अंतर–विश्वविद्यालय केंद्र : खगोलविज्ञान और खगोलभौतिकी IUCAA

Inter-University Centre for Astronomy and Astrophysics

An Autonomous Institution of the University Grants Commission

Tender for

"INTERNAL & EXTERNAL ELECTRICAL WORK OF NEW IUCAA-2 BUILDING AT IUCAA, PUNE"

Technical Bid

Inter – University Centre for Astronomy and Astrophysics (IUCAA)
Pune

Post Bag - 4, Ganeshkhind, Savitribai Phule Pune University Campus,
Pune - 411 007.
Tel. (020) 25604100 Fax: (020) 25604699

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Contact Details of the Bidder for

"INTERNAL & EXTERNAL ELECTRICAL WORK OF NEW IUCAA-2 BUILDING AT IUCAA, PUNE"

A. Name of Vendor / Firm / Company _____

Postal Address _____

Telephone Off. _____

Telex / Fax _____

Email ID _____

Signature & Seal of the Bidder

Name of the signatory:

Designation:

Date:

Place:

IMPORTANT MILESTONES AND CONTACT INFORMATION

1.	Date of commencement	8th (Eighth) day after the letter of intent is received by the contractor of start the work.
2.	Date of completion	18 (Eighteen) calendar months from the 8th day of receipt work order (including monsoon season).
3.	Defects liability Period	24 (Twenty Four) calendar months from the date of virtual Completion.
4.	Period of final measurements	Thirty days from the date of submission of Final bill with all necessary papers.
5.	The Interim Certificate / Running Bill Value	Minimum assessed bill value should not be less then Rupees 50/- Lakhs.
6.	Period of Honoring Certificate	Thirty days from the issue of architect certificate.
7.	Earnest money Deposit (EMD)	Rs. 18,60,000/- (Rs. Eighteen Lacs Sixty Thousand only) in the form of online payment. Refund: EMD of unsuccessful bidders during first stage (technical evaluation) shall be returned within 30 days of declaration of result of the first stage, i.e. technical evaluation. Bids of the unsuccessful bidders shall be returned to them earliest after expiry of the final bid validity and latest on or before the 30th day after the award of the Contract / Work Order.
8.	Security Deposit (SD)	The SD will be 5% of the Accepted tender value/final Contract/Work Order value. The EMD already submitted will be converted into Security Deposit and the balance amount of SD will be recovered from first 4 RA bills in equal installments.
9.	Performance Security(PS) / Performance Guarantee (PG)	The PS/PG will be 3% of the accepted tender value. The same has to submitted within 21 days from the award of contract/letter of Intent/work order. The PG will be released after completion of all contractual obligations including Defect Liability Period + 60 days. The PS can also be submitted in the form of Performance Bank Guarantee (PBG) drawn on a Nationalised Bank. If PS is not submitted within 21 days , then the penalty of Rs.5000/- per day will be applied.
10.	Contact information of IUCAA representative for visit to site, technical information / clarification, etc.	Mr. Nitin Ohol Estate Manager, IUCAA Tel. 020-25604334, Email: nitin_ohol@iucaa.in, tenders.estate@iucaa.in,

SECTION – I

Tender Information

Inter-University Centre for Astronomy and Astrophysics (IUCAA), Post Bag 4, Ganeshkhind, Savitribai Phule Pune University Campus, Pune 411 007, invites tenders in two-bid system, i.e., "Technical Bid" and "Financial Bid" from reputed vendors for "I "Internal & External Electrical Work of New IUCAA-2 Building At IUCAA, Pune"

Tender available on CPPP	: 14/03/2024 at 1100 hrs.
Submission of questionnaire for Pre-Bid Meeting	: 22/03/2024 up to 1100 hrs
Pre-Bid Meeting	: 27/03/2024 at 1100 hrs.
Closing date & time for receipt of tender	: 08/04/2024 at 1100 hrs.
Tender opening date & time	: 10/04/2024 at 1100 hrs.
Place of tender opening	: IUCAA's office
Earnest Money Deposit (EMD)	: Rs.18,60,000/- (Rs. Eighteen Lacs Sixty Thousand Only)

1) Bidders shall ensure that their tenders, complete in all respects, are uploaded at https://eprocure.gov.in/eprocure/app on or before the closing date and time indicated as above.
2) EMD should be paid through **NEFT/RTGS** only. Photo copy of transaction ID or UTR no. should be uploaded along with technical bid. Micro and Small Enterprises (MSEs) are provided tender documents free of cost and are exempted from payment of earnest money, subject to furnishing of relevant valid certificate for claiming exemption.
3) Tender fees shall not be applicable for tender documents downloaded by the bidder. (In order to promote wider participation and ease of bidding, no cost of tender document will be charged for tender documents downloaded or uploaded on CPPP by the bidder)
4) The Minimum turnover of the bidder shall not be less than Rs. 30 Crores (Indian Rupees Thirty Crores only) per annum for a minimum of three years out of the last five financial years, i.e. 2018-2019, 2019-2020, 2020-2021, 2021-2022 and 2022-2023.
5) In the event of any of the above-mentioned dates being declared as a holiday / closed day for IUCAA, the tenders will be received/opened on the next working day at the appointed time.
6) The Estate Manager, IUCAA, Pune - 411007 on behalf of IUCAA reserves the right to postpone the date of opening of tender without assigning any reason thereof.
7) Technical Bid consists of all documents mentioned in the Technical Bid form along with EMD. Financial Bid consists of the prices and for all Commercial Terms and Conditions. A tender in which any of the prescribed condition(s) is not fulfilled or any condition including that of conditional rebate are put forth by any bidder then their bid shall be summarily rejected. However, tenders with unconditional rebate will be considered.
8) IUCAA reserves the right to reject any or all of the tenders without assigning any reason thereof.

Estate Manager
Inter-University Centre for Astronomy and Astrophysics,
Post Bag 4, Ganeshkhind, Pune 411 007 Tel. (020) 25604100
Email- tenders.estate@iucaa.in,

Technical Bid Form

(To be filled by Bidder)

1	**Bidder's Name (firm/company Name) and Address**	
2	**Company Registration / Shop Act License No. and Validity Period/Date**	
3	**Electrical Contractor's License No. and Validity Period/Date**	
4	**Contractor 'A' Class PWD Registration No. & Validity Period/Date**	
5	Nature of Business & Establishment Year	
6	**Telephone Nos.** *Mobile No.* *Fax Nos.* *E-mail*	
7	**Contact Person** *Name* *Designation* *Mobile* *E-mail*	
8	EMD Paid (Proof to be Attached)	
9	NSIC / MSME Registration Certificate (valid certificate to be attached if any)	
10	**PAN Details** PAN no. (Photocopy to be attached)	
11	**PF/ESI/GST/Professional Tax details** Reg. no. PF (copy to be attached) Reg. no. ESI (copy to be attached) Reg no. GST (copy to be attached) Reg no. Profession Tax (copy to be attached)	
12	**Valid Labour License** (Photocopy to be attached)	
13	**Organizational Capability (staff strength)** *No. of Electrical Engineers …* *No. of Supervisors* --- *No of Technicians…* Quality Engineers …	
14	**Financial capacity over last 5 years (Income tax return/Certified balance sheet of the firm along with CA's certificate for the respective year's turnover)** FY 2018-2019 FY 2019-2020 FY 2020-2021 FY 2021-2022 FY 2022-2023	
15	Last Five years continuous experience of the firm in the field of providing such services in Central Govt. establishment/Autonomous bodies of GOI/Corporation of GOI/Reputed Public or Private Organizations (Provide details in enclosed tabular form)	
16	Provide following details of **Institutional/Similar type** of electrical projects completed within the last 5 years of similar nature: 1) Minimum three **Institutional/Similar type** Electrical projects costing more than **Rs 7 Crores OR** 2) Minimum two **Institutional/Similar type** of Electrical projects costing more than **Rs. 8 Crores** OR 3) Minimum one **Institutional/Similar type** of Electrical project costing more than **Rs. 10 Crores**. Client Certificate to be attached for all the works	

	a) Name & address of the project Type of Work Start date Completion date Final Bill Value Scope of work *Client contact details (Name, tele, fax, e-mail).*
	b) Name & address of the project Type of Work Start date Completion date Final Bill Value Scope of work *Client contact details (Name tele, fax, e-mail).*
	c) Name & address of the project Type of Work Start date Completion date Final Bill Value Scope of work *Client contact details (Name tele, fax, e-mail).*
17	List of Clients for whom the bidder has executed works of similar nature
18	List along with details of any arbitration cases / legal disputes on Current / previous projects – (Mention name of project, reason for dispute, party filing the suit and its current status)
19	**Is the company ISO Certified?**
20	List any awards, recognitions on previously executed projects
21	**Address of office**
22	Prepared and submitted by (Name & Signature)

Notes –

1. The Inter-University Centre for Astronomy & Astrophysics, Pune reserves the right to accept or reject any or all applications without assigning any reason.
2. The vendors/bidder has to fill/complete the technical bid form and Compliance sheet mentioned in clause no.17.8 in all respects. Every statement made in the technical bid format should be supported by documentary proof for consideration and all pages of the tender should be verified and signed by the authorized person in this behalf. Otherwise the tender is liable to be rejected.
3. Please support **Completed Work (Form No. I)** and **Work in hand (Form No. II)** information with copy of the Work order/Contract from the client, **Otherwise the tender is liable to be rejected.**

Date: **Yours faithfully,**

Place: **(Signature of the Authorized person)**

Name:

Designation:

Seal:

SECTION - II

COMMERCIAL TERMS

1. Introduction

1.1 IUCAA has issued these tender enquiry documents for "**Internal & External Electrical Work of New IUCAA-2 Building At IUCAA, Pune**".

1.2 This section provides the relevant information as well as instructions to assist the prospective bidders in preparation and submission of tenders. It also includes the mode and procedure to be adopted by IUCAA for receipt and opening as well as scrutiny and evaluation of tenders and subsequent placement of contract.

1.3 Before formulating the tender and submitting the same to IUCAA, the bidder should read and examine all the terms, conditions, instructions etc. contained in the tender documents. Failure to provide and/or comply with the required information, instructions etc. incorporated in these tender documents may result in rejection of their tender.

2. Language of Tender: The tender submitted by the bidder and all subsequent correspondence and documents relating to the tender exchanged between the bidder and IUCAA shall be written in the English language, unless otherwise specified in the tender enquiry. However, the language of any printed literature furnished by the bidder in connection with its tender may be written in any other language provided the same is accompanied by an English translation and, for purposes of interpretation of the tender, the English translation shall prevail.

3. Eligibility Criteria for Bidders: The vendors should meet the following criteria to qualify in the tendering process. (Sufficient proof with authorized work order & completion certificate to be submitted)

3.1 The vendor should have completed minimum ONE similar Institutional Electrical Project costing **more than Rs. 10 crores (Indian Rupees Ten Crores only) in the last 5 financial years.**

OR

3.2 The vendor should have completed minimum TWO similar Institutional Electrical Project costing **more than Rs.8 crores (Indian Rupees Eight Crores only) in the last 5 financial years.**

OR

3.3 The vendor should have completed minimum THREE similar Institutional Electrical Project costing **more than Rs.7 crores (Indian Rupees Seven Crores only) in the last 5 financial years.**

3.4 The bidder must have valid Electrical Contractor's License and Contractor's 'A' Class PWD, Registration certificate.

3.5 The Minimum turnover of the bidder shall not be less than Rs.30 Crores (Indian Rupees Thirty Crores only) per annum for minimum three years out of last five financial years. The bids of those bidders who do not fulfil any of the above-mentioned criterion shall be summarily rejected.

4. Tendering Expenses: The bidder shall bear all the costs and expenditure incurred and/or to be incurred by it in connection with its tender including preparation, mailing and submission of its tender and for subsequent processing of the same. IUCAA will, in no case be responsible or liable for any such costs, expenditure etc. regardless of the conduct or outcome of the tendering process.

5. **Content of Tender Enquiry Documents**: The relevant details required for construction & services, the terms, conditions and procedure for tendering, tender evaluation, placement of contract, the applicable contract terms and, also, the standard formats to be used for this purpose are incorporated in the above-mentioned documents. The interested bidders are expected to examine all such details etc. to proceed further.

6. **Amendments to Tender Enquiry Documents:**

   6.1 At any time prior to the deadline for submission of tenders, IUCAA may, for any reason it deems fit, modify the tender enquiry documents by issuing suitable amendment(s) to it. All such amendments shall form part of this tender document and shall be binding on all the bidders.

   6.2 In order to provide reasonable time to the prospective bidders to take necessary action in preparing their tenders as per the amendments, IUCAA may, at its discretion extend the deadline for the submission of tenders and other allied time frames, which are linked with that deadline.

7. **Clarification of Tender Enquiry Documents & Pre-Bid Meeting:** A bidder requiring any clarification or elucidation on any issue of the tender enquiry documents may take up the same with IUCAA in writing by e-mail. A pre-bid technical meeting will be held at IUCAA, Pune on **27/03/2024 at 11:00 hrs.** to discuss and resolve the queries and doubts, if any from the prospective bidders. Clarifications / questionnaire sought should be sent by email to **tenders.estate@iucaa.in** latest by **11:00 hrs. on 22/03/2024.** Clarifications / discussions / minutes of the pre-bid meeting will form a part of the tender document. Pre-bid meeting will be arranged at IUCAA campus.

   One Set of hard copy of tender document & drawings shall be available at IUCAA office during office hours.

8. **Contacting IUCAA:**

   8.1 From the time of submission of tender to the time of awarding of the contract, if a bidder needs to contact IUCAA for any reason relating to this tender enquiry and / or its tender, it should do so only in writing to **tenders.estate@iucaa.in**

   8.2 In case a bidder attempts to influence IUCAA in its decision(s) during scrutiny, comparison and/or evaluation of tenders and/or awarding the contract, the tender of such a bidder shall be liable for rejection in addition to appropriate legal action(s) being taken against such a bidder at the discretion of IUCAA.

9. **Corrupt or Fraudulent Practices:** IUCAA requires that the bidders who wish to bid for against IUCAA's tender have the highest standards of ethics. IUCAA shall reject bids of those bidders who are found to be engaged in corrupt and/or fraudulent practices. This also applies to a successful bidder who has been awarded the contract and is found to be engaged in corrupt or fraudulent practices during the execution of the contract.

10. **Interpretation of the clauses in the Tender Document/Contract Document:** In case of any ambiguity in or dispute arising out of or related to (including the interpretation of any of the clauses in this tender document/purchase order/contract), decision of the Director, IUCAA or his nominee shall be final and binding on all parties.

11. **Tender currencies:** The bidder shall quote only in Indian Rupees.

12. **Tender Prices:** Bidder has to check and fill all the fields mentioned in the price bid. The quoted rates shall be inclusive of all the relevant taxes excluding GST. The GST shall be calculated automatically on the Gross Total and shown separately at the end in the BOQ sheet. The Net Total shall be the summation of the Gross Total and the GST. All the bidders should ensure that they are GST compliant and their quoted tax structure/rates are as per GST Law.

13. **Taxes:** GST shall be levied as per prevailing rates (Present rate of GST is 18%).

14. **Earnest Money Deposit (EMD):** The Earnest Money is required to protect IUCAA against the risk of the bidder's unwarranted conduct as amplified under GCC.

14.1 The amount of EMD will be Rs. 18,60,000/- (Rs. Eighteen Lacs Sixty Thousand Only).

14.2 The EMD shall be denominated in Indian Rupees.

14.3 Scanned copy of the EMD paid receipt (as the case may be) shall be uploaded along with the Technical Bid.

14.4 The EMD shall be furnished through **NEFT/RTGS** only. IUCAA's bank details for the purpose of payment of EMD are as follows: -
Name of the Beneficiary - Inter-University Centre for Astronomy & Astrophysics
Bank Account Number - 98060100000188
Nature of Bank Account - Savings Bank Account, MICR NO. - 411012053
Name of the Bank - Bank of Baroda
Address of the branch - Bank of Baroda, IUCAA Extension counter,
Pune University Campus, Pune -411007. Bank Branch Code –EXTPOO,
IFSC Code- BARB0EXTPOO, Swift Code-BAR B IN BB PCB

14.5 Unsuccessful bidder's earnest money shall be returned to them without any interest after issuing the work order / LOI to the successful bidder. In case of the bidder whose offer is accepted, the EMD shall be converted into **Security Deposit**. [Please refer Section III, Clause 26, for further details on Security Deposit.]

14.6 EMD of a bidder will be forfeited, if the bidder withdraws or amends their bid or impairs or derogates from the tender in any respect within the period of validity of their tender. The successful bidder's earnest money shall be forfeited, if they fail to furnish the balance amount of Performance security within the aforementioned period.

14.7 Micro and Small Enterprises (MSEs) are provided tender documents free of cost and are exempted from payment of earnest money, subject to furnishing of relevant valid certificate for claiming exemption. MSEs must provide proof of their being registered as MSE (indicating the terminal validity date of their registration) for the item tendered, with any agency mentioned in the notification of the Ministry of Micro, Small and Medium Enterprises (Ministry of MSME), indicated on the website of MSME.

14.8 **Security Deposit** will be released upon completion of all contractual obligations including Defect Liability Period + 60 days.

15. **Bid Validity**

15.1 The Bids shall remain valid for acceptance for a period of **90 days** from the date of tender opening prescribed in the tender document. Any bid valid for a shorter period shall be treated as unresponsive and rejected summarily.

15.2 In exceptional cases, the bidders may be requested by IUCAA to extend the validity of their bids up to a specified period. Such request(s) and responses thereto shall be conveyed by e-mail followed by registered-post/courier. In all such cases the bidders will (i) have to extend the bid validity without any change or modification in their original tender and (ii) extend the validity period of the EMD accordingly. However, EMDs of those bidders who express their inability to do so shall not be forfeited and their bids shall not be considered for further process.

15.3 In case the day up to which the tenders are to remain valid falls on/ is subsequently declared as a holiday or closed day for IUCAA the tender validity shall automatically be extended up to the next working day.

16. **Preparation of Bids:**

16.1 For preparation of bids, the bidders shall search the tender from published tender list available on site and download the complete tender document and shall consider corrigendum issued, if any, before submitting their bids. After selecting the tender document,

the same shall be moved to the 'My favorite' folder of bidders account from where bidder

can view all the details of the tender document.

16.2 Bidder shall go through the tender document carefully to understand the documents required to be submitted as part of the bid. Bidders shall note the number of covers in which the bid documents have to be submitted, the number of documents – including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of their bid.

16.3 Any pre-bid clarifications if required, then same may be obtained online through the tender site, or through the contact details given in the tender document.

16.4 Bidders should get ready in advance the bid documents in the required format (pdf/xls/rar/dwf/jpg formats) to be submitted as indicated in the tender document/schedule. **Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.**

16.5 Bidders can update well in advance, the documents such as experience certificates, annual report, PAN, GST & other details etc., under "My Space / Other Important Document" option, which can be submitted as per tender requirements. This will facilitate the bid submission process faster by reducing upload time of bids.

16.6 The tender documents may be downloaded from http://eprocure.gov.in/eprocure/app till the last date of submission of tender. The Tender must be submitted online through CPP Portal http://eprocure.gov.in/eprocure/app

16.7 **The bidder should submit the bid online in two parts viz. Technical Bid and Financial Bid.** Technical Bid in cover-1 & Financial Bid in ".xls" format in Cover-2

17. Submission of Technical and Financial Bids:

17.1 All pages of the bid (except for un-amended printed literature) shall be initialed by the person or persons signing the bid. The bidder's name stated on the proposal shall be the exact legal name of the firm.

17.2 IUCAA may, at its discretion, extend the deadline for the submission of bids by amending the bidding documents, in which case all rights and obligations of IUCAA and Bidder previously subject to the deadline will thereafter be subject to the deadline as extended.

17.3 At any time prior to the deadline for submission of bids, IUCAA may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, notify changes in the bidding documents through an amendment.

17.4 The amendments, if any, shall be notified on the CPP portal and the amendments shall be binding on all the bidders. Hence, the bidders shall view the notification in complete before submitting their bids.

17.5 The bidder responding to announcement shall be deemed to have read and understood the documents in complete. Where counter terms and conditions have been offered by the bidder, the same shall not be deemed to have been accepted by IUCAA, unless a specific written acceptance thereof is obtained.

17.6 **SUBMISSION OF BIDS:**

i. Bidder should log into CPP Portal well in advance for bid submission so that he/ she upload the bid in time i.e., on or before the bid submission time. Bidder will be responsible for any delay.

ii. Bidder should submit the EMD as per the instructions specified in the NIT / tender document. The details of the EMD should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise, the uploaded bid will be rejected.

iii. While submitting the bids online, the bidder shall read the terms & conditions (of CPP portal) and accept the same in order to proceed further to submit their bid.

iv. Bidder shall digitally sign and upload the required bid documents one by one as indicated in the tender document.

v. Bidders shall note that the very act of using Digital Signature Certificate (DSC) for downloading the tender document and uploading their offers is deemed to be a confirmation that they have read all sections and pages of the tender document without any exception and have understood the complete tender document and are clear about the requirements of the tender document.

vi. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document. For the file size of less than 1 MB, the transaction uploading time will be very fast.

vii. **If price quotes are required in xls format, utmost care shall be taken for uploading Schedule of quantities & Prices and any change/ modification of the price schedule shall render it unfit for bidding.**

Bidders shall download the Schedule of Quantities & Prices, in .xls format and save it without changing the name of the file. Bidder shall quote their rate in figures in the appropriate cells, thereafter save and upload the file in financial bid cover (Price bid) only.

If the template of Schedule of Quantities & Prices file is found to be modified/corrupted in the eventuality by the bidder, the bid will be rejected, including forfeiture of EMD.

The bidders are cautioned that uploading of financial bid elsewhere i.e. other than in cover 2 will result in rejection of the tender.

viii. Bidders shall submit their bids through online e-tendering system to the Tender Inviting Authority (TIA) well before the bid submission end date & time (as per Server System Clock). **The TIA will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders at the eleventh hour**.

ix. After the bid submission **(i.e. after Clicking "Freeze Bid Submission" i**n the portal), the bidders shall **take print out of system generated acknowledgement** number and keep it as a record of evidence for online submission of bid, which will also act as an entry pass to participate in the bid opening.

x. Bidders should follow the server time being displayed on bidder's dashboard at the top of the tender site, which shall be considered valid for all actions of requesting, bid submission, bid opening etc., in the e-tender system.

xi. All the documents being submitted by the bidders would be encrypted using PKI (Public Key Infrastructure) encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology.

xii. Technical & Financial bids has to be uploaded on or before **Bid Submission End Date & Time** mentioned in the tender documents

17.7 **Assistance to Bidders**

i. Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contract person indicated in the tender. The contact number for the IUCAA helpdesk is 020-25604134/36 between 10:30 hrs to 17:00 hrs.

ii. Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24X7 CPP Portal Helpdesk. The 24 x 7 Help Desk Number 0120-4200462, 0120-4001002 and 0120-4001005. The helpdesk email id is support-eproc@nic.in

iii. All interested eligible bidders are requested to submit their bids online on CPP Portal http://eprocure.gov.in/eprocure/app as per the criteria given in this document:

a) Technical Bid should be upload online in cover-1.

b) Financial Bid should be upload online in cover-2

Both Technical and Financial Bid covers should be placed online on the CPP Portal (http://eprocure.gov.in/eprocure/app).

17.8 **TECHNICAL BID** (**Cover-1**)

Signed and Scanned copies of the Technical bid documents as under must be submitted online on CPPP Portal: http://eprocure.gov.in/eprocure/app . List of Documents to be scanned and uploaded (Under Cover-1) within the period of bid submission **Otherwise the tender is liable to be rejected.**:

i. **Scanned Copy of EMD paid receipt / MSE registration certificate (indicating the terminal validity date of their registration)**
ii. **Scanned copy of duly filled Technical Bid form (Section I) along with supporting documents & commercial / legal terms & conditions with proper seal and signature of authorized person on each page of the bid submitted.**
iii. **Scanned copy of** Completion Certificate of valid registered contractor for **One Institutional/Similar type of Electrical Project Work of costing not less than Rs. 10 Crores** in last five financial years **(i.e., 18-19, 19-20, 20-21, 21-22, 22-23)** Or **Two Institutional/Similar type of Electrical Project Works of more than 8 Crores in last 5 financial years**¸ Or **Three Institutional/Similar type of Electrical Project Work more than 7 Crores in last 5 financial years** from Government / Semi Government/Public sector or reputed private bodies (in **Form I**). The contractor will have to produce a certificate from an officer not below the rank of Deputy Engineer, for the works pertaining to Govt. Dept. or Semi Govt. Institutes / Dept. or equivalent from their respective Heads. **The details of ongoing works (Forms II)**
iv. **Scanned copy of** Abstract of work done **(average annual financial turnover) shall not be less than Rs 30/- Cores (Rs. Thirty Crores) per annum** in all classes of electrical work during last five financial years **(i.e.,18-19, 19-20, 20-21, 21-22, 22-23)** (**Form III**). The work done certificates issued by Govt./Semi Govt./Reputed private bodies to be attached in support of turnover. The certificate shall have name of work, date of start, date of completion and amount of work done of in last three financial years as above. The turnover certified by chartered accountant shall not be accepted. Income tax returns certificate should be attached.
v. **Scanned copy of duly filled Undertaking / Acceptance Letter (Form III).**
vi. **Scanned copies of the duly filled Declaration Form (Form IV& VI) & Form V**
vii. **Scanned copy of valid Electrical Contractor's License and Contractor's 'A' Class PWD Registration certificate**
viii. **Scanned copy of Partnership Deed / Certificate of Registration in case of Pvt. Ltd. Company** with list of Directors, their names and address with telephone numbers, if the tenderer is a partnership firm / Pvt. Ltd. Company, Power of Attorney / Resolution of Board of Director's for authorized signatory.
ix. **Scanned copy of Declaration** regarding any ongoing disputes/litigations (or any history thereof) with respect to any work executed / being executed by the tenderer with details of disputes/litigations, if applicable
x. **Scanned copy of make of goods/items offered as per approved make list.**
xi. **Scanned copy of Compliance sheet of D G Set**
xii. **Scanned copy of Compliance sheet of Panel & Transformer and OLTC**
xiii. **Scanned copy of Compliance sheet HT Cable**
xiv. **Scanned documents of all eligibility criteria should be attached.**

17.9 **FINANCIAL BID** (**Cover-2**)

i. The currency of all quoted rates shall be Indian Rupees.
ii. In preparing the financial bids, bidders are expected to consider the requirements and conditions laid down in this Tender document. The financial bids should be uploaded online as per the specified **".xls"** format i.e. Price Bid Excel sheet attached as **'.xls'** with the tender and based on the scope of work, service conditions and other terms of the tender document. It should include all costs associated with the Terms of Reference/Scope of Work of the assignment.

18. Withdrawal of Tender: No tender shall be allowed to be withdrawn after the deadline for submission of tender and before expiry of the tender validity period. If a bidder withdraws the tender during this period, IUCAA shall forfeit the earnest money furnished/deposited by such a bidder.

19. Tender Opening:

19.1 IUCAA will open the tenders at the specified date and time and at the specified place as indicated. In case the specified date of tender opening falls on declared holiday or closed day for the purchaser, the tenders will be opened at the appointed time and place on the next working day.

19.2 In the case of two-bid system mentioned above, the technical bids are to be opened in the first instance, at the prescribed time and date. These bids shall be scrutinized and evaluated by the competent authority / committee with reference to parameters prescribed in the tender document. Thereafter, in the second stage, the financial bids of only the technically qualified / acceptable offers (as decided in the first stage) shall be opened for further scrutiny and evaluation by giving an advance intimation to the technically successful bidders. IUCAA reserves the right to select the vendor on the basis of past performance and experience of the firm. The decision of IUCAA shall be final and representation of any kind shall not be entertained on the above. IUCAA shall have no obligation to convey reason for rejection of any bid.

20. Preliminary Scrutiny of Tenders:

20.1 The tenders will first be scrutinized to determine whether they are complete and meet the essential and important requirements, conditions etc. as prescribed in the tender enquiry document. The tenders, which do not meet the basic requirements, are liable to be treated as unresponsive and shall be ignored.

20.2 The following are some of the important aspects, for which a tender may be treated to be unresponsive and shall be ignored;

a) Tender is unsigned incomplete.
b) Tender is submitted without necessary supporting papers
c) Tender validity is shorter than the required period.
d) Required EMD has not been provided/paid.
e) Bidder has not agreed to give the required performance security.
f) Bidder has not agreed to essential condition(s) specially incorporated in the tender enquiry.
g) Tender is conditional tender.

21. Minor Informality / Irregularity / Non-Conformity: If during the preliminary examination, IUCAA finds any minor informality or irregularity or non-conformity in a tender, IUCAA may waive the same, provided it does not constitute any material deviation or financial impact and, also, does not prejudice or affect the ranking order of the bidders. In case, if IUCAA conveys its observation on such 'minor' issues to the bidder by asking the bidder to respond by a specified date, and the bidder does not reply by the specified date or gives evasive reply without clarifying the point at issue in clear terms, such tender will be liable to be ignored.

If IUCAA observed, that contractor had inadvertently missed out to submit some documents asked in the technical bid form, then IUCAA may ask contractor to submit the same. IUCAA may convey its observation on such 'minor' issues to the bidder by registered/speed post/email/fax etc. asking the bidder to respond by a specified date. If the bidder does not reply by the specified date or gives evasive reply without clarifying the point at issue in clear terms, such tender shall be liable to be rejected/ignored.

22. Opening of Financial bids:

22.1 The Financial bids of all eligible, technically qualified and shortlisted bidders will be opened. The date and time of opening of financial bids shall be informed only to the shortlisted bidders.

22.2 IUCAA- reserves the right to accept the offer in full or in parts or reject summarily or partly & cancel the bid without giving any reason.

23. Bidder's capability to perform the contract:

23.1 IUCAA, through the above process of tender scrutiny and tender evaluation will determine to its satisfaction whether the bidder, whose tender has been determined as the lowest evaluated responsive tender is eligible, qualified and capable in all respects to perform the contract satisfactorily.

23.2 The above-mentioned determination will, inter alia, consider the bidder's financial, professional capabilities for satisfying all the requirements of IUCAA as incorporated in the tender document. Such determination will be based upon scrutiny and examination of all relevant data and details & supporting document submitted by the bidder in its tender as well as such other allied information as deemed appropriate by IUCAA.

24. Notification of Award: IUCAA will notify the successful bidder that its tender for construction of building, has been accepted. The notification of award shall constitute the conclusion of the contract. IUCAA will inform the successful bidder in due course by e-mail.

25. Issue of Contract: After notification of award, IUCAA will send the duly executed contract/work order to the successful bidder by email/registered/speed post etc. The successful bidder shall return a copy of the order, duly executed and dated, to IUCAA in person / by registered / speed post / courier within fifteen days of receipt of the same from IUCAA, failing which IUCAA may treat the contract to be repudiated.

26. Security Deposit (SD) : SD will be 5 % of the accepted tender value. EMD will be converted in to the SD and balance amount of SD will be recovered from first 4 RA bill in equal installments. Security Deposit will be refunded to the vendor on completion of all contractual obligations including the Defect Liability Period + 60 days.

27. Performance Guarantee / Performance Bank Guarantee: Within 21 days from the date of receipt of letter of intent/Work Order, the successful bidder shall submit a Performance Security for 3% amount of the accepted contract value. The PG shall be paid through NEFT/RTGS/PBG. Photo copy of transaction ID or UTR no. must be provided. In the event of any amendment issued to the contract, the bidder shall, within 21 days of issue of the amendment, furnish the performance guarantee of the corresponding amendment value, rendering the same valid in all respects in terms of the contract, as amended. If bidder fails to submit balance performance guarantee amount within 21 days, from the date of award of Contract / Work Order / Amendment, there shall be a penalty of Rs.5000/- per day (Rupees Five thousand only per day) up to a maximum of 5% of the WO/Contract value.

27.1 Subject to above, IUCAA will release the performance guarantee without any interest to the bidder on completion of the bidder's all contractual obligations including Defect Liability Period + 60 days.

27.2 Failure of the successful bidder in providing performance guarantee and/ or returning contract copy duly signed in terms of GCC above shall make the bidder liable for forfeiture of its EMD and, also, for further actions by IUCAA against it.

27.3 If the bidder furnishes Performance Bank Guarantee to IUCAA for an amount equal to three per cent (3%) of the total value of the contract valid up to contract period (including Defect Liability Period) + sixty days, then the amount of Performance Guarantee will be refunded. Performance Bank Guarantee must be issued by a **Nationalized Bank** in India and in the prescribed form.

27.4 In the event of any loss due to bidder's failure to fulfill its obligations in terms of the contract, the amount of the performance guarantee shall be payable to IUCAA to compensate for the same. IUCAA shall have the right to deduct full or part of the performance guarantee and shall refund the balance amount, if any, to the Agency on the termination/completion of the term of the Contract.

28. Payment:

28.1 The payment will be made as per the exact measurement basis.

28.2 The minimum running (R.A) certified bill value shall be of minimum Rs 50/- Lacs. In order to facilitate the speed of construction/electrification works IUCAA will offer 75% Adhoc payment on assessed RA bill from the contractor. The advance will be adjusted against final certification of RA bill. The final bill payment will be made within 30 days after satisfactory completion of the work and issue of Architect's and PMC certificate. All payments shall be made through RTGS/NEFT/LC.

28.3 GST will be paid as per prevailing rates & TDS, Labour, Cess & other taxes will be recovered as per prevailing rates of Income tax act.

28.4 Payment of Wages and other conditions of employment of workers should be not inferior to as stipulated in the Minimum Wages Act. All formalities and procedures prescribed under the Contract Labour Act, Minimum Wages Act and other related acts should be strictly adhered to IUCAA's responsibility as Principle Employer should be fully protected. The necessary legal registers, forms, returns, and liaison with local (concerned authorities) etc. required as per the law of the land are to be maintained by the Agency and should be made available for inspection by the Inter-University Centre for Astronomy and Astrophysics at any time. The Agency will have its workers covered under ESI, PF and other Acts as applicable from time to time at its own cost.

29. Taxes and Duties, Fees etc.: Bidder shall be entirely responsible for payment of all taxes, duties, fees, levies, applicable cess etc. during the contract period.

30. Minimum Amount of Third Party Insurance (Bidder / Agency All Risk Policy) : The Contractor shall take Contractor's All Risk (CAR) Insurance Policy / Policies so as to provide adequate insurance cover for execution of the awaited contract work for total contract value and complete contract period from the "Directorate of Insurance,Maharashtra state, Mumbai" only. Its postal address for correspondence is "264 MHADA, First Floor, Opposite Kalanagar, Bandra (East), Mumbai-400051." (Telephone Nos. 022-26438690/ 26438746 and Fax No. is 022-26438461). Similarly all workmen appointed to complete the contract work are required to be insured under workmen's compensation Insurance policy. Insurance Policy / Policies taken out from any other company will not be accepted. **The rates are inclusive of insurance charges.**

31. ESI, PF & other regulatory rules & laws: Agency has to cover his workers & staff under ESI & PF scheme and comply with local laws & statutes dealing with employment of persons necessary reports to be submitted.

32. Termination and Penalty/Liquidated Damage (LD): It shall be the primary responsibility of the contractor that work contract is executed as per terms and conditions stipulated under this contract to the complete satisfaction of IUCAA. If the completion of project is delayed beyond stipulated time period, then the penalty shall be applicable at the rate of 0.5% per week of incomplete project cost, up-to maximum of 5% of the work order value. In extreme cases, IUCAA may issue show cause notice to Agency giving 15 (fifteen) days for improvement, failing which the work contract shall be liable to be terminated along with forfeiture of the performance guarantee. Decision of IUCAA in this regard shall be treated as final and binding on the Agency. If the Agency refuses to carry out the work under this contract at any stage before the expiry of the period of contract, the work contract shall be liable to be terminated by IUCAA without giving any notice along with forfeiture of the performance guarantee. In such situations IUCAA may get the work done from any other person/firm at the risk and cost of the Agency till new contract is awarded or 60 days period whichever is earlier. An expenditure so incurred by IUCAA shall be deducted from the payments due to the Agency.

32.1 **Termination for insolvency:** If the bidder is declared by any competent authority/court as bankrupt or otherwise insolvent, the contract shall be deemed to be terminated from the date of such declaration however, such termination will not prejudice or affect the rights and remedies which have accrued and / or will accrue thereafter to IUCAA.

32.2 **Termination for convenience:** IUCAA reserves the right to terminate the contract, in whole or in part, by serving written notice to the bidder at any time during the currency of the contract. The notice shall specify that the termination is for the convenience of IUCAA. The notice shall also indicate inter alia, the extent to which the bidder's performance under the contract is terminated, and the date with effect from which such termination will become effective.

The goods and services which are complete and ready in terms of the contract for delivery and performance within thirty days after the bidder's receipt of the notice of termination may be accepted by IUCAA following the contract terms, conditions and prices. For the remaining goods and services, IUCAA may decide:

a) to get any portion of the balance completed and delivered at the contract terms, conditions and prices; and / or
b) to cancel the remaining portion of the goods and services and compensate the bidder by paying an agreed amount for the cost incurred by the bidder towards the remaining portion of the goods and services.

32.3 IUCAA, reserves the right to terminate the said contract at any time on the ground of ineffective services rendered by the agency. IUCAA will be the sole judge to determine the facts.

33. Force Majeure: Notwithstanding the provisions contained in tender document clauses, the bidder shall not be liable for imposition of any such sanction so long the delay and/or failure of the bidder in fulfilling its obligations under the contract is the result of an event of force majeure.

33.1 For purposes of this clause, force majeure means an event beyond the control of the bidder and not involving the bidder's fault or negligence and which is not foreseeable. Such events may include, but are not restricted to, acts of IUCAA either in its sovereign or contractual capacity, wars or revolutions, hostility, acts of public enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes, lockouts, and freight embargoes.

33.2 If a force majeure situation arises, the bidder shall promptly notify IUCAA in writing of such conditions and the cause thereof within twenty-one days of occurrence of such event. Unless otherwise directed by IUCAA in writing, the bidder shall continue to perform its obligations under the contract as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

33.3 If the performance in whole or in part or any obligation under this contract is prevented or delayed by any reason of force majeure for a period exceeding sixty days, either party may at its option terminate the contract without any financial repercussion on either side.

33.4 In case due to a force majeure event IUCAA is unable to fulfill its contractual commitment and responsibility, IUCAA will notify the bidder accordingly and subsequent actions taken on similar lines described in above sub-paragraphs.

34. Settlement of Disputes:

34.1 Any dispute arising out of the terms of this contract or in the interpretation of any clause herein shall be settled by mutual discussion between the nominated authorities of IUCAA and the Agency or their authorized representatives. The Director of IUCAA will be the final authority in resolving such disputes.

34.2 In the event of a dispute or difference which cannot be resolved by mediation, the same shall be referred to an Arbitration Tribunal consisting of three members. Either party shall give notice to the other regarding its decision to refer the matter to arbitration. Within 30 days of such notice, one Arbitrator shall be nominated by each party and the Umpire Arbitrator shall be nominated by agreement between the parties to this agreement. The venue of the arbitration will be Pune. Subject to the aforesaid, the Arbitration and Conciliation Act, 1996 with amendments and the rules there under and any statutory modification thereof for the time being in force shall apply to the Arbitration proceedings.

35. **Governing language:** The contract shall be written in English language following the provision as contained in tender document. All correspondence and other documents pertaining to the contract, which the parties exchange, shall also be written accordingly in English language.

36. **Applicable Law:** The contract shall be interpreted in accordance with the laws of India.

37. **Contacting IUCAA Authorities:** No bidder shall contact any of the IUCAA authorities on any matter relating to their bid, from the time of the opening of the bids to the time the contract is awarded.

38. **Committee Duly Constituted by IUCAA Reserves the Right to Accept any Bid and to Reject Any or All Bids**: A committee duly constituted by I U C A A reserves the right to reject, accept or prefer any bid and to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the ground for its actions and decisions. IUCAA also reserves the right to accept any bid in part or split the contract between two or more bidders.

SECTION -III

SCOPE OF WORK & SITE CONDITION

Name of work: -	**"I**nternal and External Electrical work of New IUCAA-2 Building at IUCAA Pune**."**
Location	The site is located in IUCAA Campus, in Savitribai Phule Pune University, Pune. 411007
Nos. of Floors	Lower Ground +4
Approximate Built-up Area	Area = 70000 Sq. Feet

SECTION-IV

GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF BIDDERS (FORM B-2)

ITEM RATE TENDER AND CONTRACT FOR WORKS

ESTATE DEPARTMENT
IUCAA, PUNE – 7

Name of Work: "Internal and External Electrical Work of Extension of Gym Building and New Creche Building at IUCAA Pune."

GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS.

1. All works proposed to be executed by contract shall be notified in a B-2 (Item rate) form of invitation to tender pasted on a board hung up in the office IUCAA, Pune - 7.

   This form will state the work to be carried out as well as the date for submitting and opening tenders, and the time allowed for carrying out the work, also the amount of theearnest money to be deposited with the tender and the amount of security deposit to be deposited by the successful tenderer, and the percentage, if any, to be deducted from bills. It will also state whether a refund of a quarry fees, royalties, dues and ground rents will be granted. Copies of the specifications, designs and drawings, estimated rates, scheduled rates and any other documents required in connection with the work shall be signed by the IUCAA for the purpose of identification and shall also be open for inspection to contractors at the office of the Estate Manager office during office hours.

   Where the works are proposed to be executed according to the specifications recommended to a contractor and approved by a competent authority on behalf of the IUCAA, Pune such specifications with designs and drawings shall form part of the accepted tender.

2. In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof, and in the event of the absence of any partner, it shall be signed his behalf by a person holding a **power of attorney** authorizing him to do so.

3. The IUCAA authority competent to dispose of the tender shall have the right of rejecting all or any of the tender.

4. No receipt for any payment, alleged to have been made by a contractor in regard to anymatter relating to his tender or the contract, shall be valid and binding on IUCAA of Pune unless it is signed by the Estate Manager.

5. All works shall be measured net by standard measures and according to the rules and customs of the Public Works Department and their rates shall be without references to any local custom.

6. Under no circumstances shall any contractor be entitled to claim enhanced rates for anyitems in this contract.

7. Every registered contractor should produce along with his tender certificate of registration as approved contractor in the appropriate class, amount showing limit and renewal of such registration with date of expiry.

8. All corrections and additions or pasted slips should be initialed.

9. The measurements of work will be taken according to the usual methods as in use in P.W.D. Red Book / I.S. Codes and no proposals to adopt alternative methods will be accepted. The Engineer-in-charge decision as to what is the usual method in use in the Department will be final.

10. Successful tenderer will have to produce PAN-Card, GST certificate issued by Income Tax Department otherwise their R.A. Bills will not be paid by the IUCAA, Pune

11. The contractor will have to construct shade for storing controlled and valuable materials brought by the contractor at the work site, having double locking arrangements at contractor's cost. The materials will be taken for use in the presence ofthe departmental person. No material will be allowed to be removed from the site of works.

12. The contractor will have to make his own security arrangement for the protection of material and the equipment. The owner security arrangement for the protection of material and the equipment. The owner /IUCAA will be not responsible for any theft.

13. The successful tenderer will have to produce to the satisfaction of the accepting authority a valid and current license issued in his favor under the provision of Contract Labour (Regulation and Abolition Act, 1973) before starting work, failing which earnest money will be forfeited by IUCAA.

14. The contractor shall comply with the provision of the Apprentice Act 1961 and rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and Director/Engineer-in-charge may in his discretion cancel the contract. The contractor shall also be liable, for any pecuniary liability arising on account of any violation by him of the provisions of the said Act

CONDITIONS FOR COVID & MALARIA ERADICATION ANTI MALARIA AND OTHER HEALTH MEASURES

a. The anti-malaria and other health measures shall be as directed by the Joint Director (Malaria and Filarial) of Health Services, Pune.
b. The contractor shall see that mosquito-genic conditions are not created so as keep vector population to minimum level.
c. The Contractor shall carry out anti –malaria measures in the area as per guidelines prescribed under National Malaria Eradication Programme and as directed by the Joint Director (Malaria and Filarial) of Health Services, Pune.
d. In case of default in caring out prescribed anti-malaria measures resulting in increase in malaria incidence, contractor shall be liable to pay to IUCAA the amount spent by the IUCAA on anti-malaria measures to control the situationin addition to fine.
e. Contractor is expected to follow all guidelines of measures towards COVID prevention as per State and Central government guidelines, to be included in the quoted rates. No extra charges will be paid towards above measures.

RELATION WITH PUBLIC AUTHORITIES.

The contractor shall make sufficient arrangements for draining away the sewerage water as well as water coming from the bathing and washing places and shall dispose off this water in such a way as not to cause any nuisance. He shall also keep the premises clean by employing sufficient number of sweepers. The contractor shall comply with rules, regulations, bye-laws and directions given from time to time by any local or public authority in connection with this work and shall pay fees or charges which are livable on him without any extra cost to IUCAA. (Government of Maharashtra P.W.D. Resolution No. CAT – 1086/CR-243/D/Bldg. 2 Mantralaya, Mumbai. Dated 11-9-1987).

QUALITY ASSURANCE AND MAINTENANCE

To ensure the specified quality of work which shall also include necessary surveys, temporary works etc., and the contractor shall prepare a quality assurance plan and get thesame approved from the **Engineer-in-charge** within eight days from the date of work order.For this, contractor shall submit an organization chart of his technical personnel to be deployed on the work along with their qualification, job descriptions defining the functions of reporting, supervising inspecting and approving. The contractor shall also submit a list of tools, equipment's and the machinery and instrumentation which he proposes to use for the construction and for testing in the field and/or in the laboratory and monitoring. The contractor shall modify/supplement the organization chart and the list of machinery, equipment etc. as perthe direction of the Engineer-in-charge and shall deploy the personnel and equipment on the field as per the approved chart and list respectively. The contractor shall submit written methodstatements detailing his exact proposals of execution of the work in accordance with the specifications. He shall get these approved from the **Engineer-in-charge**. The quality of the work shall be properly documented through certificates, records, check-lists and logbooks of results etc. Such records shall be compiled from the beginning of the work and be continuously updated and supplemented and this shall be the responsibility of the contractor. The forms should be got approved from the **Engineer-in-charge**.

The contractor shall prepare detailed completion drawings after completion of thework. He shall also prepare and submit a maintenance manual giving procedure for maintenance, with the period of maintenance works including inspections, tools and equipmentto be used, means of accessibility for all parts of the structure. He shall also include in the manual, the specifications for maintenance work that would be appropriate for his design and technique of construction. This manual shall be submitted within the contract period.

SECTION-V
TECHNICAL SPECIFICATIONS

INDEX

ELECTRIC POWER DISTRIBUTION AND WIRING :

1 **Introduction**
The electric power will be received and distributed in a building, through following means:-

(i) Cabling and switchgear to receive power.
The building is divided into convenient number of parts, each part served by a rising main system to distribute power vertically/horizontally.

(ii) Power flows from rising main through tap-off box to floor main board to final DBs and then to wiring.

(iii) Dedicated circuit for different loads such as lighting, HVAC, power plug loads shall be provided, wherever possible.

(iv) Rising main, which takes care of general lighting and power outlet load of the building, should have independent cables for lighting as well as power, wherever possible. Other loads like lifts, water pump sets, other motor loads are fed by independent cables of suitable capacity fed from properly designed essential/ nonessential LT power panels with suitably designed switchgear having necessary control and safely features.

(v) Therefore the distribution/wiring system essentially consists of provision of cables, switchgear, rising main, bus-ducting, earthing, laying of pipes/ conduits etc. (in surface or recess) based on proper detailed designing to decide on various sizes/capacities of these components and various controls and safeties involved, to provide an efficient, reliable, safe and adequate electrical distribution and wiring system.

(vi) A typical schematic diagram of power distribution of a building is enclosed. (See Fig. 3)

2. System of Distribution and Wiring.
(i) The wiring shall be done from a distribution system through main and/or branch distribution boards. The system design and location of boards will be properly worked out.

(ii) Each main distribution board and branch distribution board shall be controlled by an incoming circuit breaker/linked switch with fuse. Each outgoing circuit shall be controlled by a circuit breaker/switch with fuse.

(iii) For non-residential and residential buildings as far as possible DBs shall be separate for light and power.

(iv) Only MCCB/MCB/HRC fuse type DBs shall be used. Rewirable type fuses shall not be used.
(v) Three phase DBs shall not be used for final circuit distribution as far as possible.

(vi) 'Power' wiring shall be kept separate and distinct from light wiring, from the level of circuits, i.e., beyond the branch distribution boards. Conduits for light/power wiring shall be separate.

(vii) Essential/non-essential/UPS distribution each will have a completely independent and separate

distribution system starting from the main, switchboard up to final wiring for each system. As for example, conduit carrying non-essential wiring shall not have essential or UPS wiring. Wiring for essential and UPS supply will have their own conduit system. No mixing of wiring is allowed.
(viii) Generally, no switchboard will have more than one source of incoming supply. More than one incoming supply will be allowed only at main board with proper safety and interlocking so that only one source can be switched on at a time.

(ix) Each MDB/DB/Switch Board will have reasonable spare outgoing ways for future expansion.

(x) Balancing of 3-phase circuit shall be done.

3. Wiring

3.1 ***Submain & Circuit Wiring***
(a) ***Submain Wiring:***
Submain wiring shall mean the wiring from one main/distribution switchboard to another.

(b) ***Circuit Wiring***
Circuit wiring shall mean the wiring from the distribution board to the 1st tapping point inside the switch box, from where point wiring starts.

3.2 ***Measurement of Submain and Circuit Wiring:***
(i) 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 may be, exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.

(ii) The length of circuit wiring with two wires shall be measured from the distribution board to the 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.

(iii) 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.

(iv) Protective (loop earthing) conductors, which are run along the circuit wiring and the submain 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.

3.3 ***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.

3.4 Point Wiring
3.4.1 ***Definition***
A point (other than socket outlet point) shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB.

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

(c) Back plate (in the case of stiff pendants).
(d) Lamp holder (in the case of goose neck type wall brackets, batten holders and fittings which are not prewired).

3.4.2 ***Scope***
Following shall be deemed to be included in point wiring:
(a) Conduit/channel as the case may be, accessories for the same and wiring cables between the switch box and the point outlet, loop protective earthing of each fan/light fixture.

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

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

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

(e)) Control switch or MCB, as specified.

(f) 3 pin or 6 pin socket, ceiling rose or connector as required. (2 pin and 5 pin socket outlet shall not be permitted.)
(g) Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.

(h) Bushed conduit or porcelain tubing where wiring cables pass through wall etc.
(**Note*:*** In areas where false ceiling are provided, termination of wires should be at the fittings. Flexible conduits from ceiling junction box to the fittings shall be provided duly coupled at both ends. This shall be included within the scope of point wiring.)

(i) Interconnecting wiring between switches within the switch box on the same circuit.

3.4.3 ***Measurement***
(a) ***Point Wiring (other than socket outlet points)***

(i) Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting, and classified as laid down in 3.4.4.

3.4.4 ***Classification***
Points measured under 3.4.3 on unit basis shall be classified as under according to the type of building:

(a) ***Residential Buildings***
(i) Group ‘A’, for point wiring for type I, type II and type III residential quarters and hostels.
(ii) Group ‘B’, for point wiring for type IV and above type of residential quarters and barracks.

(b) ***Non-residential Buildings***
Group ‘C’ for all types of non-residential buildings such as offices, hospitals, laboratories, educational institutions, libraries etc.

(c) ***For any Other Type of Building***
The group under which the points are to be classified shall be decided by the concerned Chief Engineer (Elect.).

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

(ii) The metal/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.

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

3.4.6 ***Group Control Point Wiring***
(i) 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 switch to the first point outlet as one point and classified according to 3.4.4, and (b) for the subsequent points, the distance from that outlet to the next one and so on, shall be treated as separate point(s) and classified according to 3.4.4.

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

3.4.7 ***Twin Control Light Point Wiring***

(i) A light point controlled by two numbers of two way switches shall be measured as
two points from the fitting to the switches on either side and classified according to 3.4.4.

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

3.4.8 ***Multiple Controlled Call Bell Point Wiring:***

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

(a) from the call bell outlet to one of the nearest ceiling roses meant for connection to bell push, treated as one point and classified according to 3.4.4, and

(b) from that ceiling rose to the next one and so on, shall be treated as separate point(s) and classified according to 3.4.4.

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

3.5 Wiring System:

(i) 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 1st point shall be done in the switch box; and neutral/earth looping of subsequent points will be made from point outlets.

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

(iii) The wiring throughout the installation shall be such that there is no break in the neutral wire except

in the form of linked switchgear.

(iv) Light, fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power outlets shall be wired in the 'power' circuits. 5A/6A socket outlets shall also be wired in the 'power' circuit both in residential as well as nonresidential buildings.

(v) *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.

(vi) *Termination of Circuit into Switchboard*
Circuit will consist of phase/neutral/earth wire. Circuit will terminate in a switch board
(first tapping point, where from point wiring starts) 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.

3.6 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 aluminum/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.

3.7 Passing through Walls or Floors:
(i) When wiring cables are to pass through a wall, these shall be taken through a protection (steel/ PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either porcelain, PVC or other approved material.

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

3.8 Joints in Wiring:
(i) No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.

(ii) There shall be no joints in the through-runs of cables. If the length of final circuit or submain is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.
(iii) Termination of multistranded conductors shall be done using suitable crimping type thimbles.

3.9 Ratings of Outlets
(to be adopted for design).

(i) Incandescent lamps in residential and non-residential buildings shall be rated at 60W and 100W respectively.

(ii) Ceiling fans shall be rated at 60W. Exhaust fans, fluorescent tubes, compact fluorescent tubes, HPMV lamps, HPSV lamps etc. shall be rated according to their capacity. Control gear loses shall be also considered as applicable.

(iii) 6A and 16A socket outlet points shall be rated at 100W and 1000W respectively, unless the actual values of loads are specified.

3.10 Capacity of Circuits
(i) Lighting circuit shall feed light/fan/ call bell points. Each circuit shall not have more than 800 Watt connected load or more than 10 points whichever is less. 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 1 KW 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 fl oor, 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.

3.11 Socket Outlets
(i) Socket outlets modular type shall be 6A 3 pin, 16 Amp 3 pin or 16/6 Amp 6 pin. 5pin 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.

(ii) 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.

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

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

(v) 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.

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

(a) ***Non-residential buildings*** – 23 cm above floor level.

(b) ***Kitchen*** – 23 cm above working platform and away from the likely positions of stove and sink.

(c) ***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.

(d) ***Rooms in residences:*** – 23 cm above floor level, or any other level in special cases as desired by the Engineer-in-charge / IUCAA authorities.

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

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

(ii) Minimum size of wiring:
Light Wiring : 1.5 sq.mm.
Power Wiring : 4.0 sq.mm.
Power circuit rated : More than 1 KW, Size as per calculation.

(iii) Insulation : Copper conductor cable shall be PVC insulated FRLSH conforming to BIS Specification.

(iv) Multi stranded : Cables are permitted to be used.

3.13 Flexible Cable
(i) Conductor of flexible cables shall be of copper. The cross sectional area of conductor for flexible cable shall be as per design.

(ii) Only 3 core flexible cables shall be used for connecting single-phase appliances.

(iii) Unless the flexible cables are mechanically protected by armour, or tough rubber, or PVC sheath, these shall not be used in workshops and other places where they are liable to mechanical damage.

(iv) Flexible cable connection to bell push from ceiling rose shall be taken through steel conduit/metallic casing and capping.

3.14 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) (a) In type I, II & III quarters, Barracks & school buildings (except principal's & staff rooms) etc. modular type switches shall be provided (unless specifically asked for by the user department / Architect.)

(b) Modular type switches to be provided for remaining types of buildings i.e. in all types of remaining non-residential buildings & residential buildings of type IV & above & Transit hostel or as may be decided by the Architect/ user department. (**Note**: Provision is meant for new constructions and in existing buildings during rewiring if the building work renovation is also in progress in the area. Otherwise existing type of modular switches will be continued.)

(iii) It is recommended to provide double pole MCB in proper enclosure as power outlet 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).
(ii) Switch box also can be of non-metallic material. The technical sanctioning authority will approve specified makes of reputed quality and specifications.

(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 3 mm 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) ***Fittings:***
Types **:** The type of fittings shall be as specified in tender documents.
Indoor Type Fittings
(i) Where conductors are required to be drawn through tube or channel leading to the fitting, the tube or channel must be free from sharp angles or projecting edge, and of such size as will enable them to be wired with the conductors used for the final circuit without removing the braiding or sheathing. As far as possible all such tubes or channels should be of sufficient size to permit
looping back.

(ii) Wires used within prewired fittings shall be flexible with PVC insulation and 14/0.193 mm (minimum) copper conductors. The leads shall be terminated on built-in-terminal block, ceiling rose or connector, as required.

(iii) Fittings using discharge lamps shall be complete with power factor correction capacitors, either integrally or externally. An earth terminal with suitable marking shall be provided for each fitting for discharge lamps.

(iv) Fittings shall be installed such that the lamp is at a height of 2.4m above floor level, unless otherwise directed by the Engineer-in-charge.

(v) Fittings made of CRCA shall be phosphatized and powder/epoxy painted.

For coastal areas and humid area like toilets, kitchen, for prolonging the life of such fittings, corrosion free materials like engineering plastic, aluminum, stainless steel etc. should be used.
Outdoor Fittings Outdoor fittings shall have suitable IP protection. It is preferable that street light fittings are of cast aluminum body of IP 65, for reducing recurring maintenance cost and improved performance. Where required IP 66 fittings also can be provided for reducing maintenance frequency and cost. Other fittings, which are not available with tested IP 65/54 protection, can be properly fabricated with weatherproof features, proper gasketing etc. As far as
possible corrosion free material like cast aluminum, stainless steel, engineering plastics may be used for fabrication of such fittings, to prolong life of such fittings. There should not be any exposed wiring in such outdoor fittings.

3.15 Attachment of Fittings and Accessories
(a) ***Conduit Wiring System***
(i) All accessories like switches, socket outlets, call bell pushes and regulators shall be fixed in flush pattern inside the switch/regulator boxes. Accessories like ceiling roses, brackets, batten holders etc. shall be fixed on outlet boxes. The fan regulators may also be fixed on outlet boxes, if so directed by the Engineer-in-charge.

(ii) Aluminum alloy or cadmium plated iron screws shall be used to fix the accessories to their bases.

(iii) The switch box/regulator box shall normally be mounted with their bottom 1.25 m from Floor level, unless otherwise directed by the Engineer-in-charge.

(b) ***Fixing to Walls and Ceiling***
(i) Wooden plugs for fixing to wall/ceiling will not be allowed. Fixing will be done with the help of PVC sleeves/Rowel plugs/ dash fasteners as required.

(ii) Drilling of holes shall be done by drilling machines only. No manual drilling of hole will be allowed.

3.16 Fans, Regulators and Clamps:
(a) ***Ceiling Fans:*** (i) Ceiling fans including their suspension shall conform to relevant Indian Standards.

(ii) The capacity of a ceiling fan to meet the requirement of a room with the longer dimension D meters should be about 55 D m3/min.

(iii) The height of fan blades above the floor should be (3H + W)/4, where H is the height of the room, and W is the height of the work plane.

(iv) The minimum distance between fan blades and the ceiling should be about 0.3 meters.

(v) When actual ventilated zone does not cover the entire room area, then optimum size of ceiling fan should be chosen based on the actual usable area of the room, rather than the total floor area of the room.

(vi) The number of fans and the optimum sizes for rooms of different dimensions are given in the following table:

Room Width	*Room Length*										
m	*4m*	*5m*	*6m*	*7m*	*8m*	*9m*	*10m*	*11m*	*12m*	*14m*	*16m*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
3	1200/1	1400/1	1500/1	1050/2	1200/2	1400/2	1400/2	1400/2	1200/3	1400/3	1400/3
4	1200/1	1400/1	1200/2	1200/2	1200/2	1400/2	1400/2	1500/2	1200/3	1400/3	1500/3
5	1400/1	1400/1	1400/2	1400/2	1400/2	1400/2	1400/2	1500/2	1400/3	1400/3	1500/3
6	1200/2	1400/2	900/4	1050/4	1200/4	1400/4	1400/4	1500/4	1200/6	1400/6	1500/6
7	1200/2	1400/2	1050/4	1050/4	1200/4	1400/4	1400/4	1500/4	1200/6	1400/6	1500/6
8	1200/2	1400/2	1200/4	1200/4	1200/4	1400/4	1400/4	1500/4	1200/6	1400/6	1500/6
9	1400/2	1400/2	1400/4	1400/4	1400/4	1400/4	1400/4	1500/4	1400/6	1400/6	1500/6
10	1400/2	1400/2	1400/4	1400/4	1400/4	1400/4	1400/4	1500/4	1400/6	1400/6	1500/6
11	1500/2	1500/2	1500/4	1500/4	1500/4	1500/4	1500/4	1500/4	1500/6	1500/6	1500/6
12	1200/3	1400/3	1200/6	1200/6	1200/6	1400/6	1400/6	1500/6	1200/7	1400/9	1400/9
13	1400/3	1400/3	1200/6	1200/6	1200/6	1400/6	1400/6	1500/6	1400/9	1400/9	1500/9
14	1400/3	1400/3	1400/6	1400/6	1400/6	1400/6	1400/6	1500/6	1400/9	1400/9	1500/9

Note : This table is indicative only. Case specific design should be done by field officers based on site conditions & constraints.

(vii) Energy Efficient fans with 28 watt, BEE 5 star rating or complying with IS 374: 1979,shall be used. The minimum service value of fans shall be 3.5 m3/min/W and air delivery 230 m3/min. The values of service factor and air delivery for ceiling fans with 1200 mm sweep are given in the table below:

Star Rating Index Calculation for Ceiling Fans (1200 mm sweep)

Star Rating	*Service Value for Ceiling Fans**
1 Star	≥ 3.2 to < 3.4
2 Star	≥ 3.4 to < 3.6
3 Star	≥ 3.6 to < 3.8
4 Star	≥ 3.8 to < 4.0
5 Star	≥ 4.0

* Where x is the base service value as per IS 374 : 1979. BEE has proposed a base service value of 3.2 at present and would upgrade it to higher value once the BIS value is finalised.
* The BIS has proposed from the year 2010 the service value of 3.5.
* All ceiling fans covered under this standard shall comply with 28 watt, minimum air delivery of 230 m3/min.

(viii) Step Type Electronic regulators should be used instead of resistance type regulators for controlling speed of fans.

(ix) All ceiling fans shall be wired to ceiling roses or to special connector boxes, and suspended from hooks or shackles, with insulators between hooks and suspension rods. There shall be no joint in the suspension rod.

(x) For wooden or steel joists and beams, the suspension shall consist of GI flat of size not less than 40 mm x 6 mm, secured on the sides of the joists or beams by means of two coach screws of size not less than 5 cm for each flat. Where there is space above the beam, a through-bolt of size not less than 1.5 cm dia, shall be placed above the beam from which the flats are suspended. In the latter case, the flats shall be secured from movements by means of another bolt and nut at the bottom of the beam. A hook consisting of MS rod of size not less than 1.5 cm dia shall be inserted between the MS flat through oval holes on their sides. Alternatively, the flats may be bent inwards to hold tightly between them by means of a bolt and nut, a hook of 'S' form**.**

(xi) In the case of 'I' beams, flats shall be shaped suitably to catch the flanges and shall be held together by means of a long bolt and nut.

(xii) For concrete roofs, a 12 mm dia. MS rod in the shape of 'U' with their vertical legs bent horizontally at the top at least 19 cm on either side, and bound to the top reinforcement of the roof shall be used.

(xiii) In buildings with concrete roofs having a low ceiling height, where the fan clamp mentioned under sub-clause (v) above cannot be used, or wherever specified, recessed type fan clamp inside metallic box.

(xiv)) Canopies on top of suspension rod shall effectively hide the suspension.

(xv) The leading in wire shall be of nominal cross sectional area not less than 1.5 sq. mm. FRLSH and shall be protected from abrasion.

(xvi) Unless otherwise specified, all ceiling fans shall be hung 2.75 m above the floor.

(xvii) In the case of measurement of extra down rod for ceiling fan including wiring, the same shall be measured in units of 10 cm. Any length less than 5 cm shall be ignored.

(xviii)) The wiring of extra down rod shall be paid as supplying and drawing cable in existing conduit.

(b) ***Exhaust Fans:***

(i) Exhaust fans shall conform to relevant Indian Standards.

(ii) Exhaust fans shall be erected at the places indicated by the Engineer-in charge. For fixing an exhaust fan, a circular opening shall be provided in the wall to suit the size of the frame, which shall be fixed by means of rag bolts embedded in the wall. The hole shall be neatly plastered to the original finish of the wall. The exhaust fan shall be connected to the exhaust fan point, which shall be wired as near to the opening as possible, by means of a flexible cord, care being taken to see that the blades rotate in the proper direction.

(iii) Exhaust fans for installation in corrosive atmosphere, shall be painted with special PVC paint or chlorinated rubber paint.
(iv) Installation of exhaust fans in kitchens, dark rooms and such other special locations need careful consideration; any special provisions needed shall be specified.

(c) ***Regulators***
The metallic body of regulators of ceiling fans/exhaust fans shall be connected to earth by protective conductor.

3.17 Marking of Switch Boards
(i) ***Schematic Diagram***
First a comprehensive schematic diagram for each building is to be prepared, starting from Main LT Panel, rising main, submain boards, DBs, etc. and the manner in which they are connected. This will include essential, non-essential and UPS systems. Sizes of interconnecting main/ submain cables shall be indicated.

(ii) ***Marking of each Main Board***
Each main board/submain board shall be marked indicating rating of each incoming/outgoing switch and the details of load/area it feeds. Detail/size of incoming and outgoing cable also shall be marked indicating from where the incoming cable has originated.

(iii) ***Marking of Distribution Board***
Each Distribution Board shall be marked indicating detail of incoming switch (Size of cable and from where it is fed) and marking of each outgoing MCB indicating the area it feeds. Suitable marking sticker will be suitably fixed to indicate such details.

(iv) ***Marking of Power/Light DBs***
Power/light DBs shall be marked 'P' and 'L' respectively.

(v) ***Marking for Non-essential/Essential/UPS/Switch Boards***
Each switchboard shall be marked essential/non-essential/UPS to indicate the nature of such switchboards.

(vi) ***Marking of Main Earthing Terminal***
Main earthing terminals in main/submain switchboard shall be permanently marked, as "Safety Earth – Don't Remove".

3.18 LT Distribution Switchgear
Only following type switchboards will be used:
(a)) Main/Submain switchboard of cubicle type.

(b) DBs – Conventional DBs of reputed makes can also be used with the approval of technical sanctioning authority in addition to prewired DB.
(c) Specially designed switchboards. Also specially designed switchboards can be used with detailed specification and fabrication drawings approved by the technical sanctioning authority.
(d) Specifications of cubicle panel and pre-wired DB are given in Clause 7.1.2 of Chapter 7.

3.19 Location of Switchboards:

(i) Switchboards are to be located in common areas like corridors, lobby etc. and not to be located in locked room.

(ii) Switchboard shall be located only in dry situation and in well-ventilated space. They shall not be placed in the vicinity of storage battery or exposed to chemical fume.

(iii) Switchboards shall not be erected above gas stove, or sinks or within 2.5 meter of any washing unit in washing rooms of launderings or in the bath rooms, toilets, or kitchen.

(iv) As far as possible main boards shall not be located in basement. Such main boards can be located in ground floor.

(v) It is preferable to locate floor main boards in rising main shafts of adequate size, with steel doors (having ventilation) or in suitable room.

(vi) Similarly DBs can be in suitable places in corridor walls having double doors.

(vii) Locating main boards under staircase or standing open in corridor is not a desirable practice, besides being highly unaesthetic.

(viii) The main switchboard, which receives power to the building, should be invariably located in a switch room, having round the clock access, for emergency attendance to the switchboard.

3.20 Guidelines for Planning Residential Areas

(i) ***U.G. System of Power Distribution, Street Lighting, Telephone Cabling and TV Cabling***

For long-term economical maintenance, better reliability of service, safety, protection against heavy rains, storm, wind etc. and aesthetics, under ground cable system will be generally followed. Also considering the high cost of land, under ground system results in better economic utilization of land area, otherwise substantial land route has to be earmarked for overhead lines.

(ii) Efficient working of street lights and staircase lighting is required for security of the colony and safety and convenience of the residents. Therefore adequate street lighting, staircase lighting is to be provided. Generally back lanes of residential blocks remain dark. Such areas are also to be covered by basic street lighting for security.

(iii) ***Kitchen***

(i) Exhaust fans opening with one point outlet to be provided irrespective of yardstick of provision of exhaust fans.

(ii) In addition to one 16 A 6-pin power outlet for kitchen, one 3 pin 6 Amp. Outlet to be provided for water filter.

(iv) ***Washing Machine***

Location to be finalized in consultation with the Architect. A power outlet plus water supply/drainage to be coordinated with Architect/Electrical Engineer.

(v) ***Meter Board***

(For a Block of Quarters)

Generally for a block of quarters of 2/3/4 storied, electric supply for each block is received in a meter board, where a cubicle meter panel is provided with system of power distribution to each quarter.

At present such meter boards are invariably located under staircase. This is not a desirable practice from technical/aesthetic viewpoint. It is technically desirable to coordinate with Architect to provide separate meter room for each block of quarters or a number of blocks.

(vi) ***Stair Case Lighting***

Stair case lighting is to be treated as an extension of street lighting, for security and convenience of the residents. LED (1 x 7 Watt) type stair case lighting may be provided to reduce load. As for example, need of 200 quarters can be met with 100 LED fitting (each of 10 watt), with connected load of 1.5 KW only. Incandescent stair case lighting and bulk head fittings should not be provided, in view of excessive energy consumption and low burning hours.

(vii) ***Emergency Electric Supply***

For ensuring essential water supply and security lighting, a D.G. set to be provided for each colony to take care of water supply pump set, street lighting and essential load requirement of buildings.

(viii) ***Fittings***
Subject to limit of yardstick of fittings for various types of quarters following guidelines to be provided:
(i) Every room to be provided with one fluorescent fitting for energy saving.
(ii) Kitchen to be provided with a fluorescent fitting, tapped from a batten holder (through an adopter), so that in case of need batten holder can be used with bulbs.
(iii) Incandescent bulkhead fittings not to be used.
(iv) Quality fittings of reputed make to be used.

(ix) ***Main Board of Each Quarter***
It shall be MCB type with provision of ELCB with the incoming MCB. It shall be located in a notch with ventilated door cover, in the room connecting to the entry of the quarter. MCB DB shall be pre-wired type, for trouble free service.

(x) ***Corrosion Free Fittings***
Coastal areas and humid areas like kitchen, toilet are subject to corrosion, which substantially reduces the useful life of such fittings, besides giving an ugly look on account of rusting.
Therefore for coastal areas, and other humid areas corrosion free type of fittings (like aluminum, stainless steel, engineering plastic) should be used, for ensuring long life of such fittings and to achieve life cycle economy, after taking into account recurring expenditure on account of painting of fittings.

(xi) ***Telephone Wiring***
Telephone wiring is to be provided for each office room/quarter. One outlet up to type III quarters, two outlets up to type IV quarters and three outlets above type IV quarters. Such telephone wiring to be brought to a tag-block at a suitable point in ground floor. Provisions shall be kept for suitable entry-pipe for laying incoming telephone cable.

(xii) ***TV Cabling***
Internal TV cabling shall be provided, with two outlets up to type III quarters and three outlets for type IV quarters and above. Similarly, from suitable point at ground floor, TV cabling shall be provided. With use of suitable splitters, such TV cabling to be connected to each quarter.

(xiii) ***Lighting for Parks***
Colonies are provided with parks. Such parks should be provided with adequate lights to include area lights, pathway lights etc. so that the parks can be effectively used by the residents and they remain secure during night time.

(xiv) ***External Pipe Network for Laying Telephone and TV Cabling for the Colony***
Starting from a suitable room, pipe network may be provided to lay telephones/TV cables for the colony. Suitable road cross pipe and manholes to be provided for drawing such cables and their maintenance.

(xv) ***Preliminary Estimate to Take Care of Telephone/TV Cabling in a Colony***
At present, such services are provided in a very crude manner making use of existing poles and hanging cables. Apart from making colonies shabby, such services are subject to damages and unsatisfactory service. Therefore preliminary estimate should provide for such TV/Telephone cabling for the colony.

(xvi) ***Other Allied Services***
Modern residential colonies require support services like CCTV (for Gate and house security), intercom system, basic security system etc. for the safety and convenience of the residents. Therefore, preliminary estimate should provide for basic provisions for such safety/security systems. Most of these services pay for themselves within 3 / 4 years of installation, besides providing security, which sometimes amount to life saving instances.

3.21 Guidelines for Planning Office Buildings

(i) The main objective is to avoid possible fire hazards, which calls for sound detailed designing and use of quality equipments and materials executed with sound workmanship and supervision.

(ii) All control LT Panels, controlling power supply to the entire building will be located in a centralized room, from where centralized control and monitoring of the entire power supply system can be made.

(iii) Earth fault protection shall be provided for each individual building at the LT receiving point i.e. Main LT Panel. ELCB shall be provided as a matter of routine in distribution boards.

(iv) Office buildings are prone to fire hazard during night hours. Therefore, after office hours, all the LT Panels should be switched off. Based on need of the building, only the specified LT panel to be kept 'ON' which feed the loads during night hours. Such panel, called common service panel, may feed following loads, which are normally used after office hours:-

(a)) Some specified lifts.

(b) Staircase/ Corridor/ Compound light.

(c) Fire protection loads.

(d) Pump Sets.

(e) Other loads which are kept 'ON' after office hours.

NON-METALLIC CONDUIT WIRING SYSTEM :

4.1 Scope

This chapter covers the detailed requirements for wiring work in non-metallic conduits.

This chapter covers both surface and recessed types of wiring work.

4.2 Application

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

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

4.2.3 ***Special Precautions***

(i) If the pipes are liable to mechanical damages, they should be adequately protected.

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

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

(b) In places where ambient temperature is less than 5 degrees Cent.

(c) For suspension of fluorescent fittings and other fixtures.

(d) In areas exposed to sunlight.

4.2 Materials

4.2.1 ***Conduits***

(i) All non-metallic conduit pipes and accessories shall be of suitable material complying with IS 2509 : 1973 and IS 3419 : 1989 for rigid conduits and IS 9537 (Part 5) : 2000 for flexible conduits. The interior of the 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 III.

(iii) No non-metallic conduit less than 20 mm in diameter shall be not used.

(iv) ***Wiring Capacity:***

The maximum number of PVC FRLSH insulated copper conductor cables of 650/1100 V grade conforming to IS 694 : 1990 that can be drawn in one conduit of various sizes is given in **Table I** under

clause 4.2.1 (ii). Conduit sizes shall be selected accordingly.

4.2.2 ***Conduit Accessories:***
(i) The conduit wiring system shall be complete in all respect including accessories.

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

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

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

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

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

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

4.2.3 ***Outlets:***

(i) The switch box shall be made of either rigid PVC molding, or mild steel, or cast iron on all sides except at the front. The regulator boxes shall however be made only of mild steel or cast iron.

(ii) PVC boxes shall comply with the requirements laid down in IS 14772 : 2000. These boxes shall be free from burrs, fins and internal roughness. The thickness of the walls and base of PVC boxes shall not be less than 2 mm. The clear depth of PVC boxes shall not be less than 60 m.

(iii) The specifications for metallic boxes shall be as per requirements of clause 4.2.3.

(iv) 3 mm thick phenolic laminated sheet covers for all types of boxes shall be as per requirements of clause 3.14(c).

5. Installation:

5.1 ***Common Aspects for Both Recessed and Surface Conduit Works:***
(i) The erection of conduits of each circuit shall be completed before the cables are drawn in.
(ii) *Conduit Joints*
(a) All joints shall be sealed/cemented with approved cement. Damaged conduit pipes/fittings shall not be used in the work. Cut ends of conduit pipes shall have neither sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

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

(iii) ***Bends in Conduit :***

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

(b) Radius of bends in conduit pipes shall not be less than 7.5 cm. No length of conduit shall have more

than the equivalent of four quarter bends from outlet to outlet.

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

(iv) ***Outlets:*** All switches, plugs, fan regulators etc. shall be fitted in flush pattern. The fan regulators can be mounted on the switch box covers, if so stipulated in the tender specifications, or if so directed by the Engineer-in-charge.

(v) ***Painting***
After installation, all accessible surfaces of metallic accessories shall be painted.

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

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

(iii) If the conduit pipes are liable to mechanical damage, they shall be adequately protected.

5.3 ***Additional Requirements for Recessed Conduit Work:***
(i) ***Making Chase***
Requirements under clause 4.3.3 (i) shall be complied with

(ii) ***Fixing Conduits in Chase***
(a) The conduit pipe shall be fixed by means of staples, or by means of nonmetallic saddles, placed at not more than 60 cm apart, or shall be fixed by any other approved means of fixing.
(b) At either side of the bends, saddles/staples shall be fixed at a distance of 15 cm from the centre of the bends.

(iii) ***Erection in RCC Work***
Requirements under clause 4.3.3 (iii) shall be complied with.

(iv) ***Fixing Inspection Boxes***
Requirements under clause 4.3.3 (iv) shall be complied with.
(v) ***Fixing Switch Boxes and Accessories***
Requirements under clause 4.3.3 (v) shall be complied with.
(vi) ***Fish Wire***
Requirements under clause 4.3.3 (vi) shall be complied with.
(vii) ***Bunching of Cables***
For ease of maintenance, cables carrying direct current or alternating current shall always be bunched so that the outgoing and return cables are drawn in the same conduits.

5.4 ***Earthing Requirements***
(i) A protective (earth) conductor shall be drawn inside the conduit in all distribution circuits to provide for earthing of non-current carrying metallic parts of the installation. These shall be terminated on the earth terminal in the switch boxes, and/or earth terminal blocks at the DBs.
(ii) Gas or water pipe shall not be used as protective conductors (earth medium).

TABLE III

Dimensional Details of Rigid Non-metallic Conduits

[Clause 5.2.1(ii)]

(All dimensions in mm)

S. No.	Nominal Outside Diameter (in mm)	Maximum Outside Diameter (in mm)	Minimum Inside Diameter (in mm)	Maximum Permissible Eccentricity (in mm)	Minimum 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 IV

Ordinary Clips or Girder Clips

[Clause 5.2.2(vi]

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

TRUNKING CABLE MANAGEMENT SYSTEM

6.1 Scope

This chapter covers the requirements of mini trunking (casing wiring) and adaptable metallic or PVC trunking ("otherwise also called wire ways").

6.2 Adaptable trunking shall be used for power cables and data cables to run parallel in two different compartments with partition.

6.1.1 Mini Trunking is suitable for surface wiring work indoors where necessitated, either due to aesthetics or technical requirements, such as case of extension of existing wiring, avoidance of recessed wiring in RCC columns etc. PVC insulated cables and / or other approved insulated cables conforming to IS 694 : 1990 shall be used in this type of work.

Wherever data cables are used for information outlets, adaptable trunking shall be used.

6.1.2 (i) This system using PVC trunking shall be adopted in residential buildings, or office building where there is a need of tidy wiring system.

(ii) PVC trunking for distribution of Voice Data and Power should be used for cable management and should accept RJ45 Data socket and Power socket or other wiring accessory like switches, indicators etc.

(iii) Where the trunking has to be necessarily adopted in situations under (i) above, PVC trunking shall be used.

(iv) Preferred size of the mini trunking should be 25 x 16 mm, 32 x 16 mm,40 x 25 mm, 40 x 40 mm

and for adaptable trunking it should be 100 x 34 mm or 100 x 50 mm or 160 x 50 mm or 200 x 50mm for making up to four isolated compartments.

(v) Trunking should be equipped with rail on its surface on which clip-on partition can be clipped which should accept frames/plates for wiring devices upto 6/8 modules.

(vi) Trunking should have insulation rating of 5 mega Ohm. Trunking should have the following fire resistance characteristics:
- Operating temperature between – 40 Deg to 60 Deg. C
- Glow wire test 960 Deg. C
- Oxygen index – 50 ± 5
- UL94 – VO

6.2 Material

6.2.1 The mini trunking and adaptable trunking shall be of the same material, viz. either PVC or anodized aluminium in extruded sections.

6.2.2 The mini trunking shall have a square or rectangular body. The trunking cover shall be "CLIP-ON" type with double grooving in the case of PVC wire-ways, and CLIP-ON type for the metallic wire ways. All surfaces shall have smooth finish inside and outside. The top of the side walls of the body shall be suitable for the above types of fixing arrangement of trunking. PVC trunking or Aluminium trunking should have uniform thickness throughout its length and shall be of factory finish.

6.2.3 PVC trunking shall be of good quality PVC, free from defects like deformation, unevenness, blisters, cavities etc.

6.2.4 ***Dimensions***

(i) The sizes of mini trunking for the various sizes of cables and the maximum number of 650/1100 V grade PVC insulated aluminium / copper conductor cables that can be carried in one trunking are given size wise in **Table V.**

(ii) The thickness of the mini trunking & adaptable trunking shall be 1 mm minimum.

(iii) When mini trunking cover is clipped onto the trunking body, cover should completely overlap on the base (casing).

6.2.5 ***Outlet Boxes***

The outlet boxes such as switch boxes, regulator boxes and their phenolic laminated sheet covers shall be as per requirements.

6.3 Installation

6.3.1 ***Attachment to Wall and Ceiling***

(i) The mini trunking and adaptable trunking shall be fixed by means of suitable screws to approved type of asbestos or fire fixing plugs, at intervals not exceeding 60 cm or all sizes for mini trunking. In case of Adaptable trunking, the screwing distance shall be such that the weight of the trunking & cable hold firmly on the wall or ceiling. On either side of the joints, the distance of the fixing arrangement shall not exceed 15 cm from the joint.

(ii) All trunking body shall be fixed directly on wall or ceiling as above.

(iii) Trunking shall be used only on dry walls and ceiling, avoiding outside walls as far as possible and shall not be buried in walls not fixed in proximity to gas, steam or water pipes or immediately below the heater.

(iv) Adaptable trunking shall be with pill off cover for protection against dust. Pill off cover shall be removed only on completion of painting of walls.

6.3.2 ***Passing through Floors or Walls:***
When conductors pass through floors, the same shall be carried in an approved PVC conduit, or heavy gauge steel conduit properly bushed at both ends. The conduit shall be carried 20 cm above floor level and 2.5 cm below ceiling level and neatly terminated into the casing. Steel conduit pipes wherever accessible shall be securely earthed.

6.3.3 ***Joints in Casing and Capping***
(i) The wire ways in straight runs should be in single piece as far as possible so as to avoid joints. Trunking shall be of 2 m or 3 m standard length for the ease of installation.

(ii) All joints shall be scarfed or cut diagonally in longitudinal section, and shall be smoothed down by fi ling to make the joints a very close fit as far as possible and without burrs. They shall be screwed at joints with two or more screws as would be necessary.

(iii) Joints arising out of bends or diversion shall be done using standard accessories like Internal angle, External angle, Flat angle (elbows), Flat junction (T) and end caps. For the separation of data and power cables there shall be partition in both trunking and accessories. Internal and external angle shall have variable angle for the alignment at the wall corners. In no case the radius of curvature of the cables inside a bend shall be less than 6 times their overall diameter.
6.3.4 Trunking should be of white colour in case of PVC trunking and of white or grey colour in case of Aluminum trunking.

(i) Mini Trunking attached to ceiling shall be carried completely across the ceiling/wall whenever required by the Engineer-in-charge, instead of being stopped at an outlet location and in all such cases, dummy mini trunking must be provided.

6.3.5 ***Attachment of Capping:***
(i) Wherever required by the Engineer-in-charge, capping shall not be fixed until the work has been inspected with the wires in position and approved. The inspection will be done from time to time as the work progresses.

(ii) Cover shall be attached to body after all the insulated wires are laid inside.

(iii) No screws or nails shall be used for fixing PVC cover to the body.

(iv) Aluminum cover shall be fixed by using cadmium plated flat head / round head screws with an axial spacing not exceeding 30 cm.

6.3.6 ***Installation of Cables***
(i) For ease of maintenance, cables carrying direct current or alternating current shall always be bunched so that the outgoing and return cables are drawn in the same trunking.

(ii) Mini trunking shall be of such a design that it holds the wires inside the trunking body (casing) at suitable intervals, so that at the time of opening of the trunking cover (capping), the wires may remain in position in the trunking body (casing) and do not fall out.

6.3.7 ***Earth Continuity***
(i) A protective (earth continuity) conductor shall be drawn inside for earthing of all metallic boxes of the installations as well as for connections to the earth pin of the socket outlets.

(ii) In the case of metallic trunking there shall be a metallic link between adjacent trunking covers with

screw connections, and also connections from the end casing to the earth terminal of metallic boxes / outlets / switch boards as per the case may be, for the complete body earthing of the system.

TABLE V

Maximum Number of PVC Insulated 650/1100 Volt Grade Aluminium/Copper Conductor Cable conforming to IS 694 : 1990

[Clause 6.2.4(i)]

Nominal Cross Section Area	10/15 mm x 10 mm	20/15 mm x 10 mm	25/15 mm x 16 mm	32 mm x 16 mm	40 mm x 25 mm	40 mm x 40 mm
1.5	3	5	6	8	12	18
2.5	2	4	5	6	9	15
4	2	3	4	5	8	12
6		2	3	4	6	9
10		1	2	3	5	8
16			1	2	4	6
25				1	3	5
35					2	4
50					1	3
70					1	2

Note : Dimensions shown above are outer dimensions of mini trunking.

M.V. PANEL, D.B., RISING MAINS, BUS TRUNKING AND OVERHEAD BUS BAR SYSTEM

7.1 Scope

This covers supply/ erection/ testing and commissioning of the equipments suitable for 415 Volt, 3 Phase, 50 HZ 4 wire system.

7.2 Requirements

(i) For each equipment, required IP rating and short circuit rating capacity will be specified. Governing BIS also will be specified.

(ii) All the equipments will be factory fabricated in an approved factory having modern fabrication and testing process. It shall have seven tank pre-treatment process comprising of degreasing, rinsing, de-rusting, rinsing, phosphatising, rinsing and passivation followed by powder coat painting having a paint thickness of 60 microns or as specified. The powder paint will be subjected to oven-heated process. All panels will be provided with suitable gasket to make it dust/ vermin proof.

7.1.1 ***Specification of LT Cubicle Panel***

(i) Cubicle panel shall be floor mounted (on a base frame) totally enclosed and extensible type. The general construction shall conform to IS 8623 : 93. The design shall include all provisions for safety of operating and maintenance personnel. Degree of IP protection shall be IP-42 for indoor application and

IP-54 for outdoors, unless otherwise specified.

(ii) The panel shall be compartmentalized type having space and arrangement for incoming cable/ bus ducting, incoming switchgear/ switchgears, bus coupler, insulated and properly supported compartmentalized bus bars, outgoing compartmentalized switchgear, bus bar supports, joint shrouds, cable alleys of suitable size for cabling routing, support and terminations, inter-connection between bus bars and switchgear with auxiliary bus bars/ insulated conductors/
strips etc. Also the panel will be provided with necessary instrumentation like CTs, PTs, Ammeters, Voltmeters, phase indicating lamps, other required instruments, wiring, fuses etc.

(iii) It shall be fabricated out of CRCA sheet not less than 2.0 mm thick for load bearing
members and 1.6 mm for doors of LT panels. The framework may be Angle Iron/ Channel/ Bolted type construction. General constructions shall employ the principle of compartmentalization and segregation of each circuit. Unless otherwise approved, incomer and bus section panels shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the rear accessible type board shall have hinged access door at the rear. Operating handle of the highest unit shall be at a height not more than 1.7 mt. Overall height of the board shall not exceed 2.3 metre.

(iv) ***Arrangement for Incoming/Outgoing Cable Termination***
Cable entries shall be provided either from the rear or from the front through cable alleys of suitable size. Removable gland plate to be provided for each cable entry. Cable support arrangement to be provided inside cable alley so that cables are neatly arranged and fixed. From each outgoing switch, insulated strip/ conductor of suitable size to be provided up to suitable terminal block, which will receive incoming/ outgoing cable termination. It is desirable that cables are not terminated directly to switchgear, but terminated through proper terminal blocks.

(v) ***Specification of Cable Terminal Block:***
Terminal block of reputed make shall be used. The housing material shall be polyamide having unbreakable and fi re-retardant characteristic. All the metal parts shall be made up of copper alloy including the screws. Mounting shall be 'Din' or 'G-rail' type. Screws shall be self captive type. No protection cover is required, and the block should be touch proof.

(vi) ***Bus bars/ Supports/ Clearances:***
The bus bar system may comprise of a system of main/ auxiliary bus bars run in bus bar alleys. For bus bar material, ratings, current density, insulation, supports, bus bar clearances and joints see para 7.2 (iii).

(vii) ***Earthing:***
2 Nos. 20 x 3 mm copper strip for LT panel upto 400 Amp. capacity or 2 Nos. 20 x 5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel connected to 2 Nos. earth bus copper strips connected to incoming earth conductors.

(viii) ***Commissioning:***
After erection, the LT panel will be commissioned after:
(a) Tightening of all nuts and bolts.
(b) Closing any left out holes to ensure the entire panel is insect proof.
(c)) Megger testing.
(d) Earth testing.

7.1.2 ***Specification of Prewired DB***
As a general practice only prewired MCB/HRC type DBs shall be used, on account approved, incomer and bus section panels shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the rear accessible type board shall have hinged access door at the rear.

Operating handle of the highest unit shall be at a height not more than 1.7 mt. Overall height of the board shall not exceed 2.3 metre.

(iv) ***Arrangement for Incoming/Outgoing Cable Termination:***
Cable entries shall be provided either from the rear or from the front through cable alleys of suitable size. Removable gland plate to be provided for each cable entry. Cable support arrangement to be provided inside cable alley so that cables are neatly arranged and fixed. From each outgoing switch, insulated strip/ conductor of suitable size to be provided up to suitable terminal block, which will receive incoming/ outgoing cable termination. It is desirable that cables are not terminated directly to switchgear, but terminated through proper terminal blocks.

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(vi) ***Bus bars/ Supports/ Clearances***
The bus bar system may comprise of a system of main/ auxiliary bus bars run in bus bar alleys.
For bus bar material, ratings, current density, insulation, supports, bus bar clearances and joints see para 7.2 (iii).

(vii) ***Earthing***
2 Nos. 20 x 3 mm copper strip for LT panel upto 400 Amp. capacity or 2 Nos. 20 x 5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel connected to 2 Nos. earth bus copper strips connected to incoming earth conductors.
(Typical Cubicle Panel is explained in Fig. 8)

(viii) ***Commissioning***
After erection, the LT panel will be commissioned after:
(a) Tightening of all nuts and bolts.
(b) Closing any left out holes to ensure the entire panel is insect proof.
(c)) Megger testing.
(d) Earth testing.

7.1.3 ***Specification of Prewired DB***
(a) As a general practice only prewired MCB/HRC type DBs shall be used, on account vertical power distribution, this is a preferred method, compared to rising cable system and is more reliable and safe from point of view of fire hazard
.
(b) Tap-off arrangements shall be provided on the rising mains with tap-off boxes.

(c) The rising main shall comprise of sheet metal enclosure, bus bars, tap-off points, tap-off boxes, end feed units, fire barriers, expansion joints, thrust pads, end covers and fixing brackets etc.
(d) The rising main shall conform to IS 8623 and IEC 439 and shall be suitable for 415 V, 3 phase, 50 Hz supply and insulation of rising mains shall be capable of withstanding the voltage of 660 volt AC. Degree of IP protection and short circuit rating shall be specified.

(ii) ***Enclosure***
The enclosure shall be made from sheet steel of 1.6 mm thickness.

(iii) ***Bus bars***
(a) ***Rating***
Bus bars shall be made of wrought aluminum or aluminum alloy, or electric grade copper, conforming

to relevant Indian Standard, as specified. The ratings of the bus bars shall be 100A, 200A, 300A, 400A, 500A, 600A, or 800A as specified.

(b) ***Current Density***

Bus bars shall be of sufficient cross-section so that a current density of 100A/sq.cm is not exceeded at nominal current rating for aluminum bus bars, and 150A/sq.cm for copper bus bars. The minimum sizes of sections of bus bars are given in Table VI.

(c) ***Cross Section of Bus Bars***

The cross section of the neutral bus bar shall be the same as that of the phase bus bar for bus bars of capacities upto 200A; for higher capacities, the neutral bus bar must not be less than half the cross-section of that of the phase bus bar.

(d) ***Insulation***

Each bus bar shall be suitably insulated with PVC sleeves/ tapes. The insulation of the rising mains shall be capable of withstanding the voltage of 660 V of AC.

(e) ***Bus Bar Supports***

Bus bar support insulators shall be class F insulators made of monohygroscopic, non-combustible, track resistant and high strength FRP/ SMC/DMC material, and shall be of suitable size and spacing to with-stand the dynamic stresses due to short circuit currents. The spacing between two insulators should be provided by the manufacturers according to the design
approved by CPRI for their bus bar supports.

(f) ***Bus Bar Clearances***

(i) The minimum clearance to be maintained for enclosed indoor air insulated bus bars for medium voltage applications shall be as follows:

Between Min. Clearances
Phase to earth 26 mm
Phase to phase 32 mm

Note: For strip connection from bus bars to switchgear, the above clearances don't apply.

(ii) (a) Bus bar joints shall be thoroughly cleaned and a suitable oxidizing grease shall be applied before making the joint.

(b) High tensile bolts, plain and spring washers shall be provided to ensure good contact at the joints.

(c) The overlap of the bus bars at the joints shall be not less than the area of the cross section of the bus bars.

(g) ***Bus Bar Marking***

Bus bars and main connections shall be marked by color or letter as per Table VII.

(iv) ***Expansion Joint***

Expansion joint made of aluminum/copper strips shall be provided wherever necessary, to take care of expansion and contraction of the bus bars under normal operating conditions. This shall be invariably provided whenever the length of the rising mains exceeds 15 m.

(v) ***Thrust Pads***

(a) The bus bars shall be provided with thrust pads so that the expansion of the conductors is upwards only.

(b) The bus bar clamps and insulators shall be designed to withstand the forces due to short circuit current. They shall also permit free vertical movement of the bus bars during expansion and contraction.

(vi) ***Mounting***

(i) Incoming cable will be connected to the rising main through an end feed unit, consisting of switch fuse unit with HRC fuse/ MCCB/ ACB of required capacity and cable end box.

(ii) Tap-off boxes at specified intervals and height shall be provided on rising main to tap power. The box shall consist of set of HRC fuses or MCCB/Switch fuse unit, so that power from rising main can be switched ON/OFF and provided with suitable overload/ short circuit protection.

(iii) Distribution boards/ switch boards will not be mounted on rising main. Such boards will be separately erected on floor/ wall and connected to tap-off box with suitable copper conductor cable (See Fig. 10).

(vii) ***Construction Features***
(a) The rising mains shall be manufactured in convenient sections to facilitate easy transportation and installation. The sections shall be connected to form a vertical run at site. Each section shall be provided with suitable wall straps at convenient intervals for fixing to the wall.

(b) The enclosure shall be sturdy so as to withstand the internal and external forces resulting from the various operating conditions.

(c) The front covers shall be detachable. Neoprene gaskets shall be provided between the covers and the side channels.

(d) The enclosure shall have a degree of protection not less than IP 42.

(e) The rising main shall be designed for temperature rise not exceeding 40 degree C over ambient temperature of 45 degree C.

(f) Built-in fi reproof barriers having 2 hr. fire rating shall be provided to restrict the spread of fi re through the rising mains from one section to the adjacent section.

(g) Necessary provisions for ventilation shall be made at suitable intervals. These shall be complete with welded non-ferrous metallic mesh to prevent entry of vermin.

(h) Two numbers of copper earth strips of 25x 3 mm (for Rising Main upto 400 Amp.) and 25 x 5 mm (for Rising main above 400 Amp. and upto 800 Amp.) shall be provided along side the rising mains enclosure, and shall be bolted to each section of the rising mains.

(viii) ***Installation of Rising Mains***
(i) Rising mains shall be installed on walls, to which the foundation bolts shall be suitably grouted (in a shaft of adequate size for rising main and floor distribution panel). The foundation bolts shall be provided by the contractor without extra payment.

(ii) (a) No structural member in the building shall be damaged/ altered, without prior approval from the competent authority through the Engineer-incharge.

(b) Structural provisions like openings, cutouts, if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.
(c) All such openings in floors provided by the Department shall be closed by the contractor after installing the cables/ conduits/ rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.

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

(ix) ***Commissioning***
Before connecting mains supply after installation, pre-commissioning checks comprising megger test, checking the tightness of connections, body earth connection etc. shall be carried out and recorded.

7.3 Bus Trunking
7.3.1 ***Application***
These are generally provided for interconnections between the transformers of 400 KVA and above and DG sets 300 KVA and above and their switch board panels, and also for interconnections between large switch board panels where specified, thereby avoiding use of large sizes of cables for such interconnections.

7.3.2 ***Materials***
7.3.2.1 ***Enclosure***
Sheet steel of minimum 2 mm thickness shall be used for fabricating the enclosure.

7.3.2.2 ***Bus Bars and Supports***
Bus bars and their supports shall comply with clauses 7.2 (iii) of these specifications.
The current rating shall be as specified in individual cases.

7.3.3 ***Construction***
7.3.3.1 *Enclosure*
(i) The enclosure shall be of bolted type, box type, welded type or any other type as per the manufacturer's standard practice, and shall be made out from sheet steel of minimum 2 mm thickness. The front cover only shall be detachable. The section of the bus duct shall be rectangular. The enclosure shall be sturdy so as to withstand the internal and external forces resulting from the various operating conditions.
(ii) The bus trunking enclosure shall be fabricated in convenient sections for easy transportation and installation. The sections shall be connected to form horizontal and vertical runs as required at site. The enclosure shall be provided with flanged ends with drilling arrangements to suit the flanges at the switchgear and transformer terminals. All flanges shall be provided with gaskets, nuts, bolts, washers etc.
(iii) The entire bus trunking enclosure shall be designed for dust and vermin proof construction. The enclosure for outdoor installation shall be additionally in weatherproof construction. The enclosure shall have a degree of protection not less than IP 42 for indoor application, and IP 54 for outdoor application in accordance with IS 2147.
(iv) Bus trunking, if required to be installed outdoors, shall be provided with a metallic protecting canopy of adequate size above the bus trunking, fabricated as part of the enclosure.
(v) Neoprene gaskets shall be provided to satisfy the operating conditions imposed by temperature, weather etc. and durability.
(vi) Provisions for ventilation shall be made as per clause 7.2 (vii) (g) of these specifications.
(vii) Two numbers of Copper earth strips of appropriate size shall be provided alongside the bus trunking enclosure and shall be bolted with each section of the bus trunking (See Table VIII).

7.3.3.2 ***Expansion Joint/ Flexible Termination***
(i) Flexible connections shall be provided by braided or multi-leafed conductors for terminations at transformer bushing and switchgear.
(ii) Expansion joints shall be provided as per clause 7.2 (iv) of these specifications.
7.3.4 ***Installation***
(i) Each section of the enclosure shall be suspended from the ceiling slab with suitable MS suspenders and support angles/ channels. The runs shall be neat and the route shall be as directed by the Engineer-in-charge.
(ii) The bus trunking shall be supported such that its weight does not come on the terminations.

(iii) Danger notice boards shall be provided on the bus trunking enclosure at suitable intervals in every room through which it passes.
(iv) The earthing strips shall be properly terminated to the earth bars at both ends.
(v) Pre-commissioning checks shall be conducted.

7.4 Overhead Bus Bar System

7.4.1 ***Application***

The overhead bus bar system is generally used for distribution of power to a number of distributed power loads, such as motors, as in a workshop. This system has an in-built flexibility for meeting additional loads without much change in the distribution system. These specifications cover indoor application only.

7.4.2 ***Materials***

7.4.2.1 *Enclosure*

Sheet metal used for fabrication of side channels shall be 1.6 mm thick and the top and bottom covers 1.2 mm thick.

7.4.2.2 *Bus Bars and Supports*

(i) The bus bars shall comply with clause 7.2 (iii) of these specifications. The bus bars shall however be rated for 200A, 300A or 400A as specified. Each bus bar shall be individually insulated by means of PVC sleeves.
(ii) The bus bar supports shall comply with clause 7.2 (iii)(e) of these specifications.

7.4.3 ***Construction***

(i) The enclosure shall be sturdy to withstand the internal and external forces resulting from the various operating conditions. The enclosure shall have a degree of protection not less than IP 42 in accordance with IS 2147.
(ii) The top and bottom cover plates shall be detachable, and shall complete with gaskets to make the enclosure totally dust and vermin proof.
(iii) The enclosure shall be fabricated in convenient sections for easy transportation and installation. The bus sections shall be jointed together with flanges and tie bolts. Each section of the enclosure shall be suspended from the ceiling slab with suitable and rigid MS suspenders and brackets as required. Detachable blank sheet steel covers shall be provided for enclosing the free ends of the bus bar run.
(iv) Two numbers of Copper earth strips of appropriate size shall be provided for the complete run of bus bar enclosure and shall be bolted to each section of the bus bar enclosure. Suitable provision should be made to enable earth connection to the plug-in box, when plugged in.

7.4.4 ***Plug-in Boxes***

(i) Each section of the bus bar enclosure shall have plug-in points spaced at intervals of approximately 600 mm for the insertion of plug-in boxes. (ii) The plug-in boxes shall be fabricated as compact sheet steel boxes with hinged doors and shall house the fuse holders/ MCCB/ MCB. The fuse holders/ MCCB/MCB shall be solidly connected to high conductivity copper clip-on contacts and reinforced by spring steel strips. These clip-on contacts shall plug-in directly on to the bus bars at the plug-in points.
(iii) Two earth points shall be located at the ends of the plug-in boxes. While inserting these boxes into the plug-in points, the earth points shall engage first in the special earth bushes provided on the underside of the bus bar enclosure before the main contacts are made. While withdrawing these boxes, the earth contact is maintained even after the main contacts are isolated. (iv) The plug-in boxes after insertion into the plug-in points shall be fastened by wing nuts. (v) Each plug-in box shall be fitted with a brass compression gland suitable for the size of the cable specified. It should be possible to provide this gland in any position, i.e. left hand side, right hand side or lower side of the plug-in box.(vi) The unused plug-in points shall be blanked with detachable sheet steel covers.

7.4.5 ***Installation***
(i) The bus sections shall be jointed together with flanges and tie bolts. Each section of the enclosure shall be suspended from the ceiling slab with suitable MS suspenders and support angles/ channels as required.
(ii) Bus trunking shall be suspended at a uniform height of about 2.4 m above floor level. The layout shall be got approved from the Engineer-in-charge before erection. The runs shall be straight, except at points of changes in direction.
(iii) A connector assembly shall be supplied loose with each section of the enclosure for coupling two sections, and it shall comprise a rubber locating ring, bus bar insulating tube and a connector insulating tube.

7.4.6 ***Earthing***
The Copper earth strips of the bus duct shall be connected to the earth bus/ earth terminal(s) of the switchboard controlling the bus ducts, by appropriate protective conductors, notwithstanding the connection by the armouring of the feeder cable.

7.4.7 ***Danger Notice Board***
These shall be provided on the enclosure at suitable intervals and not exceeding 5 m.
7.4.8 Pre-commissioning checks shall be conducted.

Note:
(i) In larger bus bars of sizes above 1000 amps, the sections can be accepted in other rectangular cross-sections and numbers also, provided the total cross sectional area offered is not less than the total cross-sectional area shown in the above table against the respective bus bar rating.

(ii) With aluminum bus bars, only aluminum wire/ solid bar connections shall be made for incoming/ outgoing mountings on the switchboards.

(iii) With copper bus bars, only copper wire/ solid bar connections shall be made for incoming/ outgoing mountings on the switchboards.

TABLE VII

(i) Marking for A.C. Bus Bars & Main Connections

	Bus Bar and Main Connections	*Colour*	*Letter/Symbol*
(i)	Three Phase	Red, Yellow, Blue	R.Y.B.
	Two Phase	Red, Blue	R.B.
	Single Phase	Red	R
(ii)	Neutral connection	Black	N
(iii)	Connection to earth	Green	E
(iv)	Phase variable (such as connections to reversible motors)	Grey	Gy.

(ii) For D.C. Bus Bars and Main Connections

	Bus Bar and Main Connections	*Colour*	*Letter/Symbol*
(i)	Positive	Red	R, or plus
(ii)	Negative	Blue	B, or minus
(iii)	Neutral connection	Black	N
(iv)	Connection to earth	Green	E
(v)	Equalizer	Yellow	Y
(vi)	Phase variable (such as connections to reversible motors)	Grey	Gy

Note: In the wiring diagram, positive and negative should be indicated by '+' and '-' respectively.

TABLE VIII

A: Earth Continuity Strip for Protective Earthing of Sub-Station Equipment

S.No.	*Type of Installation*	*Earth Electrode*	*Earth Strip from Earth Electrode to Earth Bus and Loop Earthing of Equipment*
1.	Indoor sub-station with HT panel, Transformer capacity up to 1600 KVA, LT panel, Generating set.	Copper Plate	25 x 5 mm Copper Strip
2.	Indoor sub-station with HT panel, Transformer capacity above 1600 KVA, LT panel, and Generating set.	Copper Plate	32 x 5 mm Copper Strip
3.	HT Outdoor sub-station	Copper Plate	25 x 5 mm Copper Strip
4.	LT Indoor sub-station with generator	Copper Plate	25 x 5 mm Copper Strip
5.	LT switch room having Main LT Switch Board	Copper Plate	20 x 3 mm Copper Strip

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098765**B: Earth Continuity Strip for Bus Trunking and Rising Main**

S.No.	*Type of Installation*	*Material of Main Conductor*	*Earth Strip*
1.	Bus trunking up to 2500 Amp capacity	Copper/ Aluminium	2 Nos. 25 x 5 mm copper strip
2.	Bus trunking above 2500 Amp capacity	Copper/ Aluminium	2 Nos. 32 x 5 mm copper strip
3.	Bus trunking for connecting generating set and LT panel	Copper/ Aluminium	2 Nos. 25 x 5 mm copper strip
4.	Rising main up to 400 Amp capacity	Copper/ Aluminium	2 Nos. 20 x 3 mm copper strip
5.	Rising main above 400 Amp and up to 800 Amp capacity	Copper/ Aluminium	2 Nos. 20 x 5 mm copper strip

C: Neutral Earthing of Transformers and Generators

S.No.	*Equipment*	*Earth Electrode*	*Earth Strip from Earth Station to Neutral*
1.	Transformer of capacity up to 1600 KVA	Copper plate	25 x 5 mm Copper strip
2.	Transformer of capacity above 1600 KVA	Copper plate	32 x 5 mm Copper strip
3.	Generating set of all capacity	Copper plate	25 x 5 mm Copper strip

EARTH LEAKAGE CB/RESIDUAL CURRENT CB :
The ELCB/RCCB shall comply with IS: 12640-1988/IEC: 1008. The ELCB/RCCB shall be current operated independent of the line voltage. ELCB/RCCB shall work on the principle of core balance transformer. The ELCB/RCCB shall be rated for current sensitivity of a min of 30mA and a max of 300 mA at 240/415 V AC. The terminals shall be protected against finger contact to IP:20 degree of protection. The ELCB/RCCB shall have a minimum of 20,000 electrical operations.

Testing Provision :
A test device shall be incorporated to check the integrity of the earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test know shall trip the ELCB and the operating handle shall move to the “OFF” position.

SECTION-VI

LIST OF APPROVED MAKES

Sr. No.	Name of Item	Make Approved
1.	PCC, MV Boards, MCCs, LT Panels (IEC 61439 part 1 and 2)	ABB-ArTuK Double Door, Schneider-Prisma Double Door, Siemens-Sivacon Double Door, L&T - Enersys Double Door
2.	MCB Distribution Boards	Wipro/ North West/Siemens / ABB
3.	Air Circuit Breaker (ACB)	Siemens-3WL /Legrand- DMX3/ L& T-Omega
4.	MCCB/MCB	Siemens /ABB/ L& T/ North West/Legrand
5.	Switch Fuse Units	Siemens /ABB/ L& T/ North West
6.	Contactors and Starters	L&T / Siemens / ABB
7.	Change over Switches	HPL/ Socomech / L&T / ABB
8.	Current Transformer	L&T, Starlite, AE, Newtech, Siemens, Pragati, Kappa
9.	ELCB/RCCB	Siemens /ABB/ L& T/ North West
10.	Push Buttons	L&T / Technic
11.	Indicating Lamps	L&T / Technic
12.	Fuses & Fuse bases	L&T / Siemens /ABB
13.	Digital KWH Meters with RS 485 Ports	Secure, L&T, Schneider, HPL, Secure, L&T, Schneider, HPL MSEDCL Approved
14.	Indicating / Measuring Instruments	Conzerv, HPL, Secure, L&T
15.	Terminals	Elmex / Connectwell
16.	HT / LT Cables	Finolex / RR Kables / KEI/Gloster
17.	PVC insulated Copper Wires	RR Kables/ Finolex / KEI/Gloster
18.	CAT6 Cable	Lapp/KEI/Finolex/ Systemax / Gloster
19.	Jelly Filled Telephone Cable	RR Kabel/Finolex/ITL
20.	PVC Telephone Cable	Finolex/KEI/RR Kabel/Gloster
21.	Timer	L&T/ABB/Minilec
22.	Cable Glands Single/Double Compression	Braco / Dowells / Commet
24.	PVC rigid conduits & Accessories	Precision/ Astral/Anchor Panasonic
25.	Switches, Sockets, Plugs etc	Legrand Arteor/ North West Nowa/Anchor Ave
26.	Industrial Sockets	Legrand / L&T/ABB/North West
27.	LED Light Fitting	Philips / Wipro / Havells
28.	Ceiling Fans 28 watt	Atomberg/RR Kabel/Orient
29.	Exhaust Fans	Atomberg/Orient /USHA / C.G.
30.	Relays	Areva / Minilec
31.	Bi-metalic Crimping Type Lugs	Dowells

Sr. No.	Name of Item	Make Approved
32.	Cable Trays / Wireways	Cablofil / Profab / Shruti
33	Portable Fire Extinguishers	Minimax / Disha/ Ceasefire
34	Steel Tubular Poles	National Tube Co. / Unique Pole
35	Multi Function Meter	L & T / Conzerv/ HPL
36	Anchor Fasteners	Hilti / Shakti
37	Transformer (MSEDCL Approved)	Raychem RPG, ABB, SPL Power, Kirloskar, Siemens
38	OLTC	CTR, Easun MR
39	CSS	Siemens Graycell, ABB, Schneider
40	HT cable joint Kits	Raychem, 3M
41	VCB	L&T, ABB, Siemens
42	DG Set	Cummins, Caterpillar, Sterling
43	Battery Charger	Chhabi Electric /SM Power/ Max Power/Lubi
44	Battery	Exide
45	MS Angle/Pipe	TATA / Jindal
46	Valves	Audco / Leader
47	Fuel Level Indicator	Honeywell / Jonson/ Siemens
48	Space Heater	APT
49	Thermostat	APT
50	EV Charger	ABB, Exicom, SMpower Solutions, EVRE
51	Eathing Rods/Plates	Electrostem, Sarvadnya, Unique
52	Fuel Level Indicator	Honeywell, Siemens, Jonson
53	Cement	Ultratech, Birla Super
54	TMT Steel for RCC	Tata, SAIL, Jindal
55	AMF/Syncronising Controller	DEIF
56	HT Metering Kiosk	Huphen Electromech, Huphen Fabricators MSEDCL Approved
57	DG AMF/Syncronising Panel (IEC 61439 part 1 and 2)	ABB-ArTuK, Schneider-Prisma, Siemens-Sivacon, L&T - Enersys
58	MS Steel	Tata, Jindal
59	APFCR+SVAR Panel	TDK, SM Power Solutions, L&T, Innovation Electronics
60	Capacitors	Havell's, ABB, Innovation Electronics, L&T, TDK
61	LBS/RMU	ABB, Siemens, Alstom, L&T

<u>Note</u> : Bidder must highlight make of goods/items offered as per approved make list

SEAL & SIGNATURE OF BIDDER

FORM - I

DETAILS OF WORKS OF ALL SIMILAR TYPE AND MAGNITUDE CARRIED OUT BY THE CONTRACTOR (REFER ELIGIBILITY CRITERIA (SECTION II – Point No. 3) OF **COMPLETED WORKS**)
(DETAILS OF PROJECTS SHALL BE FILLED IN THE CHART AS PER REQUIREMENT WITH PROOF)

NAME OF THE CONTRACTOR:

Sr. No.	Name of work	Name and address of the organization from whom the work was done	Place and Country	Agreement No.	Date of commen-cement	Tendered cost (In lakhs)	Total cost of work done (In lakhs)	Date of Completion	Principle Features in brief
1	2	3	4	5	6	7	8	9	10

Signature of Contractor

Note: - This is only a standard form. Details are to be furnished in this format in the formd type written statements which shall be scanned and attached in COVER No. I. The work done certificates shall be attached in support of the works claimed in this form. Thework done certificates shall be duly signed by the officer not below the rank of Deputy Engineer.

FORM - II

STATEMENT SHOWING **ON-GOING WORK** IN ALL CLASSES OF Electrical ENGINEERING WORK
(DETAILS OF PROJECTS SHALL BE FILL IN THE CHART AS PER REQUIREMENT WITH PROOF)

NAME OF CONTRACTOR: -

Sr. No.	Nam of work	Amount Put to Tender/ Tendered cost	Agreement No.	Date of Commen-cement And Date of Completion (If work completed)	Amount of work still remaining to be executed (Rs. In lakhs)	Remarks
1	2	3	4	5	11	12
Grand Total						
Average Annual Turnover						

Signature of Contractor

Note: - This is only a standard form. Details are to be furnished in this format in the formof typewritten statements which shall be scanned and attached in COVER No. I. Thework done certificates shall be also attached in support of the works claimed in this form.The work done certificates shall be duly signed by the officer not below the rank of Deputy Engineer.

FORM - III

Undertaking / Acceptance

(On non-judicial stamp paper worth Rupees 100/- and notarized)

1. I, _____ son/ daughter/ wife of Shri. _____ Proprietor /Director / authorized signatory of the Company / Firm mentioned above, is competent to sign this declaration and execute this tender document.

2. I have carefully read and understood all the terms and conditions of the tender and undertake to abide to them.

3. The information / documents furnished along with the above tender form are true and authentic to the best of my knowledge and belief. I am well aware of the fact that furnishing of any false information / fabricated document would lead to rejection of my tender at any stage besides liabilities towards prosecution under appropriate law.

Place: Pune **Authorised Signatory**

Date : **Sign and seal**

FORM - IV

Declaration

(On non-judicial stamp paper worth Rupees 100/- and notarized)

Declaration letter on official letter head stating the following:

1. We are not involved in any major litigation that may have any impact of affecting or compromising the delivery of services as required under this tender.

2. We are not black-listed by any Central / State Government / Public Sector Undertaking in India.

3. I/ We hereby declare that I/ We have read and studied in detail the all instructions and conditions of this Contract in the above Clauses, and understood the scope of the project/ work and my/our fundamental duties and responsibilities under this Contract. I/ We unconditionally accept and agree to abide by them.

Yours faithfully,

(Signature of the Authorized person)

Date: **Name:**

Place: **Designation:**

Seal:

FORM - V

(To be printed on letterhead)

EMD Refund Request

To

Estate Manager
Inter-University Centre for Astronomy & Astrophysics
Post bag -4, Ganeshkhind,
Pune University Campus,
Pune - 411007.

Sub: - Request for refund of EMD deposited for tender for "Internal and External Electrical work of IUCAA-2 building at IUCAA Pune."

Sir,

I/We request you that EMD deposited by me/ us against the tender above tender due on 10**/04/2024** vide UTR No dated for **Rs. 18,60,000/-** for providing **"**Internal and External Electrical work of IUCAA-2 building at IUCAA Pune**",** may kindly be refunded.

Yours faithfully,

(Signature of the Authorized person)

Date: **Name:**

Place: **Designation:**

Seal:

FORM - VI

ARTICLES OF AGREEMENT

AGREEMENT

This AGREEMENT made on ……. Day of.....2022.

BETWEEN

Senior Administrative Office, Inter IUCAA Center for Astronomy & Astrophysics, Pune – 411 007, (hereinafter called "The Employer")

AND

_____, Pune –

(hereinafter referred to as 'the Contractor', which expression shall, where the context so admitsor implies, be deemed to include his heirs, executors and administrators), of the Other Part.

WHEREAS IUCAA is desirous of constructing the building of ……. (hereinafter referred to as the "said work") as shown and indicated in the Drawings, Specifications and Bill of Quantities (BOQ) which are part of the Tender document.

AND WHEREAS IUCAA invited tenders for the purpose of awarding the said work.

AND WHEREAS the Contractor submitted her/his tender for the said work which has beenconsidered and accepted by IUCAA.

AND WHEREAS IUCAA has placed the work order No. ..... dat ed

…… and the Contractor has communicated his acceptance of the said work order.

AND WHEREAS the Contractor has agreed to execute the said work estimated to Rs.…….. as per his Acceptance letter dated …….

NOW IT IS HEREBY AGREED BY AND BETWEEN THE PARTIES AS UNDER:

1) The following documents shall form part of this Agreement and parties hereto

shall abide with the same:

a. B-2 form item rate tender and contract for works
b. Bill of Quantities (Schedule-B).
c. Drawings.
d. All additional terms and conditions mentioned in the Tender Document subsequently submitted by the Contractor while submitting his offer.
e. Minutes of Pre-bid meeting and the common set of conditions and deviations issuedwith reference to Pre-bid Meeting.
f. Letter of Negotiations.
g. Work Order.

2) In consideration of the payments to be made to the Contractor, s/he shall subject to the conditions of this Agreement, Tender Document and as per the common set of conditions and deviations issued with reference to pre-bid meeting, execute and complete the said work.

3) The Contractor shall execute and complete all the allied works connected with the said work, as may be ordered from time to time by IUCAA, even though such works may not be shown in the Tender Document.

4) IUCAA shall pay the Contractor such sums as shall become payable, hereunder at the times and in the manner specified in the Tender Document.

5) The term ‘the Architect’ means the Architect appointed by IUCAA for the said work and in the event of him ceasing to be the Architect, such other person appointed as the Architect by the IUCAA for the said work. The Contractor shall not object this appointment of the new Architect unless there are sufficient and valid grounds acceptable to IUCAA, provided always that no person, subsequently appointed to be the Architect for the purpose of the said work, shall be entitled to overrule, any decision, approval or direction given in writing by the earlier Architect.

6) The term 'Project Management Consultant' means the Consultant appointed by IUCAA for the said work. All the payments shall be made to the Contractor only after the certification of material and workmanship from the Project Management Consultant to the effect that they are as per the specifications and have quality of desired standards.

7) IUCAA, through the Architect, reserves the right of altering the drawings and the nature of the work and adding to or omitting any items of the work or of having portions of the same carried out departmentally and such alterations and variations shall be carried out by the Contractor without prejudice to this Agreement.

8) The Contractor shall at the first instance and at her/his own cost and expenses, arrange for all the material whatsoever, necessary for the said work and also tools, instruments, machinery etc. whatsoever, necessary for the same and in case, any material is rejected by IUCAA, the Contractor shall forthwith, at his own expenses replace the same with the quality material duly approved by IUCAA.

9) The Contractor shall not on any account, whatsoever, sublet the said work, in part or in full, except with the previous approval of IUCAA.

10) The Contractor shall remain liable to and shall indemnify IUCAA in respect of all causes or actions, claims, damages, compensations, or charges and expenses arising out of any accident or injury, sustained by any workman or any other person while executing the said work.

11) The workers employed by the Contractor for providing the said services shall be the employees of the Contractor and not of IUCAA.

12) The Contractor shall be solely responsible for the selection, appointment of the workers and for disciplinary action, if any, against her/his workers.

13) If any worker employed by the Contractor causes any damage to the property of IUCAA, the Contractor shall make good the loss suffered by IUCAA.

14) IUCAA shall not be responsible for any claim arising out of any loss or injury caused to the workers employed by the Contractor for carrying out the said work.

15) The Contractor shall be responsible for payment of wages to each worker employed by her/him pursuant to this Agreement regularly and according to the rates of wages prevailing in the market or as fixed by the Government, from time to time.

16) The Contractor shall observe and perform all the requirements of applicable laws and shall comply with all provisions of Contract Labour (Regulation and Abolition) Act 1970, ESI Act, 1948, Minimum Wages Act, 1948, Payment of Bonus Act, 1965 and other Acts applicable to the Contractor for the time being in force. The Contractor shall

indemnify and keep indemnified IUCAA against any loss, costs, charges or expenses, suffered or incurred by IUCAA on account of breach thereof by the Contractor.

17) All disputes arising out of or in connection with this Agreement shall be deemed to have arisen in Pune and only the Courts in Pune shall have the jurisdiction to determine the same.

IN WITNESS WHEREOF both the parties hereto have set their hands, the date and year hereinabove mentioned.

For and on behalf of	For and on behalf of
Inter-University Centre for Astronomy and Astrophysics (IUCAA)	The Contractor

Witnesses :

1) 2)