thick GI Ladder type cable tray along with bends,drops,joints,angles,tees,elbows,level adjust step wereever required along with supports,anchor fasteners to support the tray all complete to suspend the tray properly.	10	Mtr		
35	Supply,Installation,Testing and Commissioning of 150mm X 50 mm X 1.6 mm thick GI perforated type cable tray along with bends,drops,joints,angles,tees,elbows,level adjust step wereever required along with supports,anchor fasteners to support the tray all complete to suspend the tray properly.	15	Mtr		
36	Supply,Installation,Testing and Commissioning of 150mm X 50 mm X 1.6 mm thick GI Ladder type cable tray along with bends,drops,joints,angles,tees,elbows,level adjust step wereever required along with supports,anchor fasteners to support the tray all complete to suspend the tray properly.	10	Mtr		
	EARTHING AND EARTH STRIPS				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Providing and fixing in position the following sizes of earthing strips or wires including providing all fixing accessories and effecting proper connections as per the final direction and approval of Owner/Consultant.				
37	50 x 3 mm GI FLAT	60	Mtr		
38	25 x 5 mm GI FLAT	130	Mtr		
39	8 SWG bare Cu earth wire.	100	Mtr		
40	10 SWG bare Gl earth wire.	50	Mtr		
41	1C x 4 sqmm Cu flexible wire (green)	50	Mtr		
42	Earth terminal for each floor comprising of an earth strip of 50 X 6 mm bare copper tape with lugged holes and all outgoing earthing connected to it.	3	No		
43	SITC of Chemical earth pits all complete with 2.7 mtr Cu earth rod of 20mm dia along with bags of chemical compound all complete with earthing chamber and cover for maintenance.	3	No		
	POINT WIRING				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Supply, installation, testing & commissioning of point wiring for lights / fans / plug points / bell point etc. in HMS PVC conduit of suitable diameter **,** surface or recessed mounted complete with junction box, joints, bends, switch box, cover plate etc. including 1.1kV grade 2 x 1.5 sq.mm.Copper multi-stranded PVC insulated FRLS wires alongwith 1 x 1.5 sq.mm. Copper multi-stranded PVC insulated FRLS wires as earth wire, along with 6A modular surface/ recessed mounted switch , ceiling rose, connectors switch boxes etc. The work shall be completed with all material, labour, chiselling, making good surface etc. in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements. Average of 10 mtr for primary and 5 mtr for secondary				
44	Primary point	10	No		
45	Secondary point	10	No		
	Providing point wiring for following group light points using 2 x 2.5 sq.mm.PVC copper conductor FRLS wires in the HMS PVC conduits of suitable diameter from MCB DB to upto fixtures by looping from one fitting to other fixture by using minimum 2.5 sq.mm.PVC green colour copper earth wire as required and as per final direction and approval of the Architect/ Consultant. (The cost of MCBs have been taken as part of DB in the tender).				
46	A group of 2 points controlled by 1 No. 10 Amps., Single Pole MCB.	5	No		
47	A group of 3 points controlled by 1 No. 10 Amps., Single Pole MCB.	5	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
48	Supplying, erecting , testing & commissioning independent surface or recessed mounting modular 6 / 16A switch & socket complete with switch box, internal wiring with required chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements.	80	No		
49	Supplying, erecting , testing & commissioning independent surface or recessed mounting modular 6 A switch & 5 pin socket complete with switch box, internal wiring with required chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements.	10	No		
50	Supplying, erecting , testing & commissioning independent surface or recessed mounting modular 16 A master switch above table top along with 3Nos of 6Amps sockets at below the working plane controlled by the master switch.Also a 6Amps socket along with 6Amps switch on Raw power should be provided along with the 16Amps master switch at above the table top for each **work station.**The switches and sockets shall be complete in all respect with switch box, internal wiring with required chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements.	10	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
51	Supplying, erecting mains & submains wiring between DB & switchboards of lights/fan,independent plug point etc or between DB and light points with 1.1kV grade 2 x 2.5 + 1 x 2.5 PE multi stranded Copper PVC insulated FRLS wires drawn in HMS PVC conduits conduits of required diameter concealed / surface mounted including required accessories, termination complete with chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements etc...	100	Mtr		
52	Supplying, erecting mains & submains wiring between DB to power points with 1.1kV grade 2 x 2.5 + 1 x 2.5 PE multi stranded Copper PVC insulated FRLS wires drawn in provided underfloor raceways of appropriate sizes including required accessories, termination in complete manner in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements etc...	500	Mtr		
53	Supply installation testing and commissioning of 63 Amps 4pole industrial socket with Metal box enclosure complete with 63 Amps 4P MCB Control for Kitchen equipments.	2	No		
	SUPPLY & FIXING OF LIGHT FIXTURES				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	Supply, Installation,Testing and Commissioning of light fixtures based on instructions from Architect/Consultant and Client as shown in the lighting layouts. The lighting vendor should generate lux level report for the office space for the approval of Client/Architect/Consultant.Further the rates should include all hardware, down rods, suspension arrangements, chains, strings, diffusers,PVC covering tubes etc complete .The light fixture shall be complete with electronic Ballast & Lamp. If equivalent is to be provided then it should match the intent of the specifications and looks of the Light Fitures as per specification and should be approved by the Architect/Client/Consultant. The light fitting supplied should be warm white unless otherwise specified by the Architect/Client/Consultant. The Contractor should create a mockup at site and get the light fixtures approved by the Architect/Consultant/Client before procurement.				
	Supply and Installation of following lighting luminaries with all accessories and lamps.				
54	SITC of 2X2 type 36 watts LED light all complete with ballast /driver and suspension arrangement.Make:Philips/Divinity/Wipro	245	No		
55	SITC of 15 watts recessed mounted LED panel downlighter having a lumen output of 1200lumens all complete with allied accessories/ballasts etc.MAKE:Divinity, Philips, Wipro	30	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
56	SITC of 18 watts recessed mounted LED panel downlighter having a lumen output of 1500lumens all complete with allied accessories/ballasts etc.MAKE:Divinity, Philips, Wipro	115	No		
58	SITC of 12 watts recessed mounted L downlighter all complete with a accessories/ballasts etc.MAKE:Syaka,Re Philips, Wipro or approved equivalent.	25	No		
59	SITC of 24 watts surface mounted LED tube light along with acrylic cover all complete with ballasts and requisite accessories.Make:Syaka,Philips, Regent,Wipro or approved equivalent.	25	No		
60	SITC of LED rope light for cove lighting c watts/ meter all complete with ballasts mounting accessories. Make:Syska, Philips approved equivalent.	10	Mtr		
61	SITC of LED Exit lights showing arrows having maintenace free battery backup of 2 hrs all complete with control gear, suspension accessories. Make:Bajaj or approved equivalent.	5	No		
62	SITC of Occupancy sensors for Cabins.Make:Wipro,Philips or approved equivalent	45	No		
63	SITC of Motion sensors for washroom and allied areas-PIR occupany sensor.Make:Philips,Wipro or approved equivalent.	10	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	DATA AND TELEPHONE NETWORKING				
	The rate quoted should include the penta scan report for all points.				
64	Supplying,Installation,Testing and Commissioning of CAT 6 cable for data connectivity pulled in existing conduit or raceway as per specification.	400	Mtr		
64	Supplying,Installation,Testing and Commissioning of CAT 5 cable for telephonevconnectivity pulled in existing conduit or raceway as per specification.	400	Mtr		
65	Supply and erecting Data outlet box with shutter to be installed on wall or furniture including all connecting accessories, face plate, GI box all complete and duly connected as per specification.	15	No		
	UNDERFLOOR RACEWAYS				
	Providing and fixing Raceways/GI junction box in floors as per specifications and instructions of the EIC. Work also include chiseling , leveling ,making good the floor surface and coordination with civil agency.				
66	Supply,Installation,Testing and Commissioning of 225mm X38mm GI underfloor raceway(3 compartment) with thichnesss of 1.6mm.**MAKE:MK or LEGRAND**	40	Mtr		
67	Supply,Installation,Testing and Commissioning of Joint sleeve for above Underfloor raceway. **MAKE:MK or LEGRAND**	16	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
68	Supply,Installation,Testing and Commissioning of 75mm X38mm GI underfloor raceway(1 compartment) with thichnesss of 1.6mm.**MAKE:MK or LEGRAND**	100	Mtr		
69	Supply,Installation,Testing and Commissioning of Joint sleeve for above Underfloor raceway. **MAKE:MK or LEGRAND**	40	No		
70	Supply,Installation,Testing and Commissioning of 50mm X38mm GI underfloor raceway(1 compartment) with thichnesss of 1.6mm. **MAKE:MK or LEGRAND**	30	Mtr		
71	Supply,Installation,Testing and Commissioning of Joint sleeve for above Underfloor raceway. **MAKE:MK or LEGRAND**	12	No		
72	Supply,Installation,Testing and Commissioning of 300mmX300mm GI Junction box with height of 60mm. **MAKE:MK or LEGRAND**	5	No		
73	Supply,Installation,Testing and Commissioning of 250mmX250mm GI Junction box with height of 60mm. **MAKE:MK or LEGRAND**	10	No		
74	Supply,Installation,Testing and Commissioning of 150mmX150mm GI Junction box with height of 60mm. **MAKE:MK or LEGRAND**	6	No		
75	Supply,Installation,Testing and Commissioning of 100mmX100mm GI Junction box with height of 60mm. **MAKE:MK or LEGRAND**	5	No		
	CONDUITS				

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
76	Supplying & fixing of following sizes of HMS PVC conduit along with accessories in surface / recessed complete with junction box, joints, bends etc... complete with chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements etc... make - as per approved make list				
	25mm (AC socket and power socket wiring)	100	Mtr		
77	Supplying & fixing of following sizes of GI conduit along with accessories in surface / recessed complete with junction box, joints, bends etc... complete with chiselling making good surface etc...in cordination with civil agency complying with IE rules, regulations, standards & local supply authority requirements etc... make - as per approved make list				
	25mm (AC socket and power socket wiring)	10	Mtr		
	INTELLIGENT ADDRESSABLE FIRE ALARM SYSTEM				
78	SITC of Intelligent Addressable Fire Alarm Panel-4 loop panel capable to loop 127 No of active cum passive devices in one loop all complete with inbuilt battery to cater to a minimum of 2 hours. Make-Honeywell	1	No		
79	SITC of Repeater Panel	2	No		
80	SITC of Multi senor detectors with base and inbuilt isolation modules.	250	No		
81	SITC of Manual call point in a proper manner .	5	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
82	SITC of Hooter.	5	No		
83	SITC of Response indicators.	120	No		
84	SITC of Fire alarm cable-2C X 1.5 sq mm armoured cable-RED color in a proper manner.	4500	Mtr		
	PUBLIC ADDRESS SYSTEM				
85	Supply, installation, testing and commissioning of public address/ music system comprising of the following:				
86	SITC of solid state Amplifier of 240 W, RMS output including necessary control wires, jacks etc. any other accessories as required in complete.	2	No		
87	SITC of solid state Amplifier of 120 W, RMS output including necessary control wires, jacks etc. any other accessories as required in complete.	1	No		
88	SITC of DVD player with USB support	1	No		
89	SITC of 6 W ceiling mounted speakers with line matching transformers with decorative grills, mounting bracket, back box etc. other accessories as required in complete.	150	No		
90	SITC of 6 zone call station with goose neck mike and zone selection facility.	1	No		
91	SITC of 6zone controller with emergecy evacuation pre recorded messaging facility.	1	No		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
92	SITC of twin twisted 24/0.2 SWG armoured tinned copper PVC insulated and screened Copper cables for speakers connections, volume control etc.	3750	Mtr		
	CCTV system				
93	SITC of CCTV cable along with PVC conduits.	2000	Mtr		
	Redent Repellant system				
94	SITC of VHFO Controllers all complete with mounting accessories	10	No		
95	SITC of Transducers-Miste	130	No		
96	SITC of powder coated brackets	10	Nos		
97	SITC of rodent repellant cabling in PVC conduits	2500	Mtr		
	Fire Extinguishers				
98	SITC of 4.5kg Fire extinguishers- ABC type with mounting clamp and accessries.	5	No		
99	SITC of 4.5kg Fire extinguisher- CO2 type with mounting clamp and accessories.	5	No		
	Liasoning Works				
100	Liasoning with CFOs office to get the Office Floors of MPCB-2nd /3rd and 4th appproved with respect to Fire Safety compliance. This shall include the statutory approval/submission and approval of Form B and any other requirements all complete.	1	Job		

SR. NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
101	Liasoning with the Electrical Power Supply authority to expand the sanctioned load of 3rd floor from existing 65 KWto 90KW	1	Job		
102	Liasoning with the Electrical Power Supply authority to expand the sanctioned load of 4th floor from existing 65 KW to 90KW	1	Job		
	Total of Sub Estimate 2-Electrical and Allied works				

SUMMARY SHEET

SR.NO	DESCRIPTION	AMOUNT
1.	Sub Estimate No.1 – Interior works	
2.	Sub Estimate No. 2 – Electrical Works	
	TOTAL	

GENERAL SPECIFICATION FOR WORKS

The detailed specifications given herein after are for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards. **It may also be noted that the specifications are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings.** The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.

Unless specifically other wise mentioned, all the applicable codes and standards published by the Bureau of Indian Standards latest revision and all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, method of measurements etc. In case there in no I.S.I. (B.I.S) specification for the particular work, such work shall be carried out in accordance with instructions in all respects, and requirements of the Client/Consultant.

The contractor shall take instructions from the Client/Consultant regarding collection and stacking of materials. No building materials shall be stacked on areas where other buildings, roads, services, compound walls etc. are to be constructed.

The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where phased delivery is contemplated, this provision shall apply to each phase.

The contractor shall clear the site thoroughly of all scaffolding materials and rubbish, etc. left out of this work to the satisfaction of the Client/Consultant before the work is considered as complete.

In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specifications and drawing, the specifications shall take precedence.

Site books / Reports

For the purpose of quick communication between the Engineer and the Contractor or his Agent or representative, Site Instruction Books shall be maintained at Site in the manner as described below:

Any communication, relating to the works, may be conveyed through records in the Site Instruction Books. Such communication from the Engineer to the contractor shall be deemed to have been adequately served in terms of the contract. Each Site Instruction Book shall have machine-numbered pages in triplicate and shall be carefully maintained and preserved by the Contractor. Any instruction or other orders which the Engineer may

like to issue to the Contractor may be recorded by him in the Site Instruction book and one copy thereof issued to the Contractor.

Furnish of Reports, Statements, returns, etc., by Contractor

All reports, statements, returns, diagrams, or drawings, etc., which the Contractor is required to submit during the progress of the works to the Engineer shall unless otherwise directed, to be furnished in triplicate and at expense of the Contractor.

Contractor to Verify Site Measurements

The Contractor shall check and verify all Site levels and measurements whenever requested by other specialized Contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness, this will not in any way delay the works. A copy of all such information passed on shall be given to the Consultant.

Materials & Samples

1. **Materials to be New**
   The whole of the materials / fittings / equipment's employed in connection with the permanent work shall be new and of the best quality and description of their respective kinds and shall conform to the relevant Code (latest applicable standard) and to the approval of the Engineer. The Contractor shall be responsible to ensure that the material used is suited to the specific conditions including the climatic and environmental conditions prevailing at the site.

2. All proprietary material shall be of approved make and the type as stipulated. Lists of approved makes are given at the end of this document. It will be deemed that the Contractor has priced the respective items on the basis of those approved makes. However, it shall be the prerogative of the client to choose any particular make among the list as the most appropriate one and the Contractor shall be bound to provide the same without any variation in the contract rate.

3. **Approval of Manufacturers**
   Sufficiently before ordering materials of any description, the Contractor shall submit samples to the Consultant along with the names of the manufacturers and / or supplier proposed and shall obtain approval thereof in writing from the Consultant well in advance of commencement of work & procurement of materials at site for use.

4. **Copies of orders**
   The contractor shall supply to the Consultant in triplicate copies of all orders placed by him for the supply of materials or any item of permanent work or materials for the fabrication thereof. The specialist sub – contractors, also shall supply, through the Contractor, three copies of all orders they may place for items

of work or materials for fabricating any article or thing for which they have been sub-contracted.

5. Samples of materials and work

1. Irrespective of the fact that some specific make or type of material has been stipulated. No material hall be supplied or used on permanent works until the samples of the same are prepared / submitted and have been approved in writing by the Engineer / Architect.

b) In addition to special provision made hereinafter as to sampling and testing of materials by particular methods, samples of all materials and work proposed to be employed in the execution of the work may be called for at any time by the engineer and shall be submitted to the engineer for approval without delay by the Contractor. The Contractor shall arrange for the carriage of the same to enable the tests and analysis thereof to be made.

c) Samples of materials of all trades / disciplines supplied shall be such as to have a clear idea of the general type and characteristics of the whole of the materials to be used in the work. No plea regarding samples supplied being not representative of the whole of the material will be acceptable. In case it is not practical to bring or make the sample at the site office, the Contractor shall arrange for inspection at the Sub-Contractor's / Supplier's shop or works at his own cost. In the event of the Contractor not submitting for the approval of the engineer samples of materials of satisfactory quality and workmanship, the Engineer shall have the power to specify any particular manufacturer or merchant for the supply of such materials and the Contractor shall, without extra charge, obtain such materials from the said manufacturer or merchant. Before submitting samples for approval to the Engineer the Contractor shall satisfy himself that it is in accordance with the requirement of the contract. The samples shall also be submitted sufficiently early for all procedures to be duly completed including rejection and re-submissions if required, so that the approved programme o construction is not adversely affected in any way.

d) Samples, when approved, will be retained by the Engineer until the completion of the project and for this purpose suitable labeled boxes for storage of samples shall be provided by the Contractor.

e) The Engineer shall be at the liberty to reject all materials and workmanship at nay stages, which are not at least equal in quality and character to such approved samples.

f) The Contractor shall when required by the Engineer furnish all information as to quality, weight, constituent substances, dimensions, levels, strength and description of the materials, test results, full and accurate records of the dimensions and positions of all new work and any other information necessary, and works and give the Engineer such other particulars as may be required promptly.

Inspection and Testing of Materials

The Engineer shall be kept informed as to the progress of all works being carried out or materials being manufactured, prepared or supplied so that he may be able to make such arrangements for inspection, testing and analysis as he may desire. Wherever considered desirable by the Engineer, representative will be sent to the Contractor's, Sub-Contractor's and / or manufacturer's premises to test the materials or inspect their manufacture. The Contractor shall attend to the Engineer or his representative during such inspection to be carried out satisfactorily. Should the Engineer decide not to send a representative to the said premises, the Contractor shall obtain from the Manufacturer's certificate of test, proof sheets, mill sheets, showing that the materials have been tested satisfactorily in accordance with the requirements of the specification relating thereto, but neither omission of the Engineer to send an Inspector nor the production of manufacturer's certificates of test shall affect the liberty of the Engineer to reject after delivery of any material found not to be suitable or not in accordance with the specifications.

The Contractor shall provide means of identification of the materials delivered at the site with the corresponding certificate of test and manufacturing batch numbers.

As soon as the materials are delivered at the site the Engineer shall be informed. Notwithstanding any test that the Engineer may direct to be carried out at the Contractor's, Sub-Contractor's and / or Manufacturer's premises the Engineer shall be at liberty to carry out any further test he may desire after delivery of materials at the site and may reject any or all materials which fail to comply with the approved sample or the required specification. Only

After the approval of the materials delivered at the site the same shall be used at the works and such approval shall not relieve the contractor from fulfilling the obligations under the contract.

The Contractor shall prepare and provide such and so many test pieces of the various materials as the Engineer may, from time to time, direct or as may be specified and the Contractor shall analyze, test and weight all materials in such manner and at such time or times and in such place or places as may be specified or directed by the Engineer.

Materials shall be packed, transported, handled and stored on the site carefully and in a satisfactory manner so as to prevent any damage and / or deterioration of any kind either during transit or storage. Certain perishable materials like cement, lime, fittings, doors, windows, glass, etc. are stored in covered godowns to save them from sun, rain etc.

Rejected Materials

Should the Engineer at any time condemn any material or goods intended for use in the works as: -

a) Being inferior to samples previously approved.

OR

b) Having deteriorated in transit or on storage or on the site so as to be no longer fit for incorporation in the permanent works.

OR

c) Not complying with the specification.
The Contractor shall promptly remove all such material from the vicinity of the works to the satisfaction of the engineer and confirm in writing immediately after removal.

Should the Engineer discover on the works any material other than those approved, he may order their immediate removal from the site and the Contractor shall forthwith remove the unapproved materials from site within 48 hours. Any work executed with interior material is to be taken out and reinstated with approved material at the Contractor's expenses and within the contracted time period.

List of Proprietary Materials

The Contractor shall submit a comprehensive list of all proprietary articles and materials used in the works containing catalogue reference numbers, colour shades, etc., and the manufacturer's and or supplier's names, addresses and where appropriate, suppliers names and addresses including a price list CIF to the site of works. This list is approved format shall be complete in all respects and shall be submitted together with the 'As - Built' drawings and operation and maintenance manuals.

Failure to submit the above list will defer issue of the 'Completion Certificate'.

Contractor to satisfy himself regarding all requirements

The Contractor shall satisfy himself as to the full extent and character of the work's supply and conditions affecting labor, materials and plant, requirements of the Employer's safety and Health Regulations and all local conditions and restrictions affecting the works and provide for the same

The responsibility for carrying out the works and the methods to be adopted under this Contract shall rest solely with the Contractor subject always to the approval by the Engineer of the Contractor's proposals. Such approvals shall not, however, relieve the Contractor in any way of his responsibility for the proper execution of works in accordance with the Contract.

Record Drawings

The engineer will issue two sets f the drawings / site instructions with sketches to the Contractor for the items for which some changes have been made from the approved drawings. The Contractor will mark the changes in the main original drawings issued for the purpose earlier and keep record of all such changes including the changes in levels and dimensions as required at site and issued by written instructions of the engineer and shall keep the site drawings fully updated. Finally theses drawings with all revision shall be maintained as record drawings at site and all such revisions / corrections shall be reflected / in corporate in the As - built Drawings to be submitted by the Contractor as stated hereinafter and return these copies to the Engineer for his approval. In case any revision is required or the corrections are not properly marked, the Engineer may point out the discrepancies to the Contractor.

As - built Drawings and Completion Photographs

Two copies shall be submitted of the corrected As-Built drawings to the engineer for his approval.

The Engineer shall return one copy of the same, duly approved, if found satisfactory or advice the Contractor on the changes required of discrepancies, if any. The Contractor shall resubmit the three copies after incorporating all the corrections / changes etc. as required.

On receipt of the approved copy of these drawings the Contractor shall submit to the engineer six print copies of the same along with one reproducible copy and as directed by the Engineer for onward submission to the employer, unless otherwise stated.

Before the works (or any section there of) are completed in accordance with relevant provision of General Conditions of Contract and before submission of the Last / Final

Bill, whichever is earlier, the Contractor shall furnish to the engineer, "As-Built Drawings" or the works as completed, in sufficient details, which in the opinion of

the engineer will enable the employer to maintain, dismantle, reassemble and adjust all parts of the works.

The Contractors and his specialized sub-contractors shall submit "As-Built Drawings" for the whole of the works including civil and structural works and all other services if any, fabrication, installation equipment, and their layouts, distribution system and all other relevant information as required for approval of the Engineer.

On completion, Contractor will engage a professional photographer to take external and 10 internal views of the buildings. 3 copies each of enlarge A4 size of these photographs will be submitted to the client and one set including the negatives to the Engineer.

Care of Works and Properties

The Contractor shall so conduct his operations as not to damage, close or obstruct any utility, highway, road or other property until permits thereof have been obtained. If facilities are closed, obstructed, damaged or rendered unsafe by Contractor's operations, the Contractor shall, at his own cost, make such repairs and provide such temporary guards, lights and other signals as necessary or required for safety and as will be acceptable to the engineer and / or the owner of the utility, highway, road or other property.

First Aid Service

The Contractor shall make his own arrangements for treatment of casualties on the Item in such first-aid units as may be thought necessary. The whole of the arrangements for the First Aid Service shall comply with local Health Authority Regulations and shall at all time be subject to the approval of the engineer and the Contractor shall carry out any instruction given by the Engineer in this respect.

Progress Photograph

The Contractor shall arrange to take Progress Photograph fortnightly. The number and positions from which the photographs are to be taken shall be directed by the Engineer.

Facilities, Attendance etc. On Nominated Sub-Contractors

The Contractor shall allow for the provision of facilities, attendance etc. for the nominated sub-contractors.

These facilities, attendance etc. shall include: -

i) Storage facilities for plant, tools and equipment and products and materials;

ii) The use of sanitary accommodation, medical and welfare facilities;
iii) Facilities as described in Clauses keeping site clean, providing drinking and construction water and proper lighting at work site, access, scaffolding hoist etc., hereof;
iv) Watching and lighting and protection of their work as necessary.

Dispatch of Material

Materials shall not be dispatched from the Manufacturer's works or to the site without authority from the Engineer. The engineer shall be informed prior to dispatching the materials.

LIST OF APPROVED AND NOMINATED MANUFACTURES/SUPPLIERS OF MATERIALS AND SUB-CONTRACTORS / INTERIOR WORKS

NOTE: -

1. All materials to be used should be as per the list given below.

1. Use of equivalent make shall be only with prior approval from consultants & clients in writing. It must be at par with specified list below – in all respect any additional expenditure time due to this will be on contractors account & no claims shall be entertained.

2. Contractor Should make payment to all suppliers / Sub contractor proportionately as per the payment received form client for the particular item of work other wise client have full rights to make payment to the party directly to avoid any payment problem with supplier / sub contractor .

3. Client / Consultant reserve the right to select / prefer the material from the approved list.

LIST OF APPROVED MAKE LIST

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
A	**WOOD**	
1.	Old Burma teakwood	No specific supplier, contractor to obtain approval for samples
2.	BTC	No specific supplier, contractor to obtain approval for samples
3.	CP – Teakwood	No specific supplier, contractor to obtain approval for samples
4.	Hardwood	No specific supplier, contractor to obtain approval for samples
5.	Wood to match the veneers to be used	Jalaram , Anchor, or Approved equivalent
B	**PLYWOOD / DOOR SHUTTER**	
1.	Commercial ply	Kitply, Greenply Century
2.	Marine ply	Kitply, Greenply, Century
3.	Particle board	Asis, Asian, Grrenply (Panelmax).
4.	MDF	Green Panelmax, Century, Merino
5.	Block board	Kitply, Greenply, Century
6.	Flush Door	Kitply, Greenply, Century
7.	Fire Rated Door	Sukri, Promat, Kenwood,

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		Anchor
C	**DECORATIVE VENEERS / LAMINATES**	
1.	Veneers	Anchor , Greenply, Century
2.	Laminate	Merino, Formica, Century
D	**GLASS**	
1.	Glass	Asahi, Modiguard, Saint Gobian.
2.	Mirror	Modiguard, Prakash Mirror
3.	Tempering or toughering of glass	Tuff glaze India Pvt. Ltd., Impact safety glass works-Banglore, gold plus - Dehli
4.	Glass blocks	Fishfa glass, Raj impex treading company.
5.	Back painted & Laminated Glass	Saint Gobain or equivalent
E.	**PAINT, POLISH, ADHESIVES & PRESERVATIVES**	
1.	Paint-Plastic Emulsion/ Exterior/ OBD/ Luster/ Texture/ Primer & Cement Paint	Asian paint, ICI Dulux, Burger, Nerolac
2.	Adhesive	Pidilite Fevicol (Marine), Araldite
3.	Wood preservative	Termiseal by pest Control India, Bison by British paints
4.	Polycoating	MRF, Solvosol
5.	Melamine	MRF, Solvosol
6.	Polishes	Touch wood of Asian Paint, Wudfin of Pidilite industries,

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		Goodlas Nerolac
7.	Silicone Sealant	Dow Corning or equivalent
F.	**FALSE CEILING**	
1	Gypsum board false ceiling	Gypsum India, AMF
2.	Acoustical false ceiling, Sound Scape & Panelling	Armstrong / Ecophone/ Daiken / AMF
3.	Moisture Resistance Board	Gypsum India
4.	Section for false ceiling (Internal GI framing)	Gypsteel - Gyproc (Gypsum India)
G.	**HARDWARE**	
1.	Screws	G.K.W. Nettle folds & approved equivalent.
2.	Hardware for Storages	Kich, Godrej, GEZE
3.	Floor Springs/ door closers	Dorma, GEZE, Hafele
4.	Stainless steel handle, Stopper, Hinges, Mortise lock, Tower Bolt, drawer channel	GEZE, Dorma, Hafele
5.	KD – Fittings	Syntex / Grass / Mepla.
6.	Aluminium Section	Jindal, Hindalco, Nalco
7.	Stud Anchors & Anchor Fasteners	Hilti, Fischer, Bosh, AXE

Note: Any other item not mentioned but required at site will be as per the final approval of Client / Consultant.

Technical specifications

Electrical Works for MPCB Office

Technical Specification

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General Requirement

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor in quoted rate.

Specifications given are in amplification OR in addition to the specifications/requirements indicated in Indian Electricity Act 2003, CPWD norms and Local Power Authority rules and regulations.

The work shall be carried out with required alignments and line out. Tenderer has to provide his cost for all materials and also utilise required labour for line outs. The cost of constructing pillars, platforms for temporary works is also to be borne by the Tenderer.

Until unless stated elsewhere in this document, equipments like UPS are to be factory tested either in this country or abroad & same shall be witnessed by the representatives of Client, Architect and Consultant (Total 3-4 persons). All incidental expenses incurred for factory tests (travel, lodging, boarding etc) shall be deemed to have included in the offer quoted.

Scope

The scope of work generally comprises of supply, installation, testing & commissioning equipments such as Electrical Distribution boards, Lighting fixtures, Cables, Internal electrification, UPS System, Earthing system etc. with all allied equipments.

The agency shall work in coordination with other agencies. Any damage done to the work of others, shall be made good by the agency with out any extra cost.

1. CHEMICAL EARTHING

X GEL

It is a high conductivity maintenance free earth gel

It prevents from corrosion & so it significally increases the life spsn of earthing system without any maintenance

Supplied in 10kG buckets(5kG part A+ 5kG part B)

10litres water for 5kG part A+ 5kG part B,the compound becomes as thick but fluid substance that retains water & releases ions. These ions improve the conductivity of the soil thereby drastically reduces soil resistivity

Remains around the earth electrode does not get washed.

Increase life span of earthing system:protects form corrosion.

Z EARTH

It is a ground enhancing compound.

High hygroscopic properties retains moisture

Ensures thermal & humidity stability

Good diffusion/dissipation properties

Non corrosive

Made up of natural components(graphite, minerals etc…) it absorbs moisture from the surrounding soil & therefore provides very good environment around any earth termination

It is supplied in 20kG bags

1bag is sufficient to fill up 1 earth pit.

EARTH ROD

It is made up of 200µm (20mm diameter) copper bonded steel earth rods of 3M length.

Inspection pit

The earth termination system should be equipped with a disconnecting clamp housed in concrete or PVC inspection pit.

DISTRIBUTION BOARDS

Scope

The scope of work shall cover the supply, installation, testing and commissioning of lighting and power distribution boards. Associated minor civil works required for the erection of the DB's such as opening in wall etc. are also included in the scope of work.

System

The MCB distribution boards shall be suitable for operation on 400/440 volt, 3 phase, 4 wire, 50 Hz A.C. supply system or 220/250 volt, 1 phase, 2 / 3 wire, 50 Hz A.C. supply system.

Codes and Standards

Some of the important applicable codes/ standards issued by the Bureau of Indian Standards are listed below for the guidance of the Tenderers. Latest issues of the standards/codes shall be applicable:

1)	IS:2675-1983	Enclosed distribution fuse boards and cutouts for Voltages not exceeding 1000V.
2)	IS:375-1963	Marking and arrangement of Switchgear busbars main connec- tions and auxiliary wiring.
3)	IS:8828-1978	Miniature circuit Breakers
4)	IS:2607-1976	Air break Isolators for voltages not exceeding 1000V.
5)	IS:9926-1981	Fuse wire used in Rewirable type Electric fuses up to 650 volts.
6)	Indian Electricity Act 1910 and rules issued there under.	

General

The DB's shall be factory made and preferably of those manufacturers whose MCBs, ELCB's are to be used. General arrangement layout of the DB's shall be approved by the Construction manager/Consultant before manufacture.

Distributions boards along with the controlling MCB’s or Isolator as shown shall be fixed in a mild steel Box with hinged lockable door suitable for recessed / surface mounting in wall. Distribution boards shall be made of 16 SWG sheet steel duly rust inhibited through a process of degreasing, acid pickling, phosphating and powder coated to an approved colour over a primer.

The DB shall be cubicle, compartmentalized, wall/floor mounted and dead front operated. The DB shall be totally enclosed and made dust, vermin and weather proof such that it meets IP 54 of IS 2147 protection classification. A detachable cover plate of 2mm thick CRCA sheet to be provided on front of the board such that all live parts of the electrical accessories mounted on the board can be accessible only on removal of the said cover plate.

Further, the cover plate shall also, have suitable cut out so that dolly of the MCB's can be operated even if the cover plate is in position. A transparent plastic protection cover shall be

provided on the cut out portion of the cover plate. The cover plate shall also provide right above the respective cut outs a suitable arrangement to label the electrical circuit details of the MCB's mounted on it as well as to affix a danger plate in legible manner. The cover plate shall be fixed to the board with adequate size zinc passivated machine screws.

Above the detachable cover plate, one additional hinged door of 2mm thick CRCA sheet covering the MCB's etc., shall be provided with a suitable locking arrangement. The hinged door shall be provided with a suitable gasket capable of withstanding corrosive & humid atmosphere and to meet degree of enclosure protection IP 54 as per IS : 2147. The DB's shall undergo the process of painting as described under cubicle type main/sub main distribution boards. The DB shall have top/bottom entry arrangement for incoming and outgoing cables/conduits. All hardware to be used in manufacture of the DB shall either be of mild steel zinc passivated or otherwise be treated to prevent corrosion due to humid atmosphere.

All components shall be mounted on DIN rails and covered totally with a sheet steel cover rendering it finger-safe. Access to the internal connections shall be only through removing the cover sheet.

Three phase boards shall have phase barriers and a wire channel for internal wiring. All DB’s shall be internally prewired using copper insulated high temperature PVC wires brought to a terminal strip of appropriate rating for outgoing feeders.

Conduit knockouts shall be provided as required/shown on drawings and the entire board shall be rendered dust and vermin proof with necessary sealing gaskets.

MCB’s shall have quick make and break non-welding self wiping silver alloy contacts for 9KA short circuit both on the manual and automatic operation. Each pole on the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multiple breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to IS 8828 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable upto 4 sqmm Aluminium or 2.5 sqmm copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

Boards shall meet with the requirements of IS 2675 and marking arrangement of busbars shall be in accordance with IS 375. Bus Bars shall be of copper and rated for the incomer switch rating and sized for a temperature rise of 30 deg. C over the ambient. Neutral and earth bars shall be of copper and rated as follows:

	Neutral	Earth Bar
LDB's	Same as phase	Same as phase
PDB's	1.5 x phase bar	Same as neutral bar

There shall be one earth terminal for single phase boards and 2 for 3 phase boards. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed.

All outgoing feeders shall terminate on a terminal strip which in turn is prewired to the MCB by means of insulated single conductor high temperature PVC copper wires.

In the case of Dimmer DB's, the DB's shall incorporate the Dimmer panels as a part of the DB generally as shown on drawing and as approved.

Installation & Testing

All distribution boards shall be mounted on wall or recessed, with necessary angle iron frame work. All mounting frames shall have one prime coat and two finish coats after the completion of the work. All distribution boards shall be touched up for damaged painting.

All boards shall be meggered phase to phase and to neutral using 1000V megger with all switches in closed position. the megger value should not be less than 2.5 megohms between phases and 1.5 megohms between phase and neutral.

Fabrication drawings of all boards shall be approved by the Consultants before fabrication and the boards inspected before dispatch, unless waived in wiring.

2. LT Cable

General

The scope of this specification covers manufacture, supply, inspection, testing at works, packing and forwarding of 1100V grade LT XLPE Power cables & installation including commissioning at site.

Cables shall be aluminium, XLPE insulated, PVC sheathed and round armoured of 3 / 3-½ core and 4 core of sizes specified and suitable for 230 / 415 volts, 1 / 3 phase 50 Hz power supply. The cables shall be suitable for the rated voltage 1100 volts conforming to IS 7098 with latest amendments.

Cables shall be of approved make only. Each drum or coil of cable shall be accompanied by a certificate stating the manufacturer's name, rating of cable, result, and date of tests.

All cables shall be delivered with cable ends effectively sealed. When a cable is cut from a drum both ends shall be immediately sealed to prevent ingress of moisture. Cables shall not be transported to site in loose coils but a number of short lengths of cable may be transported on the same drum. The Contractor shall be wholly responsible for the purchase and/or hire costs of all cable drums and for the removal of these drums from site after use.

Cables shall be adequately rated for current carrying capacity under normal and short time fault conditions at the specified voltage.

The voltage drop for any circuit from origin of the installation (i.e. supply authority's terminals) and the load under steady state conditions shall not exceed ±6% of the nominal voltage.

The Contractor shall submit cable schedules for approval detailing ratings, sizes, lengths, method of installation and function of all individual cables. Cables shall be laid in uncut / single lengths from one termination to the other.

All cables will be identified close to their termination point by cable numbers as per cable schedule. Cable numbers will be punched on aluminium straps (2 mm thick) securely fastened to the cable and wrapped around it. Alternatively cable tags shall be circular in construction to which cable numbers can be conveniently punched. Each underground cable shall be provided with identity tags of lead securely fastened every 30 M of its underground length with atleast one tag at each end before the cable enters the ground. Unpaved area, cable trenches shall be identified by means of markers as per standards.

Standards

The cables offered shall conform to the latest revision of relevant Indian Standard Specifications Some of these standard are list below

Sr. No.	Indian Standard	Title
1	7098	XLPE insulated electrical cables for working voltages upto 1100V
2	8130	Conductors for insulated electric cables and flexible cords.
3	5831	PVC insulation & Sheath of electric cables.
4	3975	Mild steel wires, strips and tapes for armouring of cables.

Sr. No.	Indian Standard	Title
5	2633	Methods of testing weight, uniformity of coating, thickness on hot dip galvanised articales.
6	3961	Recommended current ratings for cables- PVC insulated and PVC sheathed.
7	1753	Aluminium conductors for insulators cables.

Principal Parameter

The LT XLPE power cables shall be used outdoors/indoor, directly burried, through pipes/duct, or laid over the tray / wall etc.

The cable shall meet the requirement of IS specifications listed above and the general technical requirement detailed below.

General Technical Requirement

The cables shall be brand new. It shall be suitable for laying in provided trenches or in provided DWC/RCC pipes or laid over the tray / wall etc.

All LT XLPE power cables shall be 1100 V grade with aluminium Conductor, XLPE insulated, inner sheathed, armoured & over all PVC sheathed.

The construction of the conductors shall be stranded for aluminium cables. Conductors of nominal area of 25sq.mm shall be circular. Those above may be circular or oval shaped.

The core insulation shall be with XLPE compound applied over the conductor by extrusion duly & shall conform to the type A compound of IS –5831.

The inner sheath shall be applied over the laid up cores by extrusion and shall be of XLPE confirming to the requirements of type ST1 PVC compound. The extruded inner sheath shall be of uniform thickness of 0.5 mm upto 16 sq.mm 0.8mm upto 120sq.mm & 1.0mm above 120sq.mm conductor size.

The armoring shall be by single round galvanized steel wires for cable diameter upto 13 mm and galvanized round steel for cables diameters above 13mm.

The outer sheath of the cables shall be applied by extrusion and shall be of PVC compound. Suitable chemicals shall be added to the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

The dimensions of the insulation armour and outer sheath materials shall be governed by IS specification.

Cable Laying

Cables should be reeled / released out from their drums in such a way that no kinks are formed; and damage, twists, excess band of the cables is not allowed. The drums should be mounted on a rollers / jack, which is supported on two ends in such a way, that the drum is lifted off the ground and is free to rotate.

Standard cable grips and real shall be used for cable pulling. Care shall be taken to avoid damage to the cable / insulation or stressing the cable beyond manufacturers recommendations.

Where groups of power and control cables are to be laid along the same route, suitable barriers to segregate them physically shall be employed.

Cables should be laid in single layer wherever possible. In each cable run, some extra length shall be kept at pole location & as directed by Engineer Incharge.

Where lengths of more than 10 m are being rolled off a drum, cable runners (roller assemblies) should be used to prevent abrasion damage to the cables.

Cables shall be laid in provided Trench / DWC / RCC Pipe or laid over the tray / wall etc.

In Ground

Once the excavation of trench is completed, then sand bedding of thickness not less then 75 mm shall be laid uniformly all along the width of the trench. The cable/s is/are laid on the bedding of sand by maintaining requisite space in between. To maintain the spacing between cables, RCC spacers as shown shall be used at an interval of 10mtr. On completion of laying of first layer of cables, another layer of sand bedding of thickness not less then 75 mm shall be laid uniformly over the cable so that the cable is covered properly. RCC tiles or RCC half round cover with embossing of HT cable, month and year of laying shall be placed in continues length over the cable .For laying of second and third layer cable, procedure followed for first need to be repeated completely. Once all the cables are laid and covered with RCC titles or Half round RCC pipe then remaining portion of the trench shall be filled with excavated soil and then the surface is to be compacted, levelled by using water and ramming.

Along with above procedure, it is also necessary to follow and comply with other requirement laid down in IS code of practice IS: 1255/1983 amended up to date. For laying HT cable using good engineering practices.

At road crossing, Cables shall run through hume pipes connected each other with cemented collars so the cables are protected from injury by a pick axe or any sharp implement which could be used later on for excavation wherever road crossing is involved.

In built-in Trench

Where ever the cable is to be laid in built-in trench, the cable shall be laid with required support by maintaining the bending radius specified.

On Trays / on Wall

Where ever the cable is to be laid on tray or on wall, the cable shall be laid in an approved manner with all clamps, ties labeling & other allied accessories.

Testing

All routine, type, acceptance tests & special test such as, oxygen, temperature index & inflammability test shall be carried out as specified in IS. The tenderer shall furnish copy of result of successful Type test as carried over the cable of same design, size and type mentioned in BOQ to prove that the design has successfully passed through required tests. These tests should be carried out in CPRI. The Type Test Certificate should not be more than five years old from the date of opening of tender. The tenderer shall confirm that the material supplied would be exactly inline with the design for which type tests have been conducted.

Following type tests, acceptance tests and routine tests are to be carried out in accordance with IS 7098 (Pt-I)/1988, with its latest amendments as indicated below:-

The following shall constitute type tests:-

Sr. No.	Tests	For requirement Ref. to	For Test method Ref. to part No. of IS: 10810
A)	Test on Conductor		
	Conductor Resistance Test	IS: 8130 – 1984	5
B)	Test for thickness of insulation and Sheath:	9 & 14	6

Sr. No.	Tests	For requirement Ref. to	For Test method Ref. to part No. of IS: 10810
C)	Physical Test for Insulation :		
	Tensile Strength and elongation at break	IS : 7098 Table – 1	7
	Ageing in Air Oven	--do--	11
	Hot Test	--do--	30
	Shrinkage Test	--do--	12
	Water absorption (gravimetric)	--do--	33
D)	Physical Test for Outer Sheath :		
	Tensile Strength and elongation at break	IS: 5831/1984	7
	Ageing in Air Oven	--do--	11
	Loss of mass in air oven	--do--	10
	Shrinkage Test	--do--	12
	Hot deformation	--do--	15
	Thermal stability	--do--	14
E)	Insulation Resistance (Volume Resistivity Test)	IS: 7098 Table - 1	43
F)	High Voltage Test	IS: 7098 clause 16.2	45
G)	Flammability Test	IS: 7098 clause 16.3	53

The following shall constitute acceptance tests:-

Conductor resistance test,

Test for thickness of insulation and sheath,

Hot set test for insulation,

Tensile strength and elongation at break of insulation and sheath,

High voltage test,

Insulation resistance (volume resistivity) test.

All the above acceptance tests will be carried out by in the presence of Engineer Incharge as per relevant IS at the time of material inspection.

The following shall constitute routine test:-

Conductor Resistance test,

High voltage test,

Partial discharge test.

Termination

All XLPE cables upto 1.1KV grade shall be terminated at the equipments by means of cable glands. They shall have a screwed nipple with conduit electrical threads and check nut.

Cable leads shall be terminated at the equipment terminals, by means of crimped type lugs. When crimping the lug to the cable, proper crimping tool to suit the size of lug / cable is to be used.

3. CABLE TRAYS /UNDERFLOOR RACEWAYS & ACCESSORIES

Scope

Scope of these specifications covers the design, material selection, fabrication, testing at manufacturer's works, insurance, packing, transportation, loading/unloading, supply at site and installation of cable trays and accessories covered herein.

Material and construction (Cable tray)

Construction

Cable trays and accessories shall be manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturers' Association (NEMA).

Cable trays and accessories shall be fabricated using mild steel sheets and hot dip galvanized in accordance with B.S.729 after fabrication. All bolts, nuts and washers shall also be galvanized. The zinc coating shall be uniform, smooth and free from imperfections such as flux & ash, black

spots, blisters etc. Cable trays and accessories shall undergo a process of degreasing, pickling in acid & cold rinsing prior to galvanisation.

Cable trays shall be of the following type:

i. Ladder type with rungs

ii. Perforated type.

Perforated cable trays shall be generally of channel type and the perforations shall be 10x30 mm oval holes. Perforated cable trays shall also be galvanised. Galvanising shall be in accordance with that specified above for ladder type cable tray.

Ladder type cable trays shall be made from 2mm thick sheet formed in `C' section of 75mm height and inward flanges of 15mm as side runners and 30mm wide x 10mm high rungs (`C' shaped) from a 1.5mm thick sheet. Perforations as mentioned above shall be provided in the width of the rungs. Pitch of the rungs shall not exceed 250 mm center to centre. Rungs shall be tack welded to the side members.

The thickness of sheet steel for perforated trays shall be 1.6 mm and they shall be of the formed channel shape.

Cable trays shall be of following dimensions as specified in BOQ.

Accessories

Following accessories and hardware, as required, shall be supplied with cable trays :

Coupler plates

bends

Tees

Reducers

4-way cross

Fasteners (Hardware)

Material and construction of Underfloor Raceways

Construction

Unless noted otherwise, trunking and accessories shall be manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturers' Association (NEMA).

Underfloor Raceways is proposed to be installed concealed under the floor finish.

Underfloor Raceways shall be fabricated from 1.6mm thick GI sheet. Overall sizes of Underfloor Raceways and compartments to be provided in each shall be as follows :

Sr. No.	Overall Trunking Size(mm)	No. of compartments & size (mm)
i.	300 x 38	1 x 100 + 1 x 100 + 1 x 100
ii.	250 x 38	1 x 100 + 1 x 100 + 1 x 50
iii.	225 x 38	1 x 75 + 1 x 75 + 1 x 75
iv.	100 x 38	1 x 50 + 1 x 50
v.	75 x 38	1 x 50

Underfloor Raceways shall be complete with partition plates and covers.

Accessories

Underfloor Raceways of each size shall be supplied with following accessories

4 way junction boxes with removable covers

Vertical access boxes

Couplers

End caps.

Any other accessories, if required, for satisfactory installation shall also be included as part of supply.

Underfloor Raceways shall be supplied in standard length as per the manufacturer.

Testing at manufacturers work

The material for cable trays and accessories shall be offered for stage inspection by the Owner as follows:

Prior to fabrication and galvanising.

After fabrication but before galvanising.

After galvanising but prior to dispatch.

During inspection, thickness of sheets, dimensions and weight of zinc coating will be measured. Items not conforming to specifications shall be rejected.

Prior to fabrication, sheets to be used for fabrication of cable trays/underfloor compartmental raceways/accessories shall be offered for inspection. Subsequent to fabrication, but prior to galvanising, trunking/accessories shall be offered for inspection. Items not conforming to specifications shall be rejected.

4. Wiring system

Scope

The scope of work under this section covers providing & commissioning of wiring system for lights, fans, exhaust fans, power sockets etc. The wiring shall generally be carried out using 1.1 KV grade PVC insulated stranded copper conductors FRLS wires in rigid PVC conduit laid on surface or concealed complete with insulated earth wire, flushed modular switches, sockets etc.

Standards

The installation shall conform in all respects to Indian Standard Code of Practice for Electrical wiring installation IS:732-1963 and IS:2274-1963. It shall also be in conformity with Indian Electricity Rules and the Regulations, National Electric Code and National Building Code. CPWD specifications and requirements of the Local Electric Supply Authority. In general, all materials, equipment and workmanship shall conform to the Indian Standards, specifications and code. Some of the applicable codes/standards are as under:

IS 375	Marking and arrangements for switchgear : Bus bars, main connection and auxiliary wiring
IS 2675	Specifications for enclosed distribution
IS 1554	Specifications for PVC insulated (heavy duty) electric cable Part-I for voltage upto 1100 volts.
IS 694	Specifications for PVC insulated: Cables for voltage upto 1100V with Aluminium conductors.
IS 5133	Boxes for the enclosure of electrical accessories
IS 1293	3 pin plugs and socket outlets
IS 1913	General and safety requirements for electric lighting fittings.
IS 374	Electric ceiling fans and regulators.
IS 3043	Code of practice for earthing IS 3043
IS 1646	Electrical installation.
IS 8623	Factory built assemblies of switch gear & control gear.

Distribution Wiring Systems

General

The wiring systems should be suitable for the following systems depending on the requirement.

3 phase, 4 wire, 440V, 50 Hz, AC.

Single phase, 2/3 wire, 240V, 50 Hz, AC

Wiring systems

Depending on the requirement, the following systems are covered by this specification.

Concealed / Exposed systems using conduits laid / surface mounted in / on slabs, beams, walls, flooring etc. The conduits should be of heavy duty rigid PVC.

Concealed wiring

Conduits using PVC pipes should be of not less than 20mm dia anywhere (wherever diameters of conduits are specified, they should be read as inside diameter and not outside diameter) and of not less than 2 mm thickness.

The total overall area of cross section of wires drawn into any conduit should not exceed 40% of the internal cross section of the conduit.

All conduit accessories should be of the same material as the conduit appropriately selected for the application required and necessary pull boxes of adequate size should be provided wherever required at no additional price.

During installation the following points should be taken care of:

Conduits in the ceiling slab should:

be run as straight as possible and if a change in direction is required it should be done with a gentle curve. Appropriate conduit accessories like various types of bends, should be used when required to ensure easy drawing of wires.

be laid on prepared shuttering work before concrete is poured and tied to reinforcement bars at least at every half metre.

be laid so that they protrude through the shuttering at the entry/exit points.

have GI pull wires installed in them while laying the conduit and before casting the slab.

Accessories such as concealed fan hook boxes, junction boxes, etc. should be firmly secured and its rim pressed tightly against the shuttering to prevent cement slurry from entry into the enclosure during concreting. Bitumen should be used around the rim as a further precaution.

Bitumen, alongwith cotton waste fibres, should be used as a sealant (to prevent ingress of cement slurry) at all screwed ends, joints, entry of conduits into accessories and at all places where the entry of cement slurry during concreting, will cause interference with smooth drawing of wires. Besides the use of bitumen, the Contractor should also use methods he thinks fit to prevent ingress of cement slurry into areas where it is not supposed to penetrate.

Since concealed termination boxes are limited in position by shuttering, extension collars should be provided to make them effectively flush with finished wall or ceiling.

Conduits laid below flooring should be kept in position by GI saddles fixed to the slab by means of nylon plugs and MS screws, at intervals of not less than 75 cms and also at all critical bends.

Conduits recessed in walls should:

be installed before plastering is done.

be secured well by steel hooks or staples at intervals of 75 cms.

be installed only after chases and grooves are made of proper dimensions to ensure that all the conduits in the groove can be properly accommodated, so that the top surface of any conduit should be at least 25 mm below the finished surface of the wall.

All recessed control boxes, distribution boards, etc. should be firmly fixed in position by nylon plugs, set in machine drilled holes, and plated screws.

All pipe sleeves required to be put in place through slabs, beams, columns and other RCC structures, will not be part of the electrical contractor’s works.

Surface Wiring

Conduits should generally run in square and symmetrical lines. They should be fixed by heavy gauge GI spacers and saddles. The spacers should be fixed by means of plated screws in nylon plugs set in machined drilled holes.

Conduits should be joined by means of couplers and required approved accessories.

Bends in conduit runs should be done by a bending machine, and care should be taken that the original cross section area is largely maintained while making the bend. Inspection boxes or inspection bends should be used wherever pipe bends cannot be used.

Crossing of surface conduits will not be permitted and, wherever this takes place, adaptor boxes are to be used.

Installation

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 20 mm Dia unless otherwise indicated or approved. Size of wires shall be as specified in the schedule of work / SLD.

Nominal dia of wires (mm)	Nominal Cross sec. area (sqmm)	20 S	mm B	25 S	mm B	32 S	mm B	38 S	mm B
1/2.40	1.50	4	3	8	6	15	9	-	-
1/1.80	2.50	4	2	6	4	10	8	-	-
1/2.24	4.00	2	2	4	3	8	6	-	-
1/2.80	6.00	1	-	4	3	6	6	-	-
1/3.55	10.00	1	-	3	2	5	4	6	5

S- runs of conduits which have distance not exceeding 4.25 m between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B- runs of conduits, which have, deflect from the straight by more than 15 degree.

Conduits shall be kept at a minimum of 100 mm from the pipes of other non-electrical services.

Separate conduits shall be used for each of the following :

Normal lights and 6A 3 pin sockets on lighting circuit

Power outlets - 16A 6 pin socket

Emergency lighting

Telephones

Data outlets

Fire alarm system

Public address system

Call bell wiring

CCTV system

Access Control

Conduit layout shall be as approved of the Engineer. Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25m.

Point Wiring

Definition

A point shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB.

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

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

Back plate (in the case of stiff pendants).

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

Scope

Following shall be deemed to-be included in point wiring.

Conduit/channel as the case may be, accessories for the same and wiring/cables between the DB and switch box, switch box and the point outlet, loop protective earthing of each fan/light fixture.

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

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

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

Any special block required for neatly housing the connector in batten wiring system.

Control switch or MCB, as specified.

3 pin or 6 pin socket, ceiling rose or connector as required. (2 pin and 5 pin socket outlet shall not be permitted).

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

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

Measurement

Point wiring (Other than socket outlet points)

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

Point wiring for socket outlet points:

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

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

Note: There shall normally be no "on the board" light plug point.

The power point outlet may be 16A/6 A six pin socket outlet, where so specified in the tender documents.

Group Control point wiring:

In the case of points with more than one point controlled by the same switch, such points shall be measured in parts i.e. (a) from the DB to switch board & the switch to the first point outlet as one point (Primary point)and for the subsequent points, the distance from that outlet to the next one and so on, shall be treated as separate point (Secondary point)

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

Socket Outlets:

Socket outlets shall be 6A 3 pin, 16 Amp 3 pin or 16/6 Amp 6 pin. 5 pin socket outlets will not be permitted. The third pin shall be connected to earth through protective (loop earthing) conductor, 2 pin or 5 pin sockets shall not be permitted to be used.

Conductors connecting electrical appliances with socket outlets shall be of flexible type with an earthing conductor for connection to the earth terminal of plug and the metallic body of the electrical appliance.

Sockets for the power outlets of rating above 1 KW shall be of industrial type with associated plug top and controlling MCB.

Where specified, shutter type (interlocking type) of sockets shall be used.

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

5A/6A and 15A/ 16A socket outlets shall be installed at the following positions, unless otherwise specified.

Non-residential buildings - 23cm above floor level.

Kitchen - 23 cm above working platform and away from the likely positions of stove and sink. Bathroom - No socket outlet is permitted for connecting a portable appliance thereto. MCB/IC switch may be provided above 2 m for fixed appliances, and at least 1 m away from shower.

Rooms in residences - 23 cm above floor level, or any other level in special cases as desired by the Engineer-in-charge.

Unless and otherwise specified, the control switches for the 6A and 16A socket outlets shall be kept along with the socket outlets.

Mains & Submains wiring

Submain & Circuit (Mains) wiring:

Submain wiring:

Submain wiring shall mean the wiring from one main/distribution switchboard to another.

Circuit(Mains) wiring:

Circuit wiring shall mean the wiring from the distribution board to the tapping point inside the switch box, from where point wiring starts.

Measurement of submain and circuit wiring:

Circuit and submain wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all lengths from end to end of conduit or channel as the case maybe, exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.

The length of circuit wiring with two wires shall be measured from the distribution. Board to the nearest switch box from which the point wiring starts. Looping of switch boxes also will-be counted towards circuit wiring, measured along the length of conduit/channel.

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

Protective (loop earthing) conductors, which are run along the circuit wiring and the sub main wiring, shall be measured on linear basis and paid for separately.

Note: Conduit carrying submain will not carry circuit/point wiring. Similarly conduit carrying circuit wiring will not carry submain/point wiring. Conduit carrying point wiring will not carry submain/circuit wiring.

Measurement of other wiring work:

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

Wiring System:

Wiring shall be done only by the looping system. Phase/live conductors shall be looped at the switch box. For point wiring, neutral wire/earth wire looping for the 1 st point shall be done in the switch box; and neutral/earth looping of subsequent points will be made from point outlets.

In wiring, no joints in wiring will be permitted any where, except in switch box or point outlets, where jointing of wires will be allowed with use of suitable connector.

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

Colour coding:-

Following colour coding shall be followed in wiring:-

Phase : Red/Yellow/Blue.(Three phase wiring)

Live : Red (Single phase wiring)

Neutral : Black

Earth : Green.

Termination of circuit into switchboard:-

Circuit will consist of phase/neutral/earth wire. Circuit will terminate in a switch board in following manner:-

Phase wire terminated in phase connector. Neutral wire terminated in neutral connector. Earth wire, terminated in earth connector.

The switchboard will have phase neutral and earth terminal connector blocks to receive phase/ neutral/earth wire.

RUN OF WIRING

i. The type of wiring shall be as specified in the tender documents namely, surface conduit/recessed conduit, steel/PVC, channel.

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

iii. Above false ceiling, in no case, open wiring shall be allowed. Wiring will be done in recessed conduit or surface steel conduit.

iv. In recessed conduit system, routes of conduit will be planned, so that various inspection boxes provided don't present a shabby look. Such boxes can be provided 5 mm above plaster level, and they can be covered with plaster of paris with marking of junction boxes.

v. Where number of electrical services like electrical wiring, telephone wiring, computer cabling, pass through corridors, it may be proper to plan such service with properly designed

aluminium/PVC channels duly covered by a false ceiling, so that subsequently such service can be maintained and additional cables can be provided.

vi. Generally conduits for wiring will not be taken in floor slabs. When it is unavoidable special precaution to be taken to provide floor channels with provision for safety and maintenance. Alternatively false flooring can be provided.

Passing through walls or floors

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

ii) All floor openings for carrying any wiring shall be suitably sealed after installation

JOINTS IS CABLES

i. The type of wiring shall be as specified in the tender documents namely, surface conduit/recessed conduit, steel/PVC, channel.

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CAPACITY OF CIRCUITS

i) Lighting circuit shall feed light/fan/ call bell points. Each circuit shall not have more man 800 Watt connected load or more man 10 points. However, in case of CFL points where load per point may be less, number of points may be suitably increased.

ii) Power circuit in non-residential building will have only one outlet per circuit.

iii) Each power circuit in residential building can feed following outlets:

a) Not more than 2 Nos. 16A outlets.

b) Not more than 3 Nos. 6A outlets.

c) Not more than 1 No. 16A and 2 Nos. 6A outlets.

iv) Load more than 1KW shall be controlled by suitably rated MCB and cable size shall be decided as per calculations.

v) Power wiring with Bus trunking:

It is permitted to meet large-scale power requirement in a hall, or floor, with use of single phase or 3 phase bus bars running inside a metal enclosure. This, will be provided with careful design and use of factory fabricated bus-trunking of reputed make, conforming to relevant BIS standards and with standard accessories like End feed unit, tap off with necessary safety features like over current, short-circuit and earth fault protection. Such trunking will be of specified breaking KA rating.

Cables

i) Copper conductor cable only will be used for submain/circuit/point wiring.

ii) Minimum size of wiring:

Light Wiring: 1.5sq.mm.

Power Wiring: 4.0sq.mm.

Power circuit rated: More than 1 KW, Size as per calculation.

iii) Insulation:

Copper conductor-cable shall be PVC insulated, Fire retardant, low smoke (FRLS) type conforming to BIS Specification.

iv) Multi stranded: Cables are permitted to be used

WIRING ACCESSORIES

a. Control switches for point:

i) Control switches (single pole switch) carrying not more than 16A shall be modular type. The switch shall be 'On' when the knob is down.

ii) Modular type switches of reputed make along with matching mounting boxes, shall be used in non-residential buildings and residential quarters of all types. Modular type sockets, stepped type fan regulators shall be used. All such boxes, switches and accessories shall be of same make of modular switch manufacturer.

iii) It is recommended to provide double pole MCB in proper enclosure as power out let for window type AC units, geysers etc.

b. Switch Box:

i. Switch box shall be hot dip galvanized, factory fabricated. Suitable in size for surface/ recess mounting and suitable in size for accommodating the required number of switches and accessories (where required to be used for applications other then modular switches/ sockets).

C. Switch box covers (for application other than modular type):

Phenolic laminated sheets of approved shade shall be used for switch box covers. These shall be of 3mm thick synthetic phenolic resin bonded laminated sheet as base material and conforming to grade P-I of IS: 2036-1974.

Note: Specification for switch boxes is covered in the chapters on the various types of wiring.

d. Ceiling rose:

i) A ceiling rose shall not be used on a circuit, the voltage of which normally exceeds 250V.

ii) Only one flexible cord shall be connected to a ceiling rose. Specially designed ceiling roses shall be used for multiple pendants.

iii) A ceiling rose shall not embody fuse terminal as an integral part of it.

e. Lamp holders:

i) Lamp holders may be batten, angle, pendant or bracket holder type as required. The holder shall be made of brass and shall be rigid enough to maintain shape on application of a nominal external pressure. There should be sufficient threading for fixing the base to the lamp holder part so that they do not open out during attention to the lamp or shade.

ii) Lamp holders for use on brackets and the like shall have not less than 1.3 cm nipple, and all those for use with flexible pendant shall be provided with cord grips.

iii) All lamp holders shall be provided with shade carriers.

iv) Where center contact Edison Screw lamp holders are used, the outer or screw contact shall be connected to the 'middle wire', or the neutral conductor of the circuit.

f. Fan Regulators and Clamps

i) The metallic body of regulators of ceiling fans/ exhaust fans shall be connected to earth by protective conductor. Regulator shall be of electronic step type as indicated.

ii) The leading in wire shall be of nominal cross sectional area not less than 1.5 Sq.mm. & shall be protected from abrasion.

iii) The down rod for ceiling fan shall be of length as required at site & shall be included in the offer quoted.

CONDUITS

(i) All non-metallic conduit pipes and accessories shall be of suitable material complying with IS: 2509-1973 and 18:3419-1989 for rigid conduits and IS: 9537 (Part 5) 2000 for flexible conduits. The interior of the con 46 Conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

(ii) The conduits shall be circular in cross-section. The conduits shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in Table-Il.

(iii) No non-metallic conduit less than 20mm in diameter shall be used.

(iv) Wiring capacity

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

Conduit accessories

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

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

(iii) Flexible conduit accessories shall be of threaded type.

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

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

(vi) The minimum width and the thickness of the ordinary clips or girder clips shall be as per Table III.

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

TABLE I

Maximum number of PVC insulated 650/1100 V grade aluminium / copper Conductor cable conforming to IS: 694-1990.

Nominal cross Sectional Area of Conductor in sq.mm	20mm		25mm		32mm		38mm		51mm		64mm	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.50	5	4	10	8	18	12						
2.50	5	3	8	6	12	10						
4	3	2	6	5	10	8						
6	2	-	5	4	8	7						
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35							3	2	6	5	8	6
50									5	3	6	5
70									4	3	5	4

Note:

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

The columns headed'S' apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit, which deflect from the straight by an angle of more than 15 degrees.

Conduit sizes are the nominal external diameters.

TABLE II

Dimensional details of rigid non – metallic conduits

(All dimensions in mm)

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

TABLE III

Ordinary Clips or girder clips

Size of Conduit	Width	Thickness
1) 20mm & 25mm	19 mm	20 SWG (0.9144 mm)
2) 32mm & above	25 mm	18 SWG (1.219 mm)

TESTING OF INSTALLATION:

Before a completed installation is put into service, the following tests shall be complied with:

INSULATION RESISTANCE:

The insulation resistance shall be measured by applying 500 volt megger with all fuses/ MCB in places, circuit breaker and all switches closed.

The insulation resistance of an installation, measured shall not be less than 50 megohms divided by the number of points on the circuit.

The insulation resistance shall be measured between

EARTH TO PHASE

EARTH TO NEUTRAL

PHASE TO NEURAL

PHASE TO PHASE

EARTH CONTINUITY PATH:

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed the value specified in IS .

POLARITY OF SINGLE POLE SWITCHES :

A test shall be made to verify that every no-linked, single pole switch is connected to one of the phase of the supply system.

COMPLETION CERTIFICATES:

All the above tests shall be carried out in presence of engineer in charge and the results shall be recorded in prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result from shall be submitted to the engineer in charge in required set of copies..

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

Samples

Samples of the items to be supplied under the Contract shall be submitted for the approval of the Owner. Material complying with the approved samples only shall be procured.

Drawings

All drawings should have the following data:

Client's name.

Project title.

Purchase Order No. & Date.

The following drawings should be furnished by the contractor:

General arrangement drawings showing principal dimensions, feeder arrangements, front view, plan and foundation details for switchgear and control panels.

Single line diagrams of power circuits giving rating of various equipment.

Schematic and control wiring diagram for control circuits, also indicating ferrule & terminal markings.

Drawings giving the schedule of components incorporated, with details of rating, make, catalogue/type number, etc.

Shop Floor Drawings

`AS EXECUTED' drawings for :

substations showing positions of equipment, cable routing, earthing details, etc.

all other works carried out, but not specifically mentioned above.

It is the duty of the contractor to get the installation approved by the competent authorities and for this purpose all paperwork, drawings, etc. that are required, will have to be done by the contractor. The employer will reimburse the statutory payments made for this purpose on production of receipts in original.

Four copies of general arrangement, single line, schematic & control wiring diagrams are to be submitted for approval within 3 weeks of receipt of order. The manufacture should commence work only after receipt of approval of drawings.

Documentation

Four sets of the following items should be submitted, each set duly bound (for all equipments, including bought out components).

Test certificates.

Instruction manuals for installation, operation and maintenance.

Spare parts list and prices.

AS EXECUTED’ drawings.

5. LIGHTING FIXTURES

Scope

The scope of work shall cover the supply, installation, testing and comissioning of various types of light fixtures. The scope also includes the supply of motion sensors and day light sensors.

Standards

The following standards and rules shall be applicable :

IS 3646 - 1960 Code of practice for interior illuminator.

IS 1913 - 1969 General and Safety requirements for electric lighting fittings.

Indian Electricity Act and Rules issued there under.

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Code of Practice or the relevant British Standard Code of Practice in the absence of Indian Standard.

Technical Specifications

Supply of LED luminaries complete with pressure die cast/extruded aluminum housing and adhering to the following specifications and lighting design requirements will be as per the actual application:

1. The driver card shall cut off at 270 V and shall resume normal working when nominal voltage is applied again. This is to ensure protection of luminaries from neutral faults and error in connection at sites.

2. Efficiency of driver electronics shall be more than 90%

3. The LEDs should be driven at the suitable current and within the permissible limits specified by the LED chip/lamp manufacturer

4. LED Driving current shall be less that or equal to test current in LM80 report

5. The fixture shall be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours

6. The luminaries should be operable with auto adjustable 100-270V supply Voltage using the same driver.

7. Power Factor of the electronic driver should be at least > 0.95 with THD <10%.

ELECTRONIC COMPONENTS

The electronic components used shall be as follows:

a. IC (Integrated Circuit) shall be of industrial grade.

b. The resistors shall be preferably made of metal film of adequate rating.

c. The conformal coating used on PCBs should be cleared and transparent and should not affect color code of electronic components or the product code of the company.

d. The heavy components shall be property fixed. The solder connection should be with good finish.

CONSTRUCTION

a. Extruded aluminum and pressure die cast aluminum (sand/gravity casting not to be considered). Aluminum grade LM 6063-T5 or LM 6 as applicable or above high conductivity heat sink material. Heat sink must be made of pressure die cast Al Only. Efforts shall be made to keep the overall outer dimensions and weight as minimum as possible.

b. All light fittings shall be provided with toughened glass of sufficient strength under the LED chamber to protect the LED and luminaries.

c. Suitable number of LED Lamps shall be used in the Luminaries.

d. Suitable reflector/lenses shall be provided to modify the illumination angle.

e. The connecting wires used inside the luminaries. shall be low smoke halogen free, fire retardant-beam/PTFE cable and fuse protection shall be provided in input side.

f. The control gear shall be designed in such a way that the junction temperature of LED should not be more than 25 C with respect to ambient temperature.

g. The luminaries shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.

h. All the material used in the (Luminaries) shall be halogen free and fire retardant confirming to UL 94.

i. The fixture should be impact resistant with suitable protection by cover for driver and LED's

j. The fixture should have designed for IP54 ingress protection .

HIGH POWER AND HIGH LUMEN EFFICIENT LED'S SUITABLE FOR FOLLOWING FEATURES SHALL BE USED:

a. LED Chips of Cree/Osram /Phillips/Nischiya/Samsung make shall be used for the purpose. No. other make shall be accepted. The manufacture shall submit the proof of procurement of LEDs from above OEMs at the time of supply.

b. The efficiency of the LED lamps at 110 C junction temperature shall be more than 80%

c. LED Junction temperature should not cross more than 90 C for longevity of luminaries. d. Solder point temp should not cross 75 C.

e. The working life of the lamp at junction temperature of 90 C for 350 mA current shall be more than 50,000 hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day these shall be supported with the suitable section of the LM80 report from the manufacturer of LED.

f. Color temperature of the proposed white color LED shall be 5000K-6500K

g. The output of LED shall be of minimum 100 lumen per watt at operating current.

h. The color rendering index (CRI) shall be of more than 75 with cool while light output.

i. Variation in illumination level shall be + - 2% is allowed in input voltage range from 180VAC to 250VAC

j. The illumination shall not have infra-red and ultra-violet emission. The test certificate from the NAB approved laboratory shall be submitted.

k. Electronic efficiency shall be more than 90%

SPECIFICATION CHART:

Sr No	Parameters	Specified value	Bidders input
1	Input Voltage	90-270V AC	
2	Input Frequency	50 Hz	
3	Total Harmonic Distortion (THD)	<10%	
4	Power factor (P.F.)	>0.95	
5	Colour Temperature	warm white	

6	Working Humidity	10% to 90% RH	
7	Working Temperature	50deg C to 50 deg C	
8	Ingress Protection	IP-54	
9	Total System power consumption (includes LED & drive part) in watts	Should be submitted for individual light fixture	
10	Color Rendering Index (CRI)	>75	

CERTIFICATIONS:

The following certificates should be submitted before procuring the lighting fixtures so that the performance of the light fixtures can be evaluated.

1.LM-79 - To evaluate luminaires efficiency (photometric data)

2.LM-80 - To evaluate LED Chip manufactures data.

GENERAL REQUIREMENTS:

1. All fittings should be as per the reference images shown in the Bill of quantities. Any other model suggested should be submitted to approval of Consultant/Architect/Client prior to procurement.

2. All fittings should have guarantee of three years & guarantee cards of all the fittings duly filled with stamp of manufacturer and contractor are to be submitted along with bill.

3. Fixtures and lamps shall be as per the catalogue number, where indicated in the bill of quantity. Any deviation should be made only after receivingcencent from the Architect/Consultant.

4. Fixtures and lamps shall be provided with all such accessories as are required to satisfy the working condition whether specifically mentioned in the specifications, drawings or not.

5. All fixtures shall be complete with accessories and fixings necessary for installation whether so detailed under fixture description or not.

6. Fixture shall be installed at mounting heights as detailed on the drawings or instructed on site by the client's representative.

7. Fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers and method of fastening specified shall be submitted to the client's representative for approval.

8. Fixture shall be completely wired and constructed to comply with the regulations and standards for Electric Lighting Fixtures, unless otherwise specified. Fixtures shall bear manufacturer's name and the factory inspection label unless otherwise approved.

9. Lighting fixtures shall be designed for minimum glare and for continuous operation under specified atmospheric condition.

10. All fixtures shall be complete with accessories like power factor improvement capacitors, ballast, ignitor etc.

6. DATA AND TELEPHONE NETWORKING

Scope

The scope of the Contractor shall include structured cabling for data outlets by means of CAT 6 cabling. The scope of the Contractor shall include the passive components ie. 4port patch panels, 1 metre and 3 meter patch cords, data outlets (dust proof shuttered type) and racks.

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to furnish, and to install a complete cabling infrastructure supporting data. The intent of this section is to provide pertinent information to allow the vendor to bid the labour, supervision, tooling, materials, and miscellaneous mounting hardware and consumables to install a complete system.

Applicable Documents

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:

1) This Technical Specification and Associated Drawings

ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001

4) ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998

5) ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993

6) ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

Cabling System and Component Specifications

Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2

1	Conductors	23 AWG solid bare copper or better
2	Insulation	Polyethylene
3	Jacket	Flame Retardant PVC
4	Pair Separator	Cross-member fluted Spline.
5	Approvals	UL Listed ETL verified to TIA / EIA Cat 6
6	Operating temperature	-20 Deg. C to +60 Deg. C
7	Frequency tested up to	Minimum 600 MHz
8	Packing	Box of 305 meters
9	Delay Skew	45ns MAX.
10	Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
11	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

UTP Jacks

Type	PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Durability	
Modular Jack	750 mating cycles

Wire terminal	200 termination cycles
Accessories	Strain relief and bend-limiting boot for cable
	Integrated hinged dust cover
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Approvals	UL listed
Performance Characteristics to be provided with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

UTP Patch Panels

Type	24-port / 48-port, PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Ports	24 / 48
Port arrangement	Modules arranged as per standard
Category	Category 6
Circuit Identification Scheme	Icons on each of 24-ports
Port Identification	9mm or 12mm Labels on each of 24-ports (to be included in supply)
Height	1 U (1.75 inches)
Durability	

Modular Jack	750 mating cycles
Wire terminal (110 block)	200 termination cycles
Accessories	Strain relief and bend limiting boot for cable
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphhorous bronze, plated with 1.27micro-meter thick gold
Panel	Black, powder coated steel
Approvals	UL listed
Termination Pattern	TIA / EIA 568 A and B;
Performance Characteristics to be provided along with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

Workstation / Equipment Cords

Type	Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Conductor	24 AWG 7 / 32, stranded copper
Length	7-feet
Plug Protection	Matching colored snag-less, elastomer polyolefin boot
Warranty	25-year component warranty
Category	Category 6
Plug	

Housing	Clear polycarbonate
Terminals	Phosphor Bronze, 50 micron gold plating over selected area and gold flash over remainder, over 100 micron nickel underplate
Load bar	PBT polyester
Jacket	PVC
Insulation	Flame Retardant Polyethylene

Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years and shall cover the system performance, application assurance and the costs of the supply of components and installation.

UTP PATCH CORD

Material:

Assembly (conforming to EIAITIA 568B-2-1) of Cat 6 type 4 unshielded twisted pair 24-

26AWG (0.51mm-0.40mm), each pair separated by a PE former (Star shaped) 100 ohms stranded wire PVC insulated cables with modular RJ-45 polycarbonate UL94V housing 15milliohms gold over nickel contacts (superior three piece connector) crimped on both ends with T568A & T568B wiring schemes with 8P8C connection. The cord shall be branded. The cords shall be used in structured cabling in accordance with following table

Sr. No.	Length	Usein
1	1m	from switch to patch panel
2	3m	From information outlet to Ip phone and from phone to computer

All patch cords shall exceed TIAIEIA and ISOIIEC Category 6/Classs E specifications.

All patch cords shall be backward compatible with Category 5 and Category 5E systems.

The patch cords shall incorporate an anti-snag feature that provides maximum protection from snagging during moves and re-arrangements.

Patch cords shall be UL listed, UL-C certified and AUSTEL approved.

Patch cords shall support network line speeds in excess of 1 gigabit per second.

Method of construction:

The patch cord shall be erected for making connections from switch to patch panel or from computer /phone to information outlet.

UTP CONNECTOR (RJ 45)

Material:

Assembly of Gold over nickel contacts with 1.5A current carrying capacity, 30V with 15milli ohms contact resistance, 8P8C connection easy to crimp with crimping tool in polycarbonate UL94V housing.

Method of construction:

The UTP cable shall be spliced, untwisted not more than 12mm, inserted into the connector with sequence as per EIAITIA 568 8.2-1 & crimped firmly with crimping tool. For connecting computers to wired LAN or external wireless Ethernet interface in Wireless LAN.

7. INTELLIGENT ADDRESSABLE FIRE ALARM SYSTEM

GENERAL DESCRIPTION:

a. Provide Fire Detection and Alarm System in accordance with NFPA 72 (Latest edition) and requirements of the Contract Documents. Provide a complete operable and intelligent analog addressable Fire Alarm and Detection System with associated communication and notification systems. The system shall include interfaces for foreign systems, as described herein and in accordance with the Contract

Documents, and all applicable Codes, Standards and local Regulations, and be approved by Fire Services.

b. All Plant furnished shall be new and the latest state-of-the-art, products of a single Manufacturer engaged in the manufacturing of analog fire detection devices for at least 5 years.

c. All software licenses shall be supplied as part of the contract. Renewable & subscription license are not acceptable.

d. The system shall be supplied, installed, tested, and approved by the local Authority Having Jurisdiction, and turned over to the

Contractor in an operational condition.

e. The subcontractor shall contract with a single supplier for the fire alarm Plant, engineering, programming, inspection and tests, and shall provide a "UL Listing Certificate" for the complete system.

f. Drawings: The Drawings shall serve to indicate the general arrangement of the various Plant and their generic functional interconnections. However, layout of Plant, accessories, specialties, conduit system and wiring, are diagrammatic and do not necessarily indicate every required device, fitting, etc., required for the complete

installation.

SCOPE:

A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

DRAWINGS & TECHNICAL SUBMITTALS

General:

Two copies of all submittals shall be submitted to the Architect/Engineer for review.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

Shop Drawings:

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

Show annunciator layout, configurations, and terminations.

Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

Software Modifications

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

WARRANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

National Fire Protection Association (NFPA) - USA:

NFPA 13	Sprinkler Systems
NFPA 16	Foam/Water Deluge and Spray Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 17A	Wet Chemical Extinguishing Systems
NFPA 2001	Clean Agent Extinguishing Systems
NFPA 72	National Fire Alarm Code
NFPA 76	Telecommunication Facilities
NFPA 318	Clean Room Applications
NFPA 101	Life Safety Code

NFPA 90A Air conditioning & ventilation system

B. Underwriters Laboratories Inc. (UL) - USA:

UL 268 Smoke Detectors for Fire Protective Signaling Systems
UL 864 Control Units for Fire Protective Signaling Systems **9th Edition Listed**
UL 268 A Smoke Detectors for Duct Applications
UL 521 Heat Detectors for Fire Protective Signaling Systems
UL 464 Audible Signaling Appliances
UL 38 Manually Actuated Signaling Boxes
UL 346 Waterflow Indicators for Fire Protective Signaling Systems
UL 1971 Visual Notification Appliances
UL 228 Door Holders

NATIONAL BUILDING CODES

IS CODES

A. **General Fire Alarm System Description**

Fire detection and Alarm System shall consist of Fire Alarm Control Panels, various types of equipments like Detectors, hooters, Strobes, monitor & control modules, Repeater panel, and different types of cables located at various strategic locations of the building.

In case of a Fire alarm initiation by an alarm initiating device, the audio-visual fire alarm shall be generated at the respective Fire Alarm Control Panels and at Repeater panel located in the Control Room, various location and also initiate signal to operate hooters located in various locations.

All types of addressable detectors / interface units shall be compatible with the fire alarm panel.

All the alarm initiating devices that are asked for to be self addressable type shall be of self addressable type. In case of non addressable detectors the detector status shall be monitored through a Conventional Zone Interface Module (CZIM) to send the analogue information available from the detector to FACP. The BIDDER shall clearly indicate what are all the device / detectors which are not self addressable in type and shall include CZIM module to make that device / detector addressable. The CZIM module cost shall also be considered as included in the detector cost

The detector shall be suitable to connect to the control unit via a four wire circuit (Class –A wiring) as per NFPA.

The Fire Alarm System envisaged for this Building is "2-Wire Analog Addressable" type.

The communication between detectors and the FACP is by means of digital communication over 2-wire, which further provides power to the detectors, devices & Sounders. There shall be A/D and D/A conversion happening inside the detectors and FACP.

All the detectors shall be incorporated with microprocessors and shall be provided with Analog to Digital Converter (ADC), which enables the detector to provide linear output corresponding to the quantity of smoke or fire, the detector encounter.

All types of detectors offered will be of restorable type i.e. suitable for operating afresh after each actuation on alarm without replacement or adjustment.

The sensitivity of each sensor shall be individually adjusted from the FACP to suit the conditions of each location. Each detector shall have self-test facility, which is monitored in the FACP. Each detector shall have drift compensation.

The response sensitivity shall also be field adjustable and not only from fire panel over a wide range to suit site conditions. It shall be possible to test the sensitivity of a detector in the field. The sensitivity / threshold value of detectors which are cross zoned must be compatible.

The FACP shall also check each sensor for contamination of dust/dirt and give signal for "Service" in case of accumulation of dust/dirt reaches a preset limit.

The fire alarm system shall work without any problem both in networked mode and in standalone mode.

The electronic circuit shall be of solid state and of failsafe design and virtually hermetically sealed to have resistance to humidity and corrosion and to prevent its operation from being impaired by dust and dirt.

The circuit shall be protected against usual electrical transients, electromagnetic and electrostatic interference (EMI & RFI) present in the Building.

Reverse polarity or fault in the field wiring shall not damage the detector.

No moving parts subject to wear & tear shall be provided.

All types of detectors & devices offered shall have a inbuilt fault isolator. The fire detectors shall be plug in type. Suitable locking device shall be supplied along with each detector. It shall be inserted into or removed from the standard base by simple push twist mechanism to facilitate easy exchange / cleaning and maintenance.

The system shall have following self diagnostic features:

i. Detector cabling shall be completely supervised for open circuit and short circuit and exact location of fault shall be displayed in the panel under Trouble/Faults.

ii. Un-authorized removal of a detector head from its base shall be supervised to give an alarm on the connected control panel.

iii. Annunciation shall be provided for DC fuse blown and loss of main AC supply etc.

iv. Alarm verification features.

B. **Analogue Addressable Fire Alarm Control Panel (FACP)**

The FACPs used in the Building shall confine to the EN54 standards having the following features

Features

1) All the FACPs provided shall have the capacity to expand from 1 to 32 loops for Future expansion.

2) Each loop shall accommodate maximum 254 detectors and devices in any combination with a loop length capable up to 1.6 kms with 2C x 1.5 sq mm cable.

3) It shall have facility to discriminate between a real fire alarm and a false alarms.

4) FACP will function as fully stand-alone panel & also networked to other FACPs with peer to peer communication.

5) Each FACP shall have a possibility of accommodating redundant controller to takeover in case of a Failure in the Primary Controller and also redundant loop card for each loop to takeover in case of a Failure in the Primary Loop Card.

6) Each FACP shall have inbuilt LCD colour touch screen (320*240 pixels)to clearly indicate the location of fire, type of device activated other indications like service requirement of a component, etc.

7) It shall have a provision for battery storage.

8) In case of a Loop Card Failure, the FACP shall allow to replace the Loop card without switching off the panel and reprogramming.

9) The FACP shall have facility such that alteration or access to the stored program shall be done through a pass-code, for protection against unauthorized personnel interference.

10) The FACP shall be capable of PA Integration with the use of RS232 module or with the use of relays.

11) FACP shall have provision to accept 230V single phase, 50 Hz supply.

12) All the major components like processor, memory, etc., shall be available as spare in case of emergency requirement.

13) FACPs shall have inbuilt buzzer to alert the personnel in case of maintenance requirement.

14) FACP shall be programmed for sequence of events to happen in case of fire like closing of fire dampers, shutting down supply fans for HVAC, Deactivating the access control system and activating the hooters with the help of a control relay module provided near the system to be activated.

15) The fire alarm control panel shall be suitable for Class-A type of wiring as per NFPA-72.

16) The fire alarm control panel shall work on positive sequence as per NFPA – 72.

17) The fire alarm control panel shall be capable of disabling an individual detector, a group and or zone of for building maintenance purposes. Facility shall be provided on the FACP for simulating the fire condition to enable testing of the various alarm circuits.

18) All the fire alarm modules *(loop cards, networking cards, and communication card. Etc.)* should be hot pluggable and hot swappable to facilitate easy replacement of faulty modules. All the electronic components shall be compatible to non-air-conditioned environment for working satisfactorily.

19) The fire alarm control panel normal power supply failure shall be annunciated audio-visually.

20) In case of multiple alarms the multiple alarm indication shall be ON. The multiple alarm indication shall be displayed in chronological order.

21) FACP shall have the facility such that each detector can be identified as a separate zone.

22) The FACP shall be reset only by authorized users after the clearance of a fault.

23) Whenever there is a third party actuation to happen, like closing of fire dampers , switching off supply / exhaust units etc , the actuation shall happen only when the fire signal is received from two different initiating devices located in a zone connected to different fire alarm panels. The communication between the FACPs shall happen with two pair cables and the fire alarm status of one panel shall be

communicated to the second panel in which the control relay module of the third party device is connected to. Inter panel communication is a must and needs to be provided for controlled actuations. All the necessary systems to ensure reliable communications between panels are to be built into the FACPs.

24) FACP shall have the facility to silence / acknowledge / reset the alarm. Apart from the FACP, Repeater panel present in the control room shall have the facility to silence / acknowledge / reset the alarm of all FACP's.

25) The Fire Alam panel should be connected to the work station. The work station monitor should display the floor plans along with the address of each detectors. The proper graphic user interface should be provided so that the active detector can be traced in the layout displayed.

26) The FACP should give out fire alarm notifications by means of SMS, phone call and emails in case of a fire situation.

27) The FACP shall have **FALSE ALARM REDUCTION** algorithms like

- Alarm Verification, Dual Detector/Group Dependency, and Intermediate Alarm Storage to eliminate False alarms due to Dirt/Dust/Disturbance values.

- EMC/EMI Monitoring - To inform the possibility of a false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc. The panel shall display the EMI/EMC Current and Average Values reported by the detector. The User/Installer shall have access to this reading during Maintenance (with password protection).

28) When fire condition is confirmed, the following sequence of annunciation will take place on the FACP:

ALARM CONDITION		VISUAL ALARM
First Fire Condition	ON	ON FLASHING/Description of area of fire origin with detector type
Acknowledge (first Alarm)	OFF	ON STEADY
New Fire Alarm Condition (after acknowledge of first alarm)	ON	ON FLASHING
Acknowledge (New fire alarm)	OFF	ON STEADY
Back to normal	OFF	ON STEADY
Reset	OFF	OFF
Reset Before Normal	OFF	ON STEADY

Construction details

1) The FACP shall have an ingress protection of at least IP – 30.

2) The housing containing the fire alarm control panel shall be of 2 mm thick steel construction finished in colour as per relevant standard.

3) It shall be capable of being surface, semi-flush or fully flush mounted with additional bezel. The fully flush bezels shall be painted to specification, stainless steel or brass as required.

4) The FACPs shall be provided with triplicated earthing terminals on the either side. The grounding terminal G1 shall be for safety grounding, G2 shall be for shield grounding and G3 shall be for signal grounding.

5) The panel shall be completely factory wired, absolutely ready-in all respects for installation at site and termination of all external cabling. The internal wiring of the panel shall be carried out with 650V grade, stranded copper wires of size rated for

the current in the corresponding circuit. The minimum size of the wire shall not be less than 0.8 sq. mm for electronic circuits and 1.5 sq. mm for electrical circuits &16 SWG for grounding.

6) All the wiring shall be done using ferrules having indelible marking.

7) Cable entry for the FACP from the bottom

8) FACP shall mount in wall.

CPU

1. The FACP shall have a processor which shall be of at-least 32 bit, which shall be designed to accept all the inputs and process the outputs within the time stipulated by the standards.

2. A redundant CPU shall be provided with the same configuration which shall be made as hot standby – in case of failure of the main CPU, the standby shall takeover without interrupting the system.

3. The CPU shall have the facility to communicate with other FACPs and process the fire signals received from other FACPs to actuate a third party device.

4. The capacity of the processor shall be adequately designed include all input / output signals and various functional requirements.

5. The processor shall be designed in such a way that the parameters in the repeater panels shall be refreshed in 1 sec.

6. It shall have its own, built in advanced microprocessor, sophisticated software and extensive memory for storing the logs of alarms, times and action taken report.

C. **Loop Modules**

The loop module shall have a microprocessor inbuilt & shall be capable of handling 254 detectors/devices in any combination.

It shall have a line length up to 1600m or 3000m depending upon the configuration & cable type.

It shall have an LED test button.

The loop module shall be encapsulated & shall be hot pluggable.

The front fascia of the loop cards shall be visible for easy identification of faults.

In case of the failure of loop card, it should be replaced without the need of any additional programming.

D. **Repeater Panels**

1) It shall be a LCD touch screen same as main panel. The MMI shall be the same as the main Controller.

2) Repeater panels shall be suitable for Wall mounting which will be displayed all the major entrances and stair cases which will enable the staff and fire fighting personnel to exactly locate the fire.

3) It shall be compatible to receive data from FACPs.

4) Audio visual Alarms during fire shall be generated in case of fire.

5) It shall connect to any of the Fire Panels in the Network using a 2 core – 1.5 sq.mm wire.

6) The Power supply to the Repeater Panel shall be drawn from the nearest Fire Panel and also be supervised by the Main Panel.

7) The Repeater Panel shall display Messages like Alarm & Fault similar to the Main Panel and shall be accessed only by Authorized Users through a passcode.

8) The Repeater Panel shall be connected to the Main Panel and other repeater panels in such a way – 1 pt Failure in the cable shall not affect the performance and shall intimate the exact location of failure in all Panels.

9) The Repeater Panel shall be equipped with a Key switch that allows Authorized users to Acknowledge/Reset Alarms.

10) The Repeater Panel shall be equipped with 2 different power inputs. On failure of primary power, the secondary shall take over.

11) The Repeater panel shall allow the users to login locally or login to the remote FACP.

12) The Repeater panel shall allow to create users with different access levels locally and shall also allow users of panels to login based on access levels.

13) The repeater panels shall integrate with the main panels without any additional interface or the bidder shall consider necessary accessories required to complete the system and quote as part of this model.

E. Intelligent Addressable Dual Optical Smoke/Heat(Multisensor) Detector

The Intelligent Addressable Multisensor Detector with 2 LED's-Infrared & Blue used in this Building shall confine to the relevant standards having the following features

1) It shall be combination of Smoke detection and heat detection. The smoke detection system shall work on Light scattering type principle using Infrared & Blue Led's, and the Heat detection system shall be of Rate of rise of temperature and Fixed Temperature.

2) The Intelligent Addressable Multisensor Detector shall be of Spot type and Addressable type.

3) The Intelligent Addressable Multisensor Detector shall be addressed either by DIP switches or through Programming from the Panel.

4) The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.

5) All the detectors shall have a visible multi-color LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.

6) It shall possess False alarm immunity and a superior signal to noise ratio

7) It shall have a Built in signal processor

8) It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)

9) It shall have drift compensation facility built in.

10) The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

11) The detector shall have at least 15 levels of sensitivity settings based on the application and room where it is installed.

12) The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

13) In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

14) The detector shall be programmed to work as Optical only or Thermal only detectors. It shall a provision to switch off any component (optical or thermal) of the detector.

15) The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

16) The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

17) The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

18) The detector shall be capable of detecting both smoldering fires and open fires and shall be EN54 /VdS approved.

F. **Intelligent Addressable Optical Smoke/ Heat (Multisensor)Detector**

The Intelligent Addressable Multisensor Detector used in this Building shall confine to the relevant standards having the following features

19) It shall be combination of Smoke detection and heat detection. The smoke detection system shall work on Light scattering type principle using Infrared and the Heat detection system shall be of Rate of rise of temperature and Fixed Temperature.

20) The Intelligent Addressable Multisensor Detector shall be of Spot type and Addressable type.

21) The Intelligent Addressable Multisensor Detector shall be addressed either by DIP switches or through Programming from the Panel.

22) The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.

23) All the detectors shall have a visible multi-color LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.

24) It shall possess False alarm immunity and a superior signal to noise ratio

25) It shall have a Built in signal processor

26) It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)

27) It shall have drift compensation facility built in.

28) The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

29) The detector shall have at least 15 levels of sensitivity settings based on the application and room where it is installed.

30) The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

31) In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

32) The detector shall be programmed to work as Optical only or Thermal only detectors. It shall a provision to switch off any component (optical or thermal) of the detector.

33) The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

34) The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

35) The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

The detector shall be capable of detecting both smoldering fires and open fires and shall be EN54 /VdS approved.

G. Intelligent Addressable Dual Optical Smoke Detector with 2 LED's-Infrared & Blue

The Intelligent Addressable Photo electric smoke Detector with 2 LED's-Infrared & Blue used in this Building shall confine to the relevant standards having the following features

36) The smoke detection system shall work on Light scattering type principle using Infrared & Blue Led's.

37) The Intelligent Addressable smoke Detector shall be of Spot type and Addressable type.

38) The Intelligent Addressable Smoke Detector shall be addressed either by DIP switches or through Programming from the Panel.

39) The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.

40) All the detectors shall have a visible multicolor LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the

visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.

41) It shall possess False alarm immunity and a superior signal to noise ratio

42) It shall have a Built in signal processor

43) It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)

44) It shall have drift compensation facility built in.

45) The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

46) The detector shall have at least 3 levels of sensitivity settings based on the application and room where it is installed.

47) The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

48) In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

49) The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

50) The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

51) The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

1.2 The detector shall be capable of detecting both smoldering fires and open fires and shall be EN54 /VdS approved.

H. **Intelligent Addressable Optical Smoke Detector**

The Intelligent Addressable Photo electric smoke Detector with Infrared LED used in this Building shall confine to the relevant standards having the following features

52) The smoke detection system shall work on Light scattering type principle using Infrared Led's.

53) The Intelligent Addressable smoke Detector shall be of Spot type and Addressable type.

54) The Intelligent Addressable Smoke Detector shall be addressed either by DIP switches or through Programming from the Panel.

55) The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.

56) All the detectors shall have a visible multicolor LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.

57) It shall possess False alarm immunity and a superior signal to noise ratio

58) It shall have a Built in signal processor

59) It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)

60) It shall have drift compensation facility built in.

61) The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

62) The detector shall have at least 3 levels of sensitivity settings based on the application and room where it is installed.

63) The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

64) In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

65) The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

66) The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

67) The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

1.3 The detector shall be capable of detecting both smoldering fires and open fires and shall be EN54 /VdS approved.

I. Intelligent Addressable Heat Detector

The Intelligent Addressable Heat Detector used in this Building shall confine to the relevant standards having the following features

1. The Heat detection system shall be of Rate of rise of temperature and Fixed Temperature.
2. The Heat Detector shall be of Spot type and Addressable type.
3. The Heat Detector shall be addressed either by DIP switches or through Programming from the Panel.
4. The Detector shall monitor EMC/EMI values in the surroundings on a continuous basis and report the current & average values to the panel. The detector and the panel shall together avoid the possibility of false alarm caused due to interferences from sources such as Motors, power cables, Wi-Fi routers, fluorescent lamps, network switches, mobile signals…etc.
5. All the detectors shall have a visible multi-color LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.
6. It shall possess False alarm immunity and a superior signal to noise ratio
7. It shall have a Built in signal processor
8. It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)
9. It shall have drift compensation facility built in.

10. The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

11. In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

12. The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

13. The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

14. The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

15. The detector shall be capable of detecting both smoldering fires and open fires and shall be EN54 /VdS approved.

J. Intelligent Addressable Ultra flat Invisible Smoke Detector

The Intelligent Addressable Invisible Ultra flat smoke Detector with 2 Nos of Optical sensors and a Pollution sensor shall confine to the relevant standards having the following features:

1. The detector can be installed in areas with high aesthetic requirements and the possibility of color toning. In addition the detectors are suitable for areas with heightened dust exposure.

2. Smooth, easily cleanable detector surface.

3. There should not be any optical chamber inside the smoke detector and the detector should not be projected down from the ceiling.

4. Detector should be Ultra slim design and lies flush with the ceiling, which does not destroy the appearance of attractive rooms.

5. Quick, easy insertion and exchange of detectors (click and lock principle).

6. Easily-visible two-color LED for display of alarm, trouble and test mode. The control of an external detector alarm display should be possible.

7. Should have integrated isolators, so that loop will continue to function in case of wire interruption or short circuit of a detector.

8. Programmable sensitivity, i.e. can be adjusted to the area of operation.

9. Automatic or manual address allocation with or without auto-detection via integrated rotary switches

10. A pre-alarm is signaled when 50 % of alarm threshold is reached (indicator in the event database of the fire panel).

11. The EMC security fulfills the guidelines according to VdS 2110 (VdS Schadenverhutung GmbH) as well as UL 268.

12. The smoke detection system shall work on Light scattering type principle using Dual detection sensors.

13. The LED's inside the detectors transmits the light at a defined angle into the light scattering area. In case of fire, the light is scattered by the smoke particles and strikes the photo diodes (2), which transform the quantity of light into a proportional electrical signal.

14. The various light-emitting and photo diodes of the sensor are individually controlled by the detector electronics. Consequently, signal combinations are produced that are independent of each other and ideally suitable for the detection of smoke, which makes it possible to differentiate between smoke and interference agents (insects, objects). In addition, the time characteristics and the correlation of the optical sensor signals for the fire or interference detection are evaluated.

15. The contamination level on the detector surface is continually measured by the pollution sensor; the result is evaluated and indicated in three stages on the fire panel. Contamination of the detector surface leads to active adaptation of the threshold (drift compensation) and to a fault indication in the case of heavy contamination.

16. Interference effects from daylight and commercial lighting sources should be filtered out with an optical daylight filter and by the use of electronic filtering and phase-locked rectification (ambient light stability: glare test DIN EN 54‑7).

17. The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

K. **Addressable Ventilation Duct Smoke Detectors**

The detector shall have a housing for accommodating a special detector that detects smoke in ventilation ducts, with input and output for air sample extraction, streamlined connection pipes for optimum air flushing of the detector, with dust-proof connection board for the loop outside the air flow, with air intake and exhaust pipe, seals and the required installation material

The Duct smoke Detector used in this Building shall confine to the relevant standards having the following features

18. The smoke detection system shall work on Light scattering type principle using Infrared. The detector shall better false alarm immunity and shall have a processor inbuilt with ISP.
19. Duct Detector shall be Addressable type.
20. The Dual Detector shall be loop powered and addressed either by DIP switches or through Programming from the Panel.
21. All the detectors shall have a visible multi-color LED to indicate the healthiness / trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from all the 360 degree from below. In some cases where the visibility of the detector is obstructed by cable trays, false ceiling etc. Facility for connecting the detector to a response indicator has to be present. The response indicator derives the power to glow from the loop.
22. It shall possess False alarm immunity and a superior signal to noise ratio
23. It shall have a Built in signal processor
24. It shall be with inbuilt fault isolators.(Detectors without Inbuilt Isolators may be considered with separate Isolator Base)
25. It shall have drift compensation facility built in.

26. The detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.

27. The detector shall have at least 3 levels of sensitivity settings.

28. The detector shall provide a chamber maid plug to blow out the dust/dirt using a blower.

29. In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming

30. The detector shall work with 2 different sensitivity settings at any point of time and the User shall have access to choose the desired settings without programming or Laptop/PC for configuration.

31. The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.

32. The detector shall have Intermediate Alarm Storage, Dual Detector Dependency, Dual group Dependency features that shall be programmed based on site application.

33. The detector shall have Air intake and exhaust pipe , extendable up to 3m

34. The detector shall have necessary filters in the air intake and exit pipes.

35. The detector considered shall be a special detector designed for Duct applications and not a Spot type Optical detector.

36. The detector shall be EN54 /VdS approved.

L. **Manual Call Points**

The Manual call points (MCP) used in the building shall confine to the relevant standards having the following features

1. Manual call points shall be of Double action - break glass type with Push Button.

2. The mounted arrangement shall be such that it can be either surface mounted or flush mounted.

3. Each addressable MCP will comprise of an electronic circuit built into it to provide addressing capability.

4. The MCPs shall be provided with inbuilt fault isolator. (the bidder shall consider a external isolator if not inbuilt)

5. The MCP shall have a LED to indicate Alarms

6. The MCP shall be EN54/VdS approved

M. **Control relay module(CRM)**

The Control Relay Modules used in this Building shall confine to the relevant standards having the following features

a. The CRM shall provide a dry potential contact o/p for activating a variety of auxiliary devices and other fire fighting / ventilation equipment.

b. The CRM shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt)

It shall have a capability of handling at least 1A @ 30VDC to integrate with third party system.

The CRM shall be addressable either by Dip switch or by the Panel.

c. The CRM shall be loop powered and shall be EN54/VdS approved.

N. **Monitor Module (Input module)(MM)**

The Monitor Modules used in this Building shall confine to the relevant standards having the following features

d. The MM shall provide 2 inputs and these inputs shall work independently to monitor 3rd party devices and shall allow to program with different parameters.

e. The MM shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt)

f. The MM shall be programmed to monitor contacts, Voltage and EOL resistor as per site applications.

g. The MM when programmed to monitor contacts shall also allow to program to monitor either open/close contacts.

h. The MM shall be addressable either by Dip switch or by the Panel.

i. The MM shall be loop powered and shall be EN54/VdS approved.

O. **Addressable interface (Conventional Zone Interface module - CZIM)**

The CZIM Modules used in this building shall confine to the relevant standards having the following features

- Addressable interface units will be provided for all non-addressable detectors/devices such as **beam detectors or to integrate existing conventional detectors, etc**. to assign an address to such detectors and to be compatible with addressable FACP.
- Each conventional detector will have its own addressable unit in the form of CZIM Modules for individual address. The addressable unit will facilitate connection of non-addressable detectors in the same circuit/loop consisting of addressable detectors.
- It shall supervise the circuit of open dry contact I/P device & signal alarms during change of state of detectors.
- The interface device shall have an LED, which flashes during polling of the FACP.
- It shall have inbuilt fault isolator module or the bidder shall consider additional isolator modules
- The CZIM shall be capable of powering the Detectors through the Aux Source and shall supervise the cable, aux power and the external power supply. The CZIM shall communicate Faults and Troubles related to Detector, Power supply to the Panel.
- The CZIM shall allow to reset conventional detectors from the panel.
- The CZIM shall offer 2 separate zones, 2 Aux power circuits and shall monitor the external power supply and supervise the zone cables.
- The CZIM shall allow Intermediate Alarm Storage, Dual detector & Dual group dependency based on site applications.

- The CZIM shall allow to configure the conventional zones with Different EOL and Alarm resistor based on the existing detector type.
- The CZIM shall either be din rail mount or Surface mount.
- The CZIM shall have the intelligence to detect faults like 4 wire short…etc.
- The CZIM shall be EN54 /VdS approved

P. **Beam (Optical Beam) Smoke detector**

The Beam detectors used shall confine to the relevant standards having the following features

- The beam detectors shall having a separate Transmitter (Tx) & receiver (Rx)
- Beam detectors shall be externally powered via Conventional Zone Interface module (CZIM). The module shall supervise the External Power Supply, Aux Power to the Transmitter and Receiver.
- It will communicate to FACP through addressable CZIM so that each detector will have individual address. The CZIM shall have inbuilt fault isolators.
- The beam detector shall be suitable to protect the distance from 10 meters to 100 meters range.
- The beam detectors shall communicate the ambient reading to the FACP on time to time basis, and the FACP shall make the decision about the current status of the detector, whether it is in fire/pre-alarm/maintenance requirement etc.
- It shall have provision for Wall / ceiling mounting.
- Beam detector shall have Response time less than 20sec.
- The response threshold values, tests shall be as per NFPA 72.

  It shall have feature such that in case of accidental change of alignment, it shall report an error, it shall raise a maintenance request to the FACP.

Q. **Sounder**

The Sounder used in this Building shall confine to the relevant standards having the following features

a. The Sounder shall be an Addressable loop powered sounder. (Bidder shall consider external power supply, cable, conduits, modules required for activating externally powered sounders and include the costing as part of the item – Sounders)

The Sounder shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt)

j. The Sounder shall either be addressed by Dip switch or by the Panel.

k. The Sounder shall be placed in the detection loop only and a separate loop or cables for sounders shall not be used

l. The sounder shall have a sound pressure level of 90dB and the volume shall be adjusted from the Fire Alarm Panel

m. The sounder shall be capable of programming at least 32 different tones for alarm detection in different floors or at different time intervals.

n. The sounder shall be tested and maintained with ease from the FACP

o. The Volume levels for Testing and Drill shall be programmed as per site conditions.

p. The Sounder shall consume a minimal current of <5mA and thus allowing to connect at least 25 loop powered sounders in the same loop.

q. The Sounder shall be capable of either accommodating a Flasher or a Detector and shall work as Sounder cum strobe or Sounder cum detector base.

r. The Sounder shall have a feature of synchronizing with other sounders in the loop.

s. The Sounder shall be loop powered and shall be EN54/VdS approved.

R. **Strobe**

The Strobe used in this Building shall confine to the relevant standards having the following features

t. The Strobe shall be an Addressable loop powered Strobe. (Bidder shall consider external power supply, cable, conduits, modules required for activating externally powered Strobes and include the costing as part of the item – Strobes)

u. The Strobe shall have inbuilt fault isolator module.(bidder shall consider external isolators if not inbuilt)

v. The Strobe shall either be addressed by Dip switch or by the Panel.

w. The Strobe shall be placed in the detection loop only and a separate loop or cables for Strobe shall not be used

x. The Strobe shall have a red flash light and shall flash at minimum of 1Hz

y. The Strobe shall be tested and maintained with ease from the FACP

z. The Strobe shall also be part of Testing and Drill and shall be programmed as per site conditions.

aa. The light output shall be at least 2 cd

bb. The Strobe shall consume a minimal current of 10mA and thus allowing to connect at least 10 loop powered strobes in the same loop.

cc. The Strobe shall be capable of either fixing it in a Sounder and shall work as Sounder cum strobe as per site conditions.

dd. The Strobe shall be loop powered and shall be EN54/VdS approved.

S. **Remote Indicator**

The Remote indicator used in this Building shall confine to the relevant standards having the following features

ee. The remote indicator is used when the automatic detector is installed in a place hidden or not visible like in closed rooms, false ceilings or walls

ff. The remote indicator should be 360° view, for both wall mount and ceiling mount.

gg. The remote indicator shall be IP 40 rating.

INSTALLATION:

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

TEST:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all waterflow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short notification appliance circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such

items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

FINAL INSPECTION:

At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

INSTRUCTION:

Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

The entire Fire alarm System components shall be of same make and Listed. The data sheets of each equipment shall be submitted along with offer.

8. PUBLIC ADDRESS SYSTEM

Scope of work

1.1 The scope of work covers supply, installation, commissioning and testing of the Integrated Digital Voice Evacuation System relating to the Fire Alarm System meeting the intents of the specifications. The system may have centralised or distributed amplifiers

1.2 The system could be combined with other paging functions or piped music or any other announcements.

GENERAL DESCRIPTION :

The objective is to have a effective public address and evacuation system for the entire area. The system will combine all the essential EVAC functionality- such as system supervision, spare amplifier switching, loudspeaker line surveillance, digital message management and a fireman's panel interface.

SCOPE :

The system shall provide for emergency call (EMG), business call and BGM audio, 6 zones, 6 call stations and two remote control panels. The voice alarm system shall be a one channel/two channel system. It shall be compatible with BGM sources. It shall be capable of connecting to EVAC compliant loudspeakers and accessories for an integrated public address and voice alarm solution.

The system shall be fully IEC 60849 compliant. It shall have full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager for 255 pre-recorded messages and chimes. It shall be possible to merge messages to allow even more flexible use of pre-recorded announcements and evacuation messages. It shall be possible for each message to have any length within the total available capacity. The memory shall have a capacity of 16 MB. It shall be possible to upload from a PC via USB into the memory, after which the unit shall operate without PC connection. The standard WAV-format shall be used for the messages and sample rates of 8kHz up to 24kHz with 16-bit word length (linear PCM) shall be supported.

Volume override relay contacts shall be provided for each zone separately for overriding local loudspeaker volume controls. All current override schemes shall be

supported (3-wire and 4-wire override schemes i.e. standard 24V and failsafe). Upon a call or an activated trigger input these contacts shall be activated for the appropriate zones, together with an additional voltage free contact (Call Active) for control purposes.

A 24Vdc output shall be available to supply power to external relays, so no external power supply shall be required for that purpose. A LED VU-meter shall allow for monitoring of the master output.

APPLICABLE STANDARD :

EVAC compliance acc. to IEC 60849

EMC emission acc. to EN 55103-1

EMC immunity acc. to EN 55103-2

Safety acc. to EN 60065

SYSTEM DESCRIPTION :

Equipment Specifications

Voice Alarm Controller

The Voice Alarm Controller is the heart of the voice alarm system. It is the basis of the Voice Alarm System, and should have the essential functionality for compliance with the EN 60849 and 54-16 standards, including full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager.

A built-in 240 W amplifier provides the power for the emergency call channel and BGM. Additional Amplifiers can be added to provide two-channel operation. All amplifiers should be supervised. The audio output uses standard analog audio 100 V line switching for full compatibility with the family of public address equipment and EVAC-compliant loudspeakers.

The powerful 240 W output section has six transformer isolated 100 V constant-voltage outputs for driving 100 V loudspeakers in six separate zones. The 100 V-technique reduces line losses on longer distances and provides easy parallel connection of multiple loudspeakers. All zones may be individually selected from the front panel, and the BGM

Output level in each zone can be individually set in six steps.

Six configurable volume-override output contacts are available for overriding local volume controls during priority calls. Both four-wire and three-wire schemes are supported. An LED meter monitors the output.

The controller should support upto 60 zones. Up to 255 messages can be stored in the internal 16 MB flash ROM, without a need for battery backup. Each message can have any length within the total available capacity. Messages and configurations are uploaded from a PC via USB into the memory, after which the unit operates without a PC connection.

The unit has 12 contact trigger inputs for business and emergency (EMG) calls. Each can be configured for a message consisting of a sequence of up to eight wav files. In this way some wav files may be used in various combinations with other messages, optimizing flexibility and the amount of storage space used .The Controller should also have two RS232 ports of which one should be reserved for product development and the other can be used to integrate to a third party digital device supporting RS232 protocol and can be used as a soft trigger input, in that way the number of trigger inputs (both emergency and business trigger inputs) can be increased to minimum of 150. Multiple messages can be merged to form one integrated message. The controller should have dip switches to adjust the system settings. The controller should have impedance calibration button for matching to the speaker impedance. The controller should have the VOX activation feature. A zone selection, together with this sequence can be configured for each trigger input. The specifications of the product should be similar to M/s Bosch Limited make LBB1990/00.

Technical Specifications are as follows:

Voltage	230VAC, 50/60 Hz
Max power consumption	600 VA

Battery power supply Voltage	24 VDC, +15% / -15%
Output power (rms/maximum)	240 W / 360 W
Frequency response	60 Hz to 18 kHz
Distortion	<1% at rated output power, 1 kHz
Programmable Trigger Inputs	12
Speech filter	-3 dB at 315 Hz, high-pass,6 dB/oct
Messages Data format	WAV-file, 16-bit PCM, mono
Memory capacity	16 MB Flash ROM
Loudspeaker outputs	12
Number of messages	255 max
Volume override outputs	6
Dimensions (H x W x D)	144 x 430 x 370 mm
Operating temperature	-10 ºC to +55 ºC (14 ºF to +131 ºF)
Storage temperature	-40 ºC to +70 ºC (-40 ºF to +158 ºF)

4.2 Speakers

4.2.1 Speaker (Ceiling Mount) – 6 W / 12W

The celing mounted 6W / 12 W speakers shall be installed as depicted in the drawing. The speakers shall have terminals to allow selection of nominal full power, half power & quarter power. The speakers shall be very easy to install with mounting clamps . It shall have excellent frequency response with wide opening angle & inbuilt 100V line matching transformer. It should blend asthetically with interiors**.** The speakers shall have fire dome confirming to EN60849 & BS5839. The areas

where false ceiling doesn't exist wall mounted 6 w speakers shall be used.

Technical Specifications

Rated Power	:	6W / 12W
Sound Pressure Level	:	96 db Max
Effective Frequency Range	:	70-10000Hz
Rated Voltage	:	100V
Rated Impedance	:	1667 Ohm
Mounting	:	Clamp Type

4.2.1a Speakers (Ceiling Mount) (12 W)

The 12W speakers shall be installed as depicted in the drawing. The speakers shall have terminals to allow selection of nominal full power, half power & quarter power. The speakers shall be very use to install with mounting bracketts . It shall have excellent frequency response with wide opening angle & line matching transformer. It should blend asthetically with interiors**.**

Technical Specifications

Max Power	:	18W
Rated Power(PHC)	:	12W(12-6-3)
Sound Pressure Level	:	100db/89db
At rated power/1w(1khz,1m)		
Frequency Range (-10db)	:	55Hz-20KHz
Opening Angle(at 1khz-4khz, -6db)	:	180/64 Deg

Rated Voltage	:	70/100V
Rated Impedance	:	418/833 Ohm

4.2.2 Column Speakers (12 W)

The bidirectional 12W speakers shall be installed as depicted in the drawing. The speakers shall have terminals to allow selection of nominal full power, half power & quarter power. The speakers shall be very use to install with mounting bracketts . It shall have excellent frequency response with wide opening angle & line matching transformer. It should blend asthetically with interiors.

Technical Specifications

Max Power	:	18W
Rated Power(PHC)	:	12W(12-6-3)
Sound Pressure Level	:	96db/90db
At rated power/1w(1khz,1m)		
Frequency Range (-10db)	:	200-15000Hz
Opening Angle(at 1khz-4khz, -6db)	:	210/60 Deg
Rated Voltage	:	100V
Rated Impedance	:	833 Ohm

4.2.3 Horn Type Speakers (20 W)

The Horn speaker unit shall have a 100-volt transformer sealed inside its high-strength, lightweight, ABS housing that is protected against the elements by molded-in UV inhibitors. Its wire enters the housing through a gland nut designed to keep

the moisture out. Horns must have lightweight high-density, phenolic-resin diaphragms and ceramic magnets.

Mounting shall be using epoxy-coated, stainless steel U bracket held in place by stainless steel hardware allowing its position to be maintained despite unusually high wind velocity.

Unit shall consist of a weather-resistant ABS housing, high density phenolic resin

diaphragm, internal 100-volt transformer, epoxy coated stainless steel mounting bracket, stainless steel hardware and 17 inches five conductor wire.

Technical Specification

Rated power	:	20 W
Tappings 100 volt line	:	20/10/5/2.5/1.25 W
Transformer Impedance	:	100V 500/1k/2k/4k Ohms
Tappings 70.7 volt line	:	10/5/2.5/1.25 W
Driver impedance, Ohms	:	20 or 8 Ohms
Effective frequency range,	:	250-8,000Hz
S.P.L. @ Full power Octave Bandwidth	:	114 db
Acoustic Power (dB-PWL@1 watt)		
1 k/2kHz, dB	:	78 / 75
Dispersion at 1k/2k Hz, Degrees	:	130/70
IP Rating	:	66

4.3 Call Station

The 6-zone call station shall be a stylish high quality call station with a stable metal base, a flexible microphone stem and a unidirectional condenser microphone. It shall be intended for making calls to selected zones. The special design shall allow for neatly flush mounting in desk tops. Using dip switches on the bottom of the call station, the call station ID shall be selectable. The call station shall have selectable gain, speech filter and limiter for improved intelligibility.

On each call station it shall be possible to select 6 zones with the possibility to connect a call station keypad to increase the number of zones or zone groups that can be selected.

It shall have LED indications for zone selection, fault and emergency state. The call station extension shall provide seven additional zone and zone group keys

On each call station it shall be possible to select 6 zones with the possibility to connect up to 8 call station keypads to increase the number of zones or zone groups that can be selected. Selected zones are indicated with LEDs on the call station, three additional LEDs give visible feedback on the active state of the microphone and the system. Green

indicates microphone active, amber indicates that the system has detected a fault (IEC 80649) and red indicates that the system shall be in the emergency state.

4.4 Booster Amplifier

The booster amplifier shall be used to increase the power of PA system. The 120/240/480 W booster amplifier with following specifications shall be used.

Rated Output Voltage(RMS)	:	120/240/480W
Battery Voltage	:	24VDC(max 10% deviation)
Frequency Response	:	60Hz to 15KHz
Impedance	:	20KOhm

S/N	:	>80db
Sensitivity	:	1 V balanced

4.5 Power Supply

The power supply voltage range shall be 18 – 24V with a current consumption of less than 50 mA. The nominal sensitivity shall be 85 dB SPL (gain preset 0dB). The nominal output level shall be 700 mV. The maximum allowable sound pressure level shall be 110 dBSPL. The microphone shall have a limiter. The distortion shall be less than 0.6% at maximum input. The equivalent input noise level shall be no more than 30 dB SPLA. The frequency range shall be 100Hz – 16kHz. The speech filter shall be a 315 Hz, high-pass, 6 dB/oct filter. The output impedance shall be 200 Ohms. The stem length with microphone shall be 390 mm.

Mains voltage shall be both 230Vac and 115Vac, ±15%, 50 / 60Hz (selectable) Power consumption of the Controller shall not exceed 600 Watts, the router shall not exceed 50Watts. Battery backup provisions shall be implemented, the battery voltage shall be 24Vdc, +20% / -10%. All low level connections and volume override shall be on MC1,5/XX-ST-3,5 type connector blocks. All high level connections except mains shall be on MSTB 2,5 /XX-ST. The input contact shall have supervision based on a series and parallel resistor.

The router and controller shall be rack mountable with removable rack mounts. The router shall be not higher than 2U. The controller shall be not higher than 3U. The rack mounting kit shall be included.

The operating temperature range shall be -10°C to +55°C. The storage temperature range shall be -40°C to +70°C.

4.6 Speaker Cables

All cables associated with PA System shall be of following specifications :

Flexible Copper Conductor of cross section 1.0 Sq. mm PVC insulated, PVC FRLS sheathed control Cable as per IS 694. These Cables shall be laid in G.I. Conduits concealed/surface. Armoured 2 Core 40/36 Twin Twisted

5.0 INSTALLATION :

Installation shall be as shown on the drawings, and as recommended by the major equipment manufacturer.

All cables, junction boxes, cables supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.

6.0 TESTING :

Sr. No.	Description	Visual	Test Readings	Documentation
1	All cables are tested for continuity, insulation, resistance etc.			√
2	System installation proper as per drawing	√		

3	Carry out visual checks on all speakers & controller free from any mechanical damage, cables, interphase modules etc.to ensure they are properly installed.	√		
4	Check for proper termination & feruling	√		
5	Check Input A/C Supply Voltage		√	
6	Check location/spacing of loudspeakers as in drawing.	√		√
7	Check Distribution of Zones as per Drawing.	√		√
8	Check full load speaker sound quality .	√		
9	Check if local lodspeakers overrides by voice messages in case of emergency evacuation .	√		√
10	Check DB level by means of Acoustomizer to achieve 75 db		√	
11	Check if recorder messages are CLEAR, free from any noise distortion & easy to understand.	√		
11	Controller display and all key working properly	√		

7.0 COMMISSIONING :

At final commissioning of each system, the Contractor shall confirm that:

All devices, control panels are tested and operate correctly .

The standby batteries are adequately sized. (Measurements of the quiescent and full loads shall be taken and compared to calculated values used at the design stage.) Calculations and measurements shall be submitted to the Engineer.

Commissioning shall be fully documented and the documentation submitted to the Engineer.

The Contractor shall demonstrate each zone and main panel to the satisfaction of the Engineer by conducting a series of witnessed acceptance tests as directed by the Engineer. This shall take place after the above final commissioning and following receipt of the commissioning documentation by the Engineer.

Both the installation and the commissioning activities shall be undertaken as a single continuous operation.

Upon completion of the installation activity, the contractor shall Test, Start-up, Commission and Handover the system to the customer.

The contractor shall make use of the following documents to record test results and details of commissioning tests:

Cable Test Sheets

Installation Check Report

System Layout Drawing(s)

System Schematic Diagram(s)

The contractor shall be responsible for inspecting and testing the complete system.

The contractor shall present an Acceptance Certificate for signature by the customer.

8.0 DOCUMENTATION :

The contractor, upon completion of the commissioning activity, shall hand over the system to the customer.

At the time of hand over, the contractor shall provide the customer with the following documentation:

1. Copy of detailed report
2. Component and equipment list
3. Product description sheets
4. System design drawing(s)
6. System schematic diagram(s)
7. System operating manuals

9.0 HANDOVER :

Prior to final acceptance, the installing contractor shall provide complete operation and maintenance instruction manuals to the owner. All aspects of system operation and maintenance shall be detailed, including wiring diagrams of all circuits, a written description of the system design, sequence of operation and drawing(s), illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, maintenance operations and procedures shall be included in the manual.

10.0 TRAINING :

General

The contractor shall provide the customer with details of the training required by personnel to operate and maintain the PA System.

The Contractor and the customer shall jointly agree the number of staff to attend the training courses.

11.0 MAINTENANCE :

Routine maintenance should be carried out in accordance with relevant customers requirements.

All performance checks undertaken should be recorded in the system log book.

As a minimum, the following performance checks must be undertaken on each maintenance visit.

Carry out verification checks as detailed in the commissioning instructions.

Remove dust and dirt from the Control Panels/speakers using a soft brush or a lint cloth. A solvent which is harmless to the finishes of metal and plastic may be applied to more stubborn stains.

Examine the exterior of the enclosure for any signs of damage or loose cable glands and rectify any faults found.

Examine the printed circuit boards for signs of over heating, dry joints and/or damaged tracks.

Examine the battery terminals for secure connection and for any signs of

corrosion. Replace or repair as required

9. CCTV WIRING

The CCTV wiring shall be carried out by the Contractor under the scope of work.

10. RODENT REPELLANT SYSTEM

Conventional Rodent Repellent System

Technical Specification for Ultrasonic Rodent Repellent system

Panel Specification:

Configuration: URRS - 12T Main Console

Operating frequency: Between 20Khz to 50Khz auto sweep

Frequency Generation: Voltage controlled oscillator (VCO)

Transducer Test: “Test Transducer” Menu selection

Ventilation: Mini Exhaust Fan

Power Consumption: 15W approx

Power Supply: 230V AC / 50 Hz

Dimensions in mm: 290 x 210 x 100

Weight: 6 Kg

Mounting: Wall Mounting

The Single should have the capacity of taking more than 30 Transducer in a systems each transducer covering an area of 150sq.ft.

Transducer Specification:

Ultrasound Generator: Piezo Electric disc type transducer

Power O/P Transducer: minimum 800mW

Sound Pressure: 80dB to 110dB (At 1 meter)

Transducer Housing: ABS Plastic with mounting base

Colour: Half White

Dimension in mm: 67.5 (Dia) x 30 (H)

Mounting Method: Hole to Hole match with Electrical T junction box

11. LIASONING

The following liasoning works shall be in the scope of the Contractor-

A. Liasoning with the Chief Fire Officer's Office to get the Fire detection and alarm system approved in all respects. This includes periodic visit to CFOs office, submission of requisite documents and drawings, submission of Form B.

B. Liasoning with the Electricity supply authority-BEST to upgrade the sanctioned loads of the floors as mentioned in the Tender BoQ.

General

Scope

The Scope Includes Supply (wherever called for) installation, testing and commissioning of entire electrical work from the point of Electrical distribution board. The scope includes, supervision work for civil work for electrical. The scope includes the liaison work for requirement of approval from licensee, statutory authorities for the scope of electrification under this tender.

The all required material supply, except for free supply items from Employer shall be included in the scope of work of contractor even if not mentioned, but required to complete the electrification work under this work shall be included. No separate claim for such item shall be claimed by contractor. If such items are identified by contractor for any clarifications, ambiguity, the same shall be clarified prior to final offer from Contractor. Contractor shall not claim on any extra item than after.

Equipment Erection Details

For equipment interconnection, the surfaces of equipment terminal pads, copper tube, conductor & terminal clamps and connectors shall be properly cleaned. After cleaning, contact grease shall be applied on the contact surfaces of equipment terminal pad, copper tube /conductor and terminal clamps to avoid any air gap in between. Subsequently bolts of the terminal pad/terminal connectors shall be tightened and the surfaces shall be cleaned properly after equipment interconnection.

Cutting of the pipes wherever required shall be such as to avoid flaring of the ends. Hence only a proper pipe cutting tool shall be used. Hack saw shall not be used.

Handling of equipment shall be done strictly as per manufacturer's/supplier's instructions/instruction manual.

Handling equipment, sling ropes etc. should be tested periodically before erection for strength.

The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc.

Storage

The Contractor shall provide and construct adequate storage shed for proper storage of equipments, where sensitive equipments shall be stored indoors. All equipments during storage shall be protected against damage due to acts of nature or accidents. The storage instructions of the equipment manufacturer/Owner shall be strictly adhered to.

Earthing

Scope

The scope includes supply, install, test and commissioning with all items required for earthing.

The earthing shall be done in accordance with requirements given here under and drawings. Measurement of soil resistivity and earth mat design calculations for switchyard area shall be submitted by contractor for review by client. The main earth mat shall be laid in the switchyard area in accordance with the approved design requirements.

Neutral points of systems of different voltages, metallic enclosures and frame works associated with all current carrying equipments and extraneous metal works associated with electric system shall be connected to a single earthing system unless stipulated otherwise.

Earthing and lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, relevant Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.

a) Code of practice for Earthing IS: 3043

b) Code of practice for the protection of Building and an allied structure against lightning IS: 2309.

c) Indian Electricity Rules 1956 with latest amendments.

d) National Electricity Safety code IEEE publication.

Earthing Conductor Layout

Earthing conductors in outdoor areas shall be buried at least 900 mm below finished ground level unless stated otherwise.

Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on the earthing terminals of the equipment/structure as per “Earthing Details”.

Earthing conductors or leads along their run on cable trench, ladder, walls etc. shall be supported by suitable welding/cleating at intervals of 750 mm. Wherever it passes through walls, floors etc., galvanised iron sleeves shall be provided for the passage of the conductor and both ends of the sleeve shall be sealed to prevent the passage of water through the sleeves.

Earthing conductor around the building shall be buried in earth at a minimum distance of 1000 mm from the outer boundary of the building. In case high temperature is encountered at some location, the earthing conductor shall be laid minimum 1500 mm away from such location.

Earthing conductors crossing the road shall be laid 300 mm below road or at greater depth to suit the site conditions.

Earthing conductors embedded in the concrete shall have approximately 50 mm concrete cover.

Equipment and Structure Earthing

Earthing pads shall be provided for the apparatus/equipment at accessible position. The connection between earthing pads and the earthing grid shall be made by two short earthing leads (one direct and another through the support structure) free from kinks and splices. In case earthing pads are not provided on the item to be earthed, same shall be provided in consultation with Owner.

Whether specifically shown in drawings or not, steel/RCC columns, metallic stairs etc. shall be connected to the nearby earthing grid conductor by two earthing leads. Electrical continuity shall be ensured by bonding different sections of hand-rails and metallic stairs.

Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval. Apart from intermediate connections, beginning points shall also be connected to earthing system.

Metallic conduits shall not be used as earth continuity conductor.

Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.

Jointing

Earthing connections with equipment earthing pads shall be bolted type. Contact surfaces shall be free from scale, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making each connection. Equipment bolted connections, after being checked and tested, shall be painted with anti corrosive paint/compound.

Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red lead and afterwards coated with two layers bitumen compound to prevent Corrosion.

Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingression.

Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before put- ting any load on it. Artificial cooling shall not be allowed.

Bending of earthing rod shall be done preferably by gas heating.

All arc welding with large dia. conductors shall be done with low hydrogen content electrodes.

The 50x6mm GS flat shall be clamped with the equipment support structures at 1000mm interval.

Power Cable Earthing

Metallic sheaths and armour of all multi core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.

Earthing Conductors

General

All conductors buried in earth and concrete shall be of galvanised steel. All conductors above ground level and earthing leads shall be of galvanised steel, except for cable trench earthing.

Constructional Features of Galvanised Steel

a) Steel conductors above ground level shall be galvanised according to IS: 2629.

b) The minimum weight of the zinc coating shall be 610 gm/sq. m. and minimum thickness shall be 85 microns.

c) The galvanised surfaces shall consist of a continuous and uniformly thick coating of zinc, firmly adhering to the surfaces of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

Tests

In accordance with stipulations of the specifications galvanised steel shall be subjected to four one minute dips in copper sulphate solution as per IS: 2633.

Procedure for Soil Resistivity Measurement

Soil resistivity measurement should be carried out with the earth tester. Please check the calibration report before performing the measurement. Also check

The measurement should be strictly followed as per procedure given in IS 3043 (Wenner method of measurement)

Some Guidelines

The depth of burial of electrode 1/20th of electrode separation

Electrodes to be in straight line & co-planar

Minimum spacing 0.5 m to 1.0 m

Preferred electrode spacing;

0.5, 1, 2, 4, 8, 16, 20, 32 (Small station) or

0.5, 1, 2, 5, 10, 20, 50 (Large station) etc

Resistivity should be measured in all 8 directions

For good contact stand electrode in tamped mud or pour a little water around it

If resistivity reading is inconsistent repeat it by varying ‘s’

Ensure current and potential circuits do not have excessive resistance due to poor connection or excessive resistance near electrodes

Lay wires to electrodes to minimize mutual inductance

Avoid recently filled area

Resistivity measured for electrode spacing ‘a’ is a measure of resistivity up to depth ‘a’

Prepare graph of resistivity versus electrode spacing, which reflects variation of soil resistivity with respect to depth

Distribution Boards

Erection

Electrical panels and bus duct shall be delivered in convenient shipping section. The contractor shall make his own arrangement for safe transportation of all the items to the erection site and also carry out complete loading/unloading during transportation. The contractor shall be responsible for final assembly and inter connection of bus bar / wiring. Foundation channel shall be grouted in the flooring by the contractor. Switchgear shall be aligned and leveled on their base

channels and bolted or tack welded to them as per the instructions of the Engineer-in-charge. The earth bus shall be made continuous throughout the length. Loosely supplied relays and instruments shall be mounted and connected on the Switchgear. The contacts of the draw-out circuit breakers shall be checked for proper alignment and interchangeability.

After erection the switch board shall be inspected for dust and vermin proof. Any hole which might allow dust or vermin etc. to enter the panel shall be plugged suitably at no extra cost.

If the instrument transformers are supplied separately they shall be erected as per the direction of the Engineer-in-charge. The contractor shall fix the cable glands after drilling the bottom/ top plates of all switch boards with suitable holes at no extra cost.

Range of overload relays/timers etc. shall be checked with requirement of motor actually to be connected at site and shall be provided accordingly.

The bus duct shall be suitably supported between switchgear and transformer. The opening in the wall where the duct enters the switchgear room shall be sealed to avoid rain water entry. The foundation of the switchgear shall be raised suitably for minor adjustment to ensure proper alignment and connection of the bus duct at no extra cost. Expansion joints, flexible connection, etc. supplied by the manufacturer / contractor of the bus duct shall be properly connected.

TESTING:

Before electrical panel is energised, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contacts open.

Before switchgear is energised, the insulation resistance of all control circuits shall be measured from line to ground.

The following tests shall be performmed on all circuit breakers during erection.

Contact alignment and wipe shall be checked and adjusted where necessary in accordance with the breaker manufacturer's instructions.

Each circuit breaker shall be drawn out of its cubicles, closed manually and its insulation resistance measured from phase to phase and phase to ground.

iii. All adjustable direct acting trip devices shall be set using values given by the Engineer-in-charge / manufacturer.

iv. Close and trip the circuit breaker from its local control switch push button or operating handle. Switch gear control bus may be energized to permit test operation of circuit breaker with AC closing with prior permission of the Engineer-in-charge.

v. Test tripping of the electrically operated circuit breaker by operating mechanical trip device.

vi. Test proper operation of circuit breakers latch, check carriage limit switch if provided.

vii. Test proper operation of lock-out device in the closing circuit. Wherever provided by simulating conditions which would cause a lock-out to occur.

viii. Trip beaker either manually or by applying current or voltage to each of its associated protective relays.

ix. Before switchgear is energised, the tests covered above shall be repeated with each breaker in its normal opera-ting position.

x. Capacitor banks shall be tested as per manufacturer's instructions. In addition, test for output and /or capacitance, Insulation resistance test and test for efficiency of discharge device shall be carried out.

xi. All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

PROFORMA FOR LT PANELS, DB, AND CONTROL PANEL TEST.

Insulation resistance test (contacts open, Breaker racked in position).

between each phase of bus : Mega ohm

between each phase & earth : Mega ohm

DC and AC control & auxiliary circuits. : Mega ohm

between each phase of CT/PT and : Mega ohm

Between CT & PT circuit if any

CT ratio.

CT secondary resistance.

CT polarity check.

Check for contact alignment and wipe.

Check / Test all releases / relays.

Check mechanical interlocks.

Check electrical interlocks.

Check switchgear / control panel wiring.

Check breaker / contractor circuit for

closing-local and remote (wherever applicable)

Tripping-local and remote (wherever applicable)

Opening time of breaker/ contractor

Closing time of breaker/ contractor

This proforma shall be jointly signed by the Engineer-in-charge and the contractor in duplicate.]

Cabling Along With Accessories

CABLING

The scope of HT cabling is from INDOOR SUB STATION/ source station of supply authority to 11 KV VCB BREAKER PANEL at Sub station within the premises. The HT Cable shall be laid underground in an approved Manner.

TRENCHING for LAYING OF CABLES (UNDERGROUND SYSTEM):

The cable trench work involves earth excavation in all types of soil, murum, hard rock and asphalted road surface. back filling and removal of excess earth from site. The work site shall be left as clean as possible.

Cables shall be so laid in trench in such away, that it shall not interfere with other underground structure. Like water pipes, sewage lines or other structures. The services which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded / diverted as directed by the engineer in charge

Cable shall be laid at minimum depth of 1200 mm. for H.T and LT cable from ground level. The width of trench shall be sufficient for laying of required no. of cables.

Sand bedding 75 mm. thick shall be made below and above the cables. Layer of precast RCC tiles shall be laid above sand bedding to cover cable completely. More than one cable can be laid in the same trench by providing adequate clearance between two cables. However, the relative

location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to conform in all respects to the surrounded ground and to the entire satisfaction of the engineer in charge / consultant.

For all underground cables, route markers should be used:

Separate route markers should be used for LT, HT and telephone cables.

Cable markers should be installed at an interval not exceeding 30 mtr. Along the straight routes of cables at a distance of 0.5 mtr. Away from centre of cable with the arrow marked on the cable markers plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.

RCC hume pipe for crossing road in cable laying shall be provided by employer. No deduction shall be made for cable laying in hume pipe for not providing tiles , sand and excavation. RCC hump pipe at the ends shall be sealed by bituminous compound after laying and testing of cables by electrical contractor without any extra charge.

The trench shall be excavated using manual and mechanical methods as per field conditions. Most main roads are of asphalt surface and some of the roads with cement concrete surface.

An air compressor with pneumatic drill or equivalent mechanical tool will be essential if the road crossings are to be speedily made. Special system of laying hume pipe under road without digging the surface may be adopted if feasible.

Where paved footpaths are encountered, the pavement slabs shall be properly stored and reinstated. Identification markers of other services shall be properly stored and restored.

The sides of the excavated trenches shall, wherever required, be well shored up with timber and sheeting.

Suitable wooden/ sheet steel barriers should be erected between the cable trench and pedestrian/ motorway to prevent accidents. The barrier could be made out of sheet steel or wood planks. These could be portable types of size 1.5 m long by 1.2 m (height). These should be painted with red and white coloured cross stripes. Warning and caution boards should be conspicuously displayed. Red lights as warning signal should be placed along the trench during the nights.

The excavated material shall be properly stored to avoid obstruction to public and traffic movement.

The bottom of the excavated trench should be leveled flat and free from any object, which would damage the cables. Any gradient encountered shall be gradual.

CABLE TAGS AND MARKERS

Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

The tag shall be of aluminum with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS: 280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.

Location of cables laid directly underground or in PVC ducts shall be clearly indicated with cable marker made of galvanized iron plate/cast iron (applicable).

Location of underground cable joints shall be indicated with cable marker with an additional inscription “Cable joints”.

The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings.

Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/trench runs. Cable tags shall be provided inside the switchgear, motor control centers, control and relay panels etc., wherever required for cable identification, where a number of cables enter together through a gland plate.

Cable Supports and Cable Tray Mounting Arrangements

The Contractor shall provide embedded steel inserts on concrete floors/walls to secure supports by welding to these inserts or available building steel structures.

The supports shall be fabricated from standard structural steel members.

Insert plates will be provided at an interval of 750 mm/ as required , wherever cables are to be supported without the use of cable trays, such as in trenches, while at all other places these will be at an interval of 2000 mm or as per site condition ..

CABLE TERMINATION AND CONNECTIONS

The termination and connection of cables shall be done strictly in accordance with cable and termination kit manufacturer’s instructions.

The work shall include all clamping, fittings, fixing, plumbing, soldering, drilling, cutting, taping, heat shrinking (wherever applicable), connecting to cable terminal, shorting and grounding as required to complete the job.

Supply of all consumable, material, shall included in the scope of work and quoted offer by the Contractor.

The equipment will be generally provided with un-drilled gland plates for cables/conduit entry. The Contractor shall be responsible for drilling of gland plates as required using proper tools, painting and touching up. Holes shall not be made by gas cutting.

Control cable cores entering control panel/switchgear/ MCCB/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with nylon strap or PVC perforated strap to keep them in position.

The Contractor shall tag/ferrule control cable cores at all terminations, as instructed by the engineer in charge. In panels where a large number of cables are to be terminated and cable identification may be difficult, each core ferrule may include the complete cable number as well.

Spare cores shall be similarly tagged with cable numbers and coiled up.

All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively closed.

Double compression type nickel plated (coating thickness not less than 10 microns) brass cable glands shall be part of the quoted work .All power and control cables shall be provided with dust and weather proof terminations.

The cable glands shall conform to IS: 6121. They shall comprise of heavy duty brass casting, machine finished and nickel plated, to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and of tested quality. Cable glands shall be of approved make.

The cable glands shall also be suitable for dust proof and weather proof termination. The test procedure, for cable gland shall be as per manufacturer.

If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires modification, the same shall be carried out by the Contractor, as directed by the engineer in charge.

Crimping tool used shall be of approved design and make.

Cable lugs shall be tinned copper solder-less crimping type conforming to IS-8309 & 8394. Bimetallic lugs shall be used depending upon type of cables used.

Solder-less crimping of terminals shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided.

STORAGE AND HANDLING OF CABLE DRUMS

Cable drums shall be unloaded, handled and stored in an approved manner .Rrolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

DIRECTLY BURIED CABLES/ CABLES LAID IN DUCTS UNDERGROUND

The Contractor shall construct the cable trenches required for directly buried cables. The scope of work shall include excavation in all type of soils, hard rock, murum and road, preparation of sand bedding, soil cover, supply and installation of pre cast concrete protective covers, PVC/RCC Pipes, back filling and ramming, supply and installation of route markers and joint markers and construction of chamber etc.. The Bidder shall ascertain the soil conditions prevailing at site, and include the costing in the quoting.

The cable (power and control) between LT stations, control room, DG set/ building and fire lighting, pump house shall be laid in the cable trenches. In addition to the above, for lighting purpose also, buried cable trench can be used in outdoor area with cables laid in ducts, underground etc.

Cable route and joint markers and RCC warning covers shall be provided wherever required. The voltage grade of cables shall be engraved on the marker.

Cables wherever are to be placed in ducts shall be placed on cable jacks. They shall be guided through the ducts by means of the draw rope where possible. Threading shall be from one manhole or joint box or hand hole or chamber to the adjacent one, one span at a time. Cable shall not be allowed to rub excessively against the walls of the duct whilst being threaded in to avoid damage. The cable ends must be properly sealed. Any joints when necessary must be made at the manhole or joint box only and on no account will there be a joint outside these. Cables must have straight runs between manholes or chambers.

Tension as specified by the cable manufacturer for a particular type of cable shall only be put on a cable whilst pulling it into a duct.

INSTALLATION OF CABLES

Cabling in the control room shall be done on ladder type cable trays while cabling in switchyard area shall be done on angles in the trench and for Electrical to container terminal it will be done in PVC conduits laid underground.

All cables from bay cable trench to equipments including and all internal, cables (both power and control) for all equipment, shall be laid in PVC pipes of required diameter as per IS: 4985 which shall be buried in the ground at a specified depth below finish formation level. Separate PVC pipes shall be laid for control and power cables.

Cables shall be generally located adjoining the electrical equipment through the pipe insert embedded in the floor. In the case of equipments located away from cable trench either pipe inserts shall be embedded in the floor connecting the cable trench and the equipment or in case the distance is small, notch/opening on the wall shall be provided. In all these cases necessary to maintain the bending radius as recommended by the cable manufacturer.

Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS: 2074.

Suitable arrangement should be used between fixed pipe / cable trays and equipment terminal boxes, where vibration is anticipated.

Power and control cables in the cable trench shall be laid in separate tiers. The order of laying of various cables shall be as follows, for cables other than directly buried.

a) Power cables on bottom tiers.

b) Control instrumentation and other service cables in top tiers.

Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 meter interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminum strip clamps at every 2m.

Cables shall not be bent more then the minimum permissible limit. The permissible limits are as follows:

Cable and Minimum bending radius

Power cable 12 D, above 60mm dia15 OD

Control cable 10 D

D is overall diameter of cable

In each cable run some extra length shall be kept at a suitable point to enable one (for LT cables)/two (for H.T. cables) straight through joints to be made in case the cable develop fault at a later date.

Selection of cable drums for each run shall be so planned as to avoid using straight through joints. Cable splices will not be permitted except where called for, unavoidable or where permitted by the engineer in charge. If straight through joints are unavoidable, the Contractor

shall use the straight through joints kit of reputed make. The cost of the same shall be deemed to have included in the respective cable item

Control cable terminations inside equipment enclosures shall have sufficient lengths so that changing of termination in terminal blocks can be done without requiring any splicing.

Metal screen and armour of the cable shall be bonded to the earthing system of the station, wherever required. Rollers shall be used at intervals of about two meters while pulling cables.

All due care shall be taken during unreeling, laying and termination of cable to avoid damage due to twist, kinks, sharp bends, etc.

Cable ends shall be kept sealed to prevent damage. In cable vault, fire resistant seal shall be provided underneath the panels.

Inspection on receipt, unloading and handling of cables shall generally be in accordance with IS: 1255 and other Indian Standard Codes of practices.

Wherever cable pass through floor or through wall openings or other partitions, GI/PVC wall sleeves with bushes having a smooth curved internal surface so as not to damage the cable, shall be supplied, installed and properly sealed by the Contractor at no extra charges.

Contractor shall remove the RCC/Steel trench covers before taking up the work wherever provided and shall replay the covers after the erection-work in particular area is completed or when further work is not likely to be taken up for some time.

Contractor shall furnish three copies of the report on work carried out in a particular week, indicating cable numbers, date on which laid, actual length and route, testing carried out, terminations carried out, along with the marked up copy of the cable schedule and interconnection drawing wherever any modifications are made. Contractor shall paint the tray identification number on each run of trays at an interval of 10 m.

In case the outer sheath of a cable is damaged during handling/installation, the Contractor shall repair it at his own cost to the satisfaction of the engineer in charge . In case any other part of a cable is damaged, the same shall be replaced by a healthy cable at no extra cost to the Owner, i.e. the Contractor shall not be paid for installation and removal of the damaged cable.

All cable terminations shall be appropriately tightened to ensure secure and reliable connections. The Contractor shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve or paint.

The cable end seals shall be checked after laying and, if found damaged, shall immediately be resealed. Sufficient number of heat shrinkable cable end sealing caps shall be stocked at site

stores for testing and jointing work. The integrity of the outer sheath shall be checked after the cable is laid in position.

RCC HUME PIPE

RCC hume pipe shall be of NP2 class dia as specified in the BOQ complete with collar jointing, excavation in all types of soil, hard rock, murrum etc… up to a depth of 1 metre including back filling & sealing of ends to avoid choking of pipes.

The jointing of pipes shall be only through collar joints with cementing at end of the collars.

CABLE TRAYS

i) The cable trays shall be of G.I .sheet and minimum thickness of sheet shall be 2mm. or as specified.

ii) The Contractor shall perform all tests and inspection to ensure that material and workmanship are according to the relevant standards. Contractor shall have to demonstrate all tests as per specification, and equipment shall comply with all requirements of the specification.

iii) Tests

TEST FOR GALVANISING (ACCEPTANCE TEST)

DEFLECTION TEST: (TYPE TEST)

A 2.5 meter straight section of 300mm, 600mm wide cable tray shall be simply supported at two ends. A uniform distributed load of 76 kg/m shall be applied along the length of the tray. The maximum deflection at the mid-span shall not exceed 7mm.

PROFORMA FOR TESTING CABLES:

Drum No. from which cable taken.

Cable from ---- to -----

Length of run of this cable --------metre

Insulation resistance test

between core 1 to earth	:	Mega ohm
between core 2 to earth	:	Mega ohm
between core 3 to earth	:	Mega ohm

between core 1 to core 2 : Mega ohm

between core 2 to core 3 : Mega ohm

between core 1 to core 3 : Mega ohm

High voltage test

Between core an earth.

Between individual cores

This proforma shall be jointly signed by the Engineer-in-charge and the contractor in duplicate.

INSTALLATION OF LIGHTING FIXTURES

Scope of work under this item shall start from light point, with a connector/ ceiling Rose , 3core 1.5 mm.^{2} PVC insulated wires from the point to the connector inside the lighting fixture, connections, fixing of lighting fixture complete with all accessories including supports, down rods , lamps on wall / roof / steel truss etc. testing the lighting fixture and commissioning.

INSTALLATION OF EXHAUST FANS

Scope of work under this system shall start from exhaust fan point, with a ceiling rose, 3core 2.5 mm.^{2} PVC insulated wire from ceiling rose to connector of exhaust fan, connections, including fixing of fan with all accessories and supports complete with testing and commissioning.

Completion Tests

After supply and installation of complete project or a particular building / area, following tests shall be carried out by the contractor before switching on the power to installation and the results shall be recorded and submitted to the Site-Engineer. If results are not satisfactory / as per standards set herewith, the contractor shall identify the defects / short coming and shall rectify the same. Nothing extra shall be paid for carrying out these tests and contractor has to arrange all necessary instruments.

Insulation Resistance To Earth:

This is to be measured with all fuse links in place, all switches ON, all lamps and appliances in position by applying a voltage not less than twice the working voltage (subject to a limit of 500 V). Insulation resistance of the whole or any part of the installation to earth must not

be less than 50 mega-ohms divided by the number of outlets (points and switch positions) except that it need not exceed one mega-ohm for the whole installation.

Insulation Resistance Between Conductors

Tests to be made between all the conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire or neutral or the other pole or phase conductors of the supply. For this test, all lamps shall be removed and all switches put ON. The result of the test must be 50 mega-ohms divided by the number of outlets (points and switch positions) but need not exceed 1 mega-ohm for the whole installation.

Polarity Of Single Pole Switches

Tests shall be made to verify that all non-linked single pole modular switches are on phase conductor (live) and not on neutral or earth conductor. This can be done by connecting test lamps between two terminals of switch and earth. If the lamp lights up when switch is ON and either terminal is touched, the switch is correctly installed.

Safety Precautions While Testing

The following points to be taken care for safety purpose before testing: -

The work shall be carried out with the equipment dead or energised at a safe voltage or current.

The equipment shall not to be left unattended on live. There shall be no exposed live parts that are hazardous

The test personnel should be able to supervise the working area at all times to prevent danger to others.

The test personnel should be competent, posses authorised license i.e. adequately trained, experienced and knowledgeable to do the work safely and ensure that others are not put at risk.

The test personnel will be required to design and/or manufacture any special test equipment; they should know what standards or guidance should be followed and are these documents readily available.

Physical safeguards should be applied to the equipment under test to avoid danger and prevent injury e.g. the use of temporary or permanent screens or enclosures.

Routine maintenance shall be carried out on the hardware used in testing.

Check whether it is necessary to set up a permanent test area where equipment is taken or a temporary test area around the equipment and how will this be done.

Check the size of the unit under test and how much space is required around it to avoid congestion while testing.

Additional emergency switching, off, devices to be provided at easily accessible places.

MINIMUM TOOL BOX

HT Equipments & Cables

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
UNDERGROUND CABLING				
	Insulated Crow Bar	5 feet steel rod with nylon insulated grip for half length	Qty as per number of gang members	
2	Rollers for cable pulling	Steel rollers fixed on frame used at 2m interval and at turnings (valid for cable laid directly in ground). For cables laid in ducts pulleys to be provided.	Qty as per length of cable trench	
3	Jack for cable drums	Jacks with suitable strength for lifting cable drum through one feet height	At least one set	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer/supervisor	
2	Road barricades	2m x 1.5m (H) pipe structure	At regular intervals as	

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
		painted yellow	per site requirement	
3	Red Flag	Red cotton cloth of adequate size to indicate danger	As per site requirement	
4	Luminous Warning Board		Minimum 2 Nos	
5	Caution Tape	Red printing on white back ground	Running Cable length	
6	First Aid Kit		Minimum one set	
7	Safety Shoes		Qty as per number of gang members	
TESTING & MEASURING EQUIPMENTS				
1	HV Tester	0-30/60kV, 0-100mA	1 No	
2	Megger	5kV, Hand Held manual driven	1 No	Electronic megger is optional
HT EQUIPMENTS				
Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
1	Crimping Tool	25-400sqmm	1 No	
2	Cutting Pliers	8" insulated grip	1 No	
3	Screw Driver	9" power grip	1 No	
4	Screw Driver	4" power grip	1 No	

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
5	Adjustable Spanner	24mm	1 No	
6	Spanner	25/9 Ring Spanner set of 25	1 No	
7	Hack Saw Frame and Blade	12"	1 No	
8	Knife	6"	1 No	
9	Pedestal Type ladder		1 No	
10	Welding Machine with suitable cable	415V, 5kVA, 400A	1 No	
11	Torches	5 Cell	1 No	
12	Vice	8”	1 No	
13	Drill Machine	½” Drill bits	1 No	
14	Bamboo/ FRP Ladder	3m local	1 No	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer / supervisor	
2	Discharge Rods	20', 3 connectable fiber pipes	2 sets	
3	Caution Board	Red letters on white back ground on plastic base board (300x400mm)		

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
4	Hand Gloves	15kV Rubber Grip	One pair	
5	First Aid Kit		1 No	
6	Rubber Sheets	10mm x 5’ x 3’	1 No	
7	Earthing Spikes	2 feet, local make	1 No	For additional earthing
TESTING & MEASURING EQUIPMENTS				
1	Tester	230V	1 No	
2	Measuring metal tape	3m	1 No	
3	Clip on meter	0-1000A	1 No	For engineers
4	CMRI	as per specifications	1 No	For engineers
5	Cell Tester	3-0-3V	1 No	
6	Insulation Tester	1kV	1 No	
7	Insulation Tester	5kV	1 No	
8	Earth resistance tester	4 Terminal Type	1 No	

LT Equipments

Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
TOOLS				
2	Crimping Tool	25-400sqmm	1 No	
	Cutting Pliers	8" insulated grip	1 No	
3	Screw Driver	9" power grip	1 No	
4	Screw Driver	4" power grip	1 No	
5	Adjustable Spanner	24mm	1 No	
6	Spanner	24mm	1 No	
7	Hack Saw Frame and Blade	12"	1 No	
8	Knife	6"	1 No	
9	Bamboo/ FRP Ladder	3m local	1 No	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer/ supervisor	
2	Discharge Rods	20', 3 connectable fiber pipes	2 sets	
3	Caution Board	Red letters on white back ground on plastic base board	2 sets	

Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
		(300x400mm)		
4	Hand Gloves	15kV Rubber Grip	One pair	
5	First Aid Kit		1 No	
	For additional earthing	2 feet, local make	1 No	
TESTING & MEASURING EQUIPMENTS				
1	Tester	230V	1 No	
2	Measuring metal tape	3m	1 No	
3	Clip on meter	0-1000A	1 No	For engineers
4	CMRI	as per specifications	1 No	For engineers
5	Earth resistance tester		1 No	Optional Item

LIST OF PREFERRED MAKES OF EQUIPMENT/ MATERIAL

Preferred makes of equipment and materials are given below. Although the preferred makes are given, the Contractor shall submit samples of all materials other than heavy equipment and obtain prior approval of the Architect/ Consultants (whose decisions shall be binding) for the make of each item before ordering the same. This condition is also applicable to all items of equipment and material for which makes are not given in this specification:

Sr. No.	Product	Make (ISI marked)
1	Power distribution boards	Schneider L and T Siemens Legrand
2	LV Glands & Lugs	Dowell Electro Works Jainson Asian Comet
3	LV Switchgear	 MCB-C Curve: Legrand Siemens L&T Schneider Electric

Sr. No.	Product	Make (ISI marked)
4	LV Cables	Polycab Finolex KEI RR Kabel Havells Kenter
5	Wires	Polycab Finolex KEI RR Kabel Havells Kenter
6	Cable Tray	Profab Rico Steel Sadhana
7	Underfloor raceways	MK-Honeywell Legrand
8	PVC Conduits & accessories	Precision

Sr. No.	Product	Make (ISI marked)
		BEC AKG Polypack
9	Switches / Sockets / TV Socket / Telephone sockets / Data sockets / Regulators etc.(Modular)	MK Honeywell -Elements Wipro (North West) Havells (Crabtree) Philips Legrand Elleys
10	Industrial Socket Metal Clad	CG (Scame) Schneider Electric (Clipsal) C&S
11	Industrial Socket Splash Proof	CG (Scame) Gewiss Schneider Electric (Clipsal) C&S
12	Ceiling Fans/ Exhaust Fans	Orient Crompton Bajaj

Sr. No.	Product	Make (ISI marked)
		Usha Havells
13	Lighting Fixture	Philips Wipro Divinity Regent
14	Maintenance Free Earthing	Indelec Stormaster (Fast Track Enterprises) Ashlok
15	Cat 6 and fibre optic cable	Commoscope Tyco Molex Legrand
16	Fire Alarm System	Honeywell- Notifier/ Essar Edwards Siemens-Fire finder
17	Public Address System	Bosch Honeywell

Sr. No.	Product	Make (ISI marked)
18	Rodent repellant system	Maser
19	Cabling for Fire alarm system, Public address system , CCTV System and PA system	Polycab Havells Kenter
20	Electrical Low Tension Panels-CPRI(Central Power Research Institute) approved	VIVID ELECTROMECH PVT LTD ABAK DEEPAK ELECTRO CONTROL
21	GI Conduits	BEC AKG

Note: If make of any item is not mentioned above or is missed out, the same shall be approved by the Consultant/Architect.