INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH
GOREGAON (EAST), MUMBAI

TENDER DOCUMENT FOR

Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR

NIT No: IGIDR/Tender/2026/ED/04 Dated: 29.01.2026

INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH

Gen. A.K. Vaidya Marg, Film city Road, Santosh Nagar, Goregaon (East), Mumbai-400065.

Telephone: 022 6909 6200/507/9892910366; Fax: 022 6909 6399.

INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH, MUMBAI

Notice Inviting Tender

"NAME OF THE WORK: **Interior Furnishing works in three Classrooms and Hostel Rooms** at INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH, GOREGAON, MUMBAI – 400 065."

1. The Institute invites bids from reputed & qualified contractors for the following work:

Name of work	Completion Period	Estimated Cost	EMD (INR)
(1)	(2)		(3)
Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR	**Six weeks or by 31/03/2026**	**INR 4,63,42,081.00**	**INR 9,27,000..00**

2. The tenders in the two bid systems are being invited for the above-mentioned work. IGIDR reserves its right to award the work to the successful bidder.
3. The bidder has to submit an Earnest Money Deposit of **Rs. 9,27,000/- (Rupees Nine Lakh Twenty-Seven thousand only**) along with the bid.
4. Tender bids in two bid systems are invited through **two separate Emails** to **tender@igidr.ac.in**: **"Email-1: EMD and Pre-qualification/Technical Bid" and "Email-2: Financial bid"**. Subject of email should be mentioned as **"Email-1: EMD and Pre-qualification/Technical Bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR" and "Email-2: Financial Bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR"** respectively. **All the bid documents should be attached as a PDF document or zip file, and the financial bid file should be protected with a password.**
5. The last date of submission of the bid document shall be up to **13.02.2026, at the end of the day**.
6. **The intending bidder should inspect the site to understand the scope and nature of work before submitting their bid.**
7. The Institute reserves the right to reject any prospective application without assigning any reasons whatsoever.

REGISTRAR

SECTION - A*

LETTER OF OFFER

Date _____

To,
The Registrar,
Indira Gandhi Institute of Development & Research,
Gen. A.K. Vaidya Marg, Film city Road,
Goregaon (East), Mumbai 400065.

Subject: Tender for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR, Mumbai.

Reference: NIT No. IGIDR/Tender/2026/ED/04 Date: 29.01.2026

Dear Sir,

With respect to your above-mentioned tender, we hereby submit our tender in the required format along with the Company Profile and supporting documents.

Should this tender be accepted, I/We hereby agree to abide by and fulfill the terms and provisions of the said Conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit the EMD and pay to the IGIDR the amount mentioned in the said Conditions.

I/We have deposited **NEFT/DD/FDR/BG** of **Rupees Nine Lakh Twenty-Seven thousand only** or **MSME exemption Certificate** as an earnest money deposit to the IGIDR, which will not bear any interest. Should I/We fail to execute the contract when called upon to do so. I/We do hereby agree that this sum shall be forfeited by me/us to the IGIDR.

I / We have carefully gone through the terms and conditions prescribed, and I / We accept the same in to without any alterations/modifications.

Yours faithfully,

Signature

Name & seal of Bidder

** The bidder should submit the Letter of Offer on their company letterhead.*

SECTION - 'B'

GENERAL INSTRUCTIONS TO BIDDERS

Tender bids through email should be addressed to The Registrar, Indira Gandhi Institute of Development Research, Goregaon (East), Mumbai-400065**.**

1. Bidder has to submit Earnest Money Deposit of **Rs. 9,27,000/- (Rupees Nine Lakh Twenty-Seven thousand only**) through **NEFT/DD/FDR/BG** to "INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH, MUMBAI" Account no. 010220100010001, IFSC code: BKID0000102, Branch name: IGIDR, Bank Name: Bank of India, and UTR number with screenshot of transaction should be included in the part of the tender document towards Earnest money.

2. The bidders registered under **MSE** are exempted from the submission of EMD, but they should submit the necessary copy of the MSME certificate for exemption.

3. The tender bids in two bid systems are invited through two separate Emails to **tender@igidr.ac.in**: **"Email-1: EMD and Pre-qualification/Technical Bid" and "Email-2: Financial bid"**. Subject of email should be mentioned as **"Email-1: EMD and Pre-qualification/Technical Bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR" and "Email-2: Financial Bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR"** respectively. **All the bid documents should be attached as a PDF document or a zip file. In case the bidder cannot attach a single bid file to an email, then they can split their bid and submit it in multiple emails, with mentioning in the email subject as Part-I, II, III…. etc.**

4. All the required documents should be scanned and merged either into a single PDF file or zipped into a single file and attached to the respective Emails. **The Financial bid should be attached as a PDF document protected with a password, and the password should be shared at the time of financial bid opening through an online meeting. The vendor should keep their password securely with them and be required to give it only when asked in an online meeting for financial bid opening.**

5. The bids will be received up to **13.02.2026 at the end of the day.** Each copy of the tender document is under their stamp and signature. No tender will be accepted after **13.02.2026** under any circumstances whatsoever.

6. The Email bid with subject **"EMD & Pre-qualification/Technical Bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR"** shall be opened by the Tender Opening Committee on the next day **16.02.2026 at 11.30 AM** through online meeting platform. The link of meeting will be shared with participating bidders. In case, a holiday is declared by the Government on the day of opening the bids, the bids will be opened on the next working day at the same time.

7. The Email bid with subject **"Financial bid for Interior Furnishing works in three Classrooms and Hostel Rooms at IGIDR"** of only qualified bidders will be opened. The date of opening of price bid shall be informed by institute to the qualified bidders. The date of opening of financial bid and link for online meeting shall be informed by the institute to the qualified bidders. **The bidders should provide the password of financial bid PDF file during the opening of the financial bid. In case bidder can NOT provide password for financial bid at the opening then their bid shall be rejected.**

8. Tender bid shall remain valid for acceptance by the Institute for a period of **three** months from the date of opening of the bid, which period may be extended by mutual agreement, and the bidder shall not cancel or withdraw the tender during this period.

9. The bidder must use only the tender forms issued by the Institute to fill in the rates. Any addition/alteration in the text of the tender form made by the bidder shall not be valid and shall be treated as null and void.

10. The Tender form must be filled in English. If any of the documents is missing or unsigned, the tender may be considered invalid by the Institute in its discretion.

11. Rates should be quoted both in figures and in words in columns specified. Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender void at the Institute's option. No advice whatsoever, especially on any change in rate specifications after the opening of the tender, will be entertained.

12. Each Page of the Tender Documents should be stamped and signed by the authorized person or persons submitting the Tender in token of his/their having acquainted himself/themselves with the General terms & conditions, specifications, special conditions of contract, etc., as laid down. Any Tender with any of the documents not so signed will be rejected.

13. A tender that is not accompanied by EMD will not be considered. The EMD will be returned to the bidder if their tender is not accepted by the Institute but without Interest. The EMD paid by the successful bidder shall be held/encashed by the IGIDR as security for execution and fulfillment of the contract. No interest shall be paid on this deposit. The Earnest Money Deposit (EMD) of the successful bidder may be converted into Performance Security Deposit. The security deposit of the successful bidder will be forfeited if they fail to comply with any of the conditions of the contract. No interest will be paid on Security Deposit withheld by the Institute.

14. The Institute does not bind itself to accept the lowest or any bid and reserves to itself the right to accept or reject any or all the tenders, either in whole or in part, without assigning any reasons for doing so.

15. Institute reserves the right to sub-divide the work mentioned in the tender, amongst two or more bidders at its own discretion and the successful bidders will have to execute orders for part of the items placed with them at the quoted rates. Institute also reserves the right to increase or decrease the quantities and even omit any item of work after the order is placed and the successful bidder shall execute the same without claiming anything extra for the same. In this context the rates quoted for each item must be self-supporting and relevant.

16. On receipt of intimation from the IGIDR of the acceptance of his/their tender, the successful vendor/contractor shall be bound to sign the formal Contract and within seven days thereof, the successful vendor/contractor shall sign an agreement and the Schedule of Conditions but the written acceptance by Indira Gandhi Institute of Development Research and the Contractor so, whether such formal agreement is or is not subsequently executed. The cost of necessary Stamp paper for execution of the agreement shall be borne by the successful bidder.

17. No bidder will be allowed to withdraw after submission of the tender; otherwise the EMD submitted by the bidder would stand forfeited. In case, the successful bidder decline the offer of contract (or refuse to acknowledge or execute the contract within 15 days of award of order), for what so-ever reasons, their EMD will be forfeited.

18. The rates quoted in the bid shall include all charges like material rates, applicable GST, transportation, loading and unloading, any other tax and duty or other levy whether existing or future,

levied by the Central Government or any State Government or Local Authority, if applicable. No claim in respect of GST or any other tax, duty or levy, whether existing or future, shall be entertained by the Employer. The bidding Contractors shall familiarize themselves with the local conditions & have to factor in all & any incidental expenses on site while quoting the rates. IGIDR shall not involve itself in any interactions with any local entity on behalf of the appointed contractors to resolve any issue whatsoever.

19. **The intending bidder can obtain any clarifications regarding the tender document, technical scope etc. if any by contacting to Mr. Amit Gaikwad (Estate Officer) on email estateofficer@igidr.ac.in or telephone- 022 6909 6507 or from the Estate Department of the Indira Gandhi Institute of Development Research, Goregaon (E), Mumbai-400 065 on any Institute`s working day from Monday to Friday.**

20. The Consultants for this project are: **M/s Design Ideas**, Flat No 2, Srirang Building, Chandavarkar Road, Opp Ramvadi Hall, Matunga East, Mumbai 400019. Contact Person: Mr Paresh Padgaonkar, Cell No: 9821004421.

I/We hereby declare that I/we have read and understood the above instructions, and the same will remain binding upon me/us.

Place: Signature of the Bidder with seal

Date:

SECTION - 'C'

GENERAL TERMS AND CONDITIONS

Upon the declaration of an intending bidder to be the Successful Bidder by the Institute, they shall be subject to the following terms and conditions that shall form part of the Formal Contract to be executed with the Institute.

1. The successful bidder shall not assign the sub-contract. He shall not sublet any portion of the contract except with the written consent of the IGIDR. In case of breach of these conditions, the IGIDR may serve a notice in writing on the Contractor rescinding the contract.
2. The successful bidder must co-operate with the other contractor appointed by the Institute so that the work shall proceed smoothly to the satisfaction of the Institute.
3. The contractor should hand over any reusable material dismantled from the site to the Institutes engineer after properly creating an inventory & tabulating the same. The contractor should also help the Institute in shifting the material from the premises to other premises if required.
4. The Contractor should note that unless otherwise stated the tender is strictly on item rate basis and his attention is drawn to the fact that rates for each and every item should be correct, workable and self-supporting. The quantities in the Schedule of Quantities approximately indicate the total extent of work but may vary to any extent and may even be omitted thus altering the aggregate value of the contract. No claim shall be entertained on this account.
5. The work shall be carried out in strict adherence to the stipulations of the National Building Code, relevant IS Standards & the latest CPWD works manual & the specifications. The contractor to also bear the cost for any testing required for material/ Samples of work like Concrete blocks, plaster, etc. as per the above-mentioned Codes & manuals from a Government approved Testing Laboratory.
6. The contractor shall bring to the notice of the Employer in case of any extra items not mentioned in the schedule of quantities during the course of the work and shall only carry out the same on written approval from the Institute's Engineer.
7. The successful bidder is bound to carry out any or all items of work necessary for the completion of the job even though such items are not included in the quantities and rates. Schedule of Instructions in respect of such additional items and their quantities will be issued in writing by the institute. The rates for such extra items shall be worked out on the basis of a rate analysis considering the basic material prices with market discounts plus labour cost plus the profit & overheads component of 15% over the material & labour cost.
8. The successful bidder shall comply with the Labour acts or any other Labour Laws in force from time to time for all of the workers employed by him. No child labor shall be employed by the contractor anywhere on the site.

9. IGIDR shall not allow any labor accommodation on its premises & shall not allow any work beyond the regular working hours from 8 AM to 7 PM. The contractor to take care to create least disturbance to the IGIDR community while working & see to it that the work does not cause any hardships to the community. If the contractor requires permission to work overnight, then they have to get the Institutes prior approval before starting the work.
10. In case the successful bidder contravenes any provisions of the law, and the Institute suffers any damage or loss or harm due to any acts of commission or omission of the Contractor, the Contractor is bound to indemnify the Institute. The Contractor shall also be responsible for the discharge of all legal liabilities towards the Institute and also for observing all laws and Government rules relating to labor laws.
11. The successful bidder has to obtain permission from the local authorities as per the existing local bye laws for such works and the charges/fees if any, has to be borne and paid by the contractor.
12. The successful bidder should have valid labour license from Labour Commissioner wherever the number of workmen engaged is 50 or more.
13. The successful bidder shall have the addresses and photographs of their workmen being engaged by them for the said work. The entry of workmen will be allowed inside the building only on producing the photo pass issued by the Contractor/Institute.
14. The successful bidder has to transfer the payment of wages to his labour/staff to their respective bank account every month. The contractor shall produce copy of the bank statement for salary transfer to his workmen, copy of PF, ESIC challan, and GST challan etc. before final payment whenever asked by the Institute.
15. In all matters of dispute arising on the work, the matter shall be referred to **The Registrar, Indira Gandhi Institute of Development Research, Goregaon** for a decision.
16. The successful bidder shall carry out all the work strictly in accordance with scope of work, specifications and as per detailed instructions of the Institute's Engineer. If in the opinion of the Institute's Engineer, changes have to be made in the design and with the prior approval in writing of the Employer they desire the successful bidder to carry out the same. The Institute's Engineer's decision in such cases shall be final.
17. **Arbitration Clause**:

    In the event that the Successful Bidder is not satisfied by the decision of the Registrar, Indira Gandhi Institute of Development Research, the dispute shall be settled by arbitration in accordance with the provisions of **Arbitration and Conciliation Act, 1996** or any enactment thereof. The Arbitral Tribunal shall consist of one arbitrator, to be appointed by the Institute. The place of arbitration shall be Mumbai and any award whether interim or final, shall be made, and shall be deemed for all purposes between the parties to be made in **Mumbai**. The arbitration proceedings shall be conducted in the English language and any award or awards shall be rendered in the English language. The

procedural law of the arbitration shall be the Indian law. The award of the arbitral tribunal shall be final, conclusive and binding upon the Successful Bidder and the Institute.

18. **Insurance Clause:**

The Contractor shall be responsible for all injury to person, animals or things and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any nominated sub-Contractor's employees, whether such injury or damage arise from carelessness, accident or any other case whatever in any way connected with the carrying out of the contract. This clause shall be held to include, inter-alia, any damage to buildings whether immediately adjacent or otherwise, and any damage to road, streets, footpaths, bridges or ways as well as all damage caused to the buildings and works forming the subject of this contract, by frost or other inclemency of weather. the Contractor shall indemnify the employer and hold him harmless in respect of all and any expenses arising from any such injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of injury or damage under any Acts of government or otherwise and also in respect of any award of compensation or damages consequent upon such claims. The Contractor shall reinstate all damages of every sort mentioned in this clause, so as to deliver up the whole of contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property or third parties.

The Contractor shall indemnify the employer against all claims which may be made against the employer by any member of the public or other third party in respect of anything which may arise in respect of the works or in consequence there of and shall at his own expenses arrange to effect the maintain until the virtual completion of the contract with an approved office, policy of insurance in the joint names of the employer and the Contractor against such risk and deposit such policy or policies with the employer from item to time during the currency of this contract. The contract shall also similarly indemnify the employer against all claims which may be made upon the employer whether under the workmen's compensation act or any other statutes in force during the currency of this contract or act Common Law in respect of any employee of the contractor or any sub-contractor and shall at his own expense effect and maintain, until the virtual completion of the contract, with an approved office a policy of insurance in the joint names of the Employer and the contractor against such risks and deposit such policy or policies with the Employer from time to time during the currency of the contract. The minimum limit of the coverage under the third party insurance policy shall be Rs. 2 lakhs person for any one accidental or occurrence and Rs. 5 lakhs in respect of damage to property for any one accident or occurrence.

The Contractor shall be responsible for anything, which may be excluded from the insurance policies above referred to and also for all other damages to any property arising of and incidental to the

negligent or defective carrying out of this contract. He shall also indemnify the Employer in respect of any costs, charges or expenses arising out of claim or proceedings of damage arising there from. The Employer shall be at liberty and is hereby empowered to deduct the amount of any damage compensation, costs, charges and expenses arising occurring from or in respect of any such claims of damage from any or all sums due or to become due to the Contractor.

In addition to the above, the Contractor shall insure the work against loss due to fire, for the entire contract amount with an approved insurance company till the virtual completion of the work. Workmen Compensation Policy for all the employees/workmen to be deputed on the site as per the workmen compensation act.

19. **Defect Liability Period:**

The defect liability period for the work done by the contractor should be for **Twelve months** from the date of completion of work. Any defect or fault which may appear during **12** months from the date of virtual completion of work/or supply and installation in full as specified under the contract, arising in the opinion of the Institute's Engineer from materials or workmanship not in accordance with the contract, shall upon the directions in writing of the Institute's Engineer, and within such reasonable time as shall be specified therein, be amended and made good by the Contractor at his own cost and in case of default the Institute may employ and pay other persons to amend the make good such defects/faults and damages, loss and expenses consequent there upon or incidental thereto shall be made good and borne by the Contractor and such damages, loss and expenses shall be recoverable from him by the Institute, or may be deduced by the Institute upon the Institute's/Institute`s Engineers' certificate in writing from any moneys due or that may become due to the contractor. The contractor/supplier shall remain liable under the provisions of this clause notwithstanding the signing by the Institute's Engineer any certificate or passing of any accounts.

20. **Security Deposit:**

a) **Contract Performance Guarantee:** The successful bidder will have to deposit a Contract Performance Guarantee of **5%** of the total contract amount, subject to the revision at the time of placing the work order, within **7** working days of the receipt of the formal work order. The performance guarantee will be furnished in the form of an account payee Demand Draft, Fixed Deposit Receipt or Bank Guarantee from a commercial bank drawn in favour of "Indira Gandhi Institute of Development Research" payable at Mumbai. The performance guarantee should remain valid for a period of 60 days beyond the date of completion of work by the successful bidder.

b) **Retention Money Deposit:** The successful bidder will have to furnish retention money deposit (RMD) for an amount equal to **5%** of the total contract amount. An amount **@5%** shall be

deducted from each running/final bill as part of retention money deposit. The **5%** amount of RMD retained from the bills shall be released after the completion of defect liability period & warranty period of One Y**ear**.

The security deposit of the successful bidder will be forfeited if they fail to comply with any of the conditions of contract. No interest will be paid on Security Deposit withheld by the Institute.

21. **Mode of Payment:**
    a. Payment shall be made to the contractor after successful completion of work on prorate basis within **15** working days of submission of invoice certified by the institute's consultant (PMC) along with measurement book as per actual measurement of work done**.**
    b. The interim value of work done for processing of running bill shall be **Rs.80,00,000.00**. The amount @ 5% shall be deducted from each running bill as retention money deposit which shall be payable after the completion of defect liability and waterproofing warranty period.

22. **Completion Period:**

The work shall be completed within 6 weeks or by **31st March 2026** from date of award of the work order, subject nevertheless to the provisions for extension of time.

The contractor should start the work at same in different locations to ensure that the work to be completed before **31st March 2026**.

23. **Penalty Clause:**

Time allowed for carrying out the work is Six weeks, which shall be strictly observed by the successful bidder, and it shall be reckoned from the 4th day of issue of the work order. The work shall throughout the stipulated period of the contract be preceded by all the due diligence and if the Contractor fails to complete the work within the specified period he shall be liable to pay compensation at the rate of **1% per week** subject to a maximum amount of **10%** of the contract amount. The Tender shall before commencing work prepare a detailed work program which shall be approved by the Institute's Engineer.

Any damage cause to any of Institute's properties shall be made good by the successful bidder at their own cost.

24. **Termination Clause:**

24.1 Without prejudice to any other remedy available to the Institute, in case of default on the part of the contractor in the performance of this contract or in the discharge of any contractual obligations arising out of this contract or if the contractor commits substantial breach of his obligations and such breach is not corrected within 7 (seven) days from the date of receipt of the

notice specifying the breach, by the contractor, the Institute may terminate this contract by giving a 15 (fifteen) days written notice of intended termination to the contractor.

24.2 In the event of this Contract being terminated, the Institute shall be liable to make payments of the amount due under this Contract up to the effective date of termination for which services (including parts thereof) have been rendered by the Contractor, subject to clause 24.5 hereunder.

24.3 Notwithstanding anything contained herein above, the Institute may terminate this contract at any time by giving one month's notice to the Contractor without assigning any reason thereof and without prejudice to the rights of the Institute to recover any money becoming due and payable to the Institute under this Contract. The Contractor may terminate this Contract at any time by giving two months' notice to the Institute without assigning any reason thereof.

24.4 Forthwith on the expiry or earlier termination of this Contract, the Contractor shall return to the Institute all materials and equipment belonging to the Institute with regard to this Contract. The Institute shall also intimate to the Contractor of a time when it can collect its equipment stored in the Institute, and the Contractor shall collect the same. In the event that the Contractor does not collect its equipment by the appointed time, the Institute shall not be liable for the same thereafter.

24.5 Forthwith on the expiry or earlier termination of this Contract, the Institute shall determine the costs of execution, cost of remedying any defects (if any), and the cost of completion of the work (if required). The Institute shall be entitled to recover from the Contractor the extra costs, if incurred, after adjusting the same against the Performance Security Deposit made by the Contractor.

24.6 On the earlier termination of this Contract due to failure to discharge its duties, the Performance Security Deposit shall stand forfeited by the Institute.

I/We hereby declare that I/we have read and understood the above terms and conditions that form part of the Formal Contract to be executed between I/us and the Institute. The same shall be binding upon me/us upon being declared as the Successful Bidder.

Place: Signature of the bidder with seal

Date:

SECTION - 'D'

SPECIAL CONDITIONS

1. The workmen will not be allowed to stay within the premises. The workmen will be allowed to work in premises after 08:00 AM in morning and maximum till 07:00 PM in the evening.
2. The water required for the work or workmen cannot be availed from the site. The contractor has to make arrangements independently.
3. The electric power required for the work can be drawn from the supply available at site on the condition that expenses shall be borne by the contractor. The electric meter to be installed at the site by the contractor at his own cost. In case of the electric meter not installed the electricity charges **@1%** of total bill amount shall be recovered from the contractor.
4. The debris/dust or any wastage generated out of the above work shall be cleaned as frequently as required and as instructed by the Institute's Engineer away from the Institute's premises.
5. The work has to be carried out with least inconvenience to the staff.
6. Permission required from the local bodies, if any shall be obtained by the successful bidder at his cost.
7. The successful bidder shall employ adequate number of manpower as required for satisfactory fulfillment of his contractual obligations as per this agreement and shall provide adequate number of manpower with appropriate training and experience, at its own expense, for the proper discharge of the responsibilities entrusted to them.
8. The successful bidder shall decide the mode and manner of work to be done by his workmen.
9. The contractor shall before be commencing work submit a detailed work schedule/program which shall be approved by the Institute and the time schedule should be strictly adhered to.
10. The Contractor shall arrange to get all the samples of materials to be used in the work approved from the institute. The proposed materials should be of ISI approved brands.
11. The successful bidder shall only use the materials of brands approved by the institute.
12. Any damage caused to any of Institute's properties shall be made good by the contractor at their own cost.
13. The Contractor shall make their own arrangements for storing of their materials at site.
14. The contractor should submit the following documents within 7 days of issuance of work order.
    a. Workmen Compensation Policy for all the employees/workers to be deputed on the site as per the workmen compensation act which should also cover hospitalization.
    b. Contract agreement of Rs.500/- stamp paper (Draft enclosed along with Tender).
    c. Documents of workmen engaged mentioning their bio-data and photocopy of Aadhar & Pan Card etc.

15. Contractor shall keep the Institute indemnified against all claims, if any. Contractor should also mention if they have been black listed/ debarred or any ongoing arbitration process from/ against any Central/ State Government or any Public Ltd company. With holding any such information shall lead to immediate disqualification of the said contractor.
16. **Before quoting the rates, the bidder should inspect the site and understand themselves with the nature and scope of the work.**
17. The supervision of work shall be done by the **Project Management Consultant (PMC)** appointed by the Institute. The successful bidder should coordinate with the PMC and carry out the work as per the instructions of the PMC and the Institute's Engineer In-charge.
18. **The measurement of work done shall be jointly done by the successful bidder, a consultant and the Institute. The successful bidder should submit his bill along with the certification from the consultant.**
19. **The Institute reserves the right for omission or deletion of tender items from scope of work, reduction in quantity of work/item or alterations in BOQ during the execution as per the Institute's requirement. The successful bidder shall accept the Institute's decision and should bind to it.**

We hereby declare that I/we have read and understood the above terms and conditions that form part of the Formal Contract to be executed between us and the Institute. The same shall be binding upon me/us upon being declared as the Successful Bidder.

Place :

Date : Signature of the Bidder with seal

SECTION - 'E'

PRE-QUALIFICATION CRITERIA

- **Pre-Qualification Documents to be submitted by Bidder along with Pre-qualification Bid:**

a) The bidder should be registered with the appropriate registration authorities.

Copy of Certificate of Incorporation or Registration under the Shop & Establishment Act or Partnership Deed/MOA in case of a partnership firm to be submitted.

b) The bidder should have a minimum of **five** years' experience in executing the civil structure repair and waterproofing works during the last **seven** years.

c) Copy of Registration of Provident Fund and ESIC in Maharashtra state.

d) Copy of Registration of Goods & Service Tax and PAN.

e) Copy of Registration of Labour License if applicable.

f) The bidder should have an average annual turnover of **INR 500.00 Lakh** from the **execution of Interior, furniture, Civil, Plumbing, Electricals, and Data, Firefighting & PA system, Access control, AV system, HVAC, and allied works only** in the last three consecutive financial years (FY2022-2023, FY2023-24, & FY2024-25). The bidder must submit the audited balance sheet, P & L account statements, or a Turnover certificate from a CA for the last three financial years with **positive net worth** in **each year,** duly certified by a CA.

g) The bidder should have successfully completed similar works, i.e., **Interior, furniture, Civil, Plumbing, Electricals, and Data, Firefighting & PA system, Access control, AV system, HVAC, and allied works only**, during the last **seven** years ending the last month of the date of publication of this tender, either of the following-

(i) At least **01** similar work of costing not less than **INR 371.00 Lakh** for one organization.

or

(ii) At least **02** similar works of costing not less than **INR 232.00 Lakh** in two different organizations.

or

(iii) At least **03** similar works of costing not less than **INR 185.00 Lakh** in three different organizations.

(Copy of Work orders and respective completion certificates from the client to be submitted).

h) The bidder should have a **solvency certificate of INR 1,85,00,000.00** issued by his banker within the period of the last **one** Year.

i) At least one of the qualifying projects has to be executed for any Central/State Government organization/Institute/University, or any Public Sector Unit.

j) Bidder should submit a list of at least **three** clients along with the name and contact number of their representatives. Copy of the certificate of appreciation from the client if any.

k) Either the Registered Office or a Branch Office (fully working) with availability of staff of the bidder should be located in the territory region of MMRDA. **(Submit the valid office address proof and the list of staff full time available in the office).**

Bidders must submit documentary proof in support of meeting each of the above minimum qualification criteria. A simple undertaking by the bidder for any of the stated criteria will not suffice the purpose. All

documentary proof must be listed on the letter pad of the company and enclosed in a cover, to be submitted along with the qualification bid (Email-1) duly stamped and signed by the authorized person of the agency.

- **Information to be furnished by the bidder:**

Sr. No.	Item	Information to be filled by Bidder
1	Name of the bidder	
2.	Address	
2	Telephone Number: Office /Residence: Mobile Number: Fax No. E-Mail address-	
3	Details of Registration (number & date)	
4	Month and Year in which the firm / company was formed/ incorporated.	
5	Type of organisation (Sole Proprietor, Partnership, Pvt Ltd., Public Ltd., etc.)	
6	Enclose copy of CoI, partnership deed, Articles of Association (in case of firm)	
7	Average Annual Turnover of Last Three Financial Year (attached audited balance sheet & profit & Loss account)	FY 2022-23: FY 2023-24: FY 2024-25:
8	Bank Account Details	A/C No. Bank Name: IFSC:

Date : Signature of the Bidder with seal

SECTION - 'F'

TECHNICAL BID

1. GENERAL:

The Contractor shall include in his rates for all the items listed in this Section.

1.1 Contractor to Inspect Site:
The Contractor shall visit and examine the work site and satisfy himself as to the nature of the existing roads or other means of communications, the extent and magnitude of the work and facilities for obtaining materials and shall obtain generally his own information on all matters affecting the execution of the work. No extra charge made in consequence of any misunderstanding or incorrect information on any of these points or on the ground of insufficient description will be allowed. All expenses incurred by the contractor in connection with obtaining information for submitting this Quotation including his visits to the site or efforts in compiling the bid shall be borne by the bidder and no claims for reimbursement thereof shall be entertained.

1.2 Access to site:
The Contractor is to include in his rates for forming access to the site, with all temporary roads and gangways required for the works.

1.3 Setting out:
The Contractor shall set out the building in accordance with the plans. All grid/ centre lines shall be pegged out to the satisfaction of the Architects. The contractor shall be responsible for the correctness of the lining out and any inaccuracies are to be rectified at his own expense. He will be responsible for taking ground levels of the site before setting out and recording them without any extra charge.

The Contractor shall construct and maintain proper benches at the intersection of all main walls, columns etc., in order that the lines and levels may be accurately checked at all times

1.4 Treasure Trove:
Should any treasure, fossils, minerals, or works of art of an quarial interest be found during excavation or while carrying out the works, the Contractor shall give immediate notice to the Institutes of any such discovery and shall make over such finds to the Employer.

1.5 Access for Inspection:
The Contractor is to provide at all times during the progress of the works and the Maintenance period proper means of access, with ladders, gangways etc. and the necessary attendance to move and adapt as directed for the inspection of measurement of the works by the Engineers of their representatives.

1.6 Attendance upon all Trades:
The General Contractors shall be required to attend on all the Tradesmen or Sub-Contractors/Contractors appointed by the Employer for Water Supply and Sanitary, Electrical Installation, Air-conditioning, Security Equipment, Hardware, Telephone and other Specialist Contractors. The rates quoted shall be inclusive of all attendance and also allow the other contractors, appointed by the Employer, use of his scaffolding and retain until such time the relevant sub-Contract works are completed.

1.7 Water supply:
Potable & Construction Water shall be arranged by the contractor at his expense and the Institute shall not be responsible for the supply of the same, The contractor while quoting has to include the cost towards the same in the rates quoted and no extra payment shall be made towards the same.

1.8 Electric Supply:

Electric connection shall be given by the client at one point; the contractor should make his provision for drawing the electricity from that point at his cost. A meter shall be installed at one point and the electricity used shall be measured and billed as per the prevalent electricity board rates plus Administrative charges of the Institute as mutually decided.

1.9 Caretaker and Watchmen:
The Contractor, from the time of being placed in possession of the site, must make arrangements for watching, lighting, and protecting the work, all materials, workmen, and the public by day and night on all days, including Sundays and Holidays at his own cost.

1.10 Storage for Materials:
The Contractor shall provide for all necessary sheds of adequate dimension for storage and protection of materials like cement, lime, timber, and such other materials, including tools and equipment, which are likely to deteriorate by the action of sun, wind, rain, or other natural causes due to exposure in the open. For cement, the contractor shall arrange for leak proof go down of sufficient size to store not less than 3 months requirement of cement.

All such sheds shall be cleared away and the whole area left in good order on completion of the contract to the satisfaction of the Institute's Engineer.

All materials that are stored on the site, such as bricks, aggregates, etc., shall be stacked in such a manner as to facilitate rapid and easy checking of quantities of such materials.

1.11 Cost of Transporting:
The Contractor shall allow in his cost for all transporting, unloading, stacking, and storing of supplied of goods and materials for this work on the site and in the places approved from time to time by the Engineers. The Contractor shall allow in his price for the transport of all materials controlled or otherwise to the site.

2. SPECIFICATIONS:

a) INDIAN STANDARDS AND CODES OF PRACTICE

The book of specifications and the various sections therein are intended for a particular application to the tests/works under the contract. However, the given specifications may not cover all the tests. Such tests, which are not covered in the specifications, shall be in accordance with the latest and most current revisions of standards and codes of practice published by the **Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Jafar Marg, New Delhi,** and available through their local branches.

In case of conflict between the Indian standards and the specifications included in the contract documents, the more stringent shall prevail.

Related documents and their precedence

The items in specifications should be in conjunction with the relevant drawings, bill of quantities, general and special conditions of contract. In case of conflict between the specifications and other documents, the precedence shall be in the following order in priority: 1) special conditions of contract 2) bill of quantities 3) drawings 4) specifications 5) general conditions of contract

b) TESTING & INSPECTION

The engineer may issue instructions requiring the contractor to open up for inspection any work covered up or to arrange for or carry out tests for work and the cost of such opening up or testing shall be borne by the contractor & shall be in accordance with the provisions of this contract.

c) QUALITY CONTROL

- GENERAL

The contractor shall provide and maintain an effective contractor quality control (CQC) program and perform sufficient inspections and tests of all items of work, to ensure compliance with contract documents. Includes surveillances and tests specified in the technical sections of the specifications. Furnish appropriate facilities, instruments, and testing devices required for the performance of the quality control function. Controls must be adequate to cover construction operations and be keyed to the construction sequence.

- LATEST DOCUMENTS

The contractor's quality control system shall provide for procedures to ensure that the latest version of contract documents and instructions required for testing and inspection and have them available at the site at all times for use by the contractor's staff.

- SCAFFOLDS AND LADDERS

Scaffolds and ladders used during the course of work shall be in accordance with IS: 3696 Part 1 and Part 2.

The scaffolding shall be designed and erected by the contractor in accordance with the requirements of the work, by experienced workers. All scaffolding material shall be in good serviceable condition and assembled to be stable in the conditions of the work being performed.

- MECHANICAL EQUIPMENT

Do not use mechanical equipment without the prior approval of the institute's engineer.

Do not use gas cutting and electric welding or cutting without the prior approval of the institute's engineer. Take special precautions to prevent fire if permission is granted for gas and electrical cutting and welding.

d) THE MAIN CONTRACTOR

- RELATIONSHIP WITH THE CLIENT

A close relationship and continuous interaction must be maintained with the client and the Managers of the contractor. The client does have specific safety and health requirements to be observed and co-operation with his Project Managers or other representatives, throughout the contract is essential. The prospective contractors are given information on which to base their tenders and at the Tender Stage, the prospective contractors are expected to understand fully the Scope and Design Intent of these provisions.

- PLANNING

Detailed planning should take the following matters into account

- Knowledge of hazardous operations.
- Requirement for equipment to ensure safe working, or ease of handling.
- The sequence of work and its phasing between contractors, to minimize the possibility of one contractor placing another contractor's men at risk.

- The need to provide information, instruction and appropriate training, both on general site safety and on hazards specific in the site.
- The need for fire precautions and emergency procedures.

- Site security and foreseeable risks to the public, including the need for directional and warning signs.
- Safe access across the site for persons. Thought should be given to arrangement for keeping the site tidy, accommodation for site staff, welfare, first aid and other facilities.
- The provision of safe places of work at different stages of the job including the provision of scaffolding for a number of sub/works contractors.

- CO-ORDINATION

The site Manager must be totally responsible for compliance with health and safety code. The Construction Manager must take suitable arrangements to ensure the effective co-ordination of the work of with other contractors on site. He should ensure that he is kept informed on a day to day basis, of progress and problems, which arise. Clear lines of communication should be set up between each contractor and the Safety Officer of the Main Contractor. Operatives must also know whom to contact over safety and health matters requiring action or a decision. Such effective co-ordination will be enhanced by ensuring that 'safety and health' figures prominently on the agenda of regular project meetings. Weekly report on safety must be submitted to the Project Controller in every Project Meeting.

e) NON-COMPLIANCE OF SAFETY AND HEALTH PROVISIONS

The Compliances of the Safety and Health provision are of utmost important to the Client. The prospective contractors must do that the client will have a serious view of any non-compliance report of Safety Committee. Based on Safety Committee's report, the Client has right to order stoppage of work till rectification is carried out to the satisfaction of the Safety Committee and all stoppages on this account will be at the entire risk, costs and consequences of the Contractor.

f) ACCIDENT PREVENTION ORGANISATION

FIRST AID KIT

Regardless of the number of employees there must be at least one first aid box on site. Every first aider and occupational first aider should have easy access to first-aid equipment, and provision should be made for every employee to have reasonably rapid access to first aid. Each box should be placed in a clearly identified ad readily accessible location and contain a sufficient quantity of suitable first aid materials and nothing else. Boxes and kits should be checked frequently to ensure they are fully stocked, and all items are in a usable condition. Sufficient quantities of each item should always be available in every first aid box or cabinet. The first aid box or cupboard should protect the contents from dampness and dust and be clearly marked with a white cross on green background.

g) FIRE PREVENTION

Electrical wiring equipment for heating or power purposes must be installed in compliance with the requirements. Internal combustion engine powered equipment must be located with exhausts well away from combustible materials. Smoking is to be prohibited in the vicinity of fire hazards, and such areas must be conspicuously posted. Care shall be taken properly to ground nozzles, hoses, or steam lines used in hazardous tanks or vessels.

h) PERSONAL PROTECTION

Workers are often reluctant to use protection equipment. Such items should not only be suitable for their purpose but also be as comfortable as possible and acceptable to the workers concerned. Only then can efforts to ensure that equipment is worm or used prove successful.

All necessary personal safety equipment's (like Helmet, Safety belts, gloves, masks, goggles, etc.) as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use, and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

* Those engaged in handling any material, which is injurious to eyes, shall be provided with protective goggles.
* Those engaged in welding works shall be provided with welder's protection eye-shields.
* The contractor shall not employ men below the age of 18 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following precautions shall be taken:

(i) No paint containing lead or lead products shall be used except in the form of paste or ready.
(ii) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.
(iii) The contractor to workmen shall supply overalls and adequate facilities shall be provided to enable working painters to wash during and in cessation of work.

i) HAND & POWER TOOLS

- Hand and power tools must be maintained in a safe condition, whether furnished by the contractor or by the employee. When power-operated tools are designed to accommodate guards, they must be equipped with appropriate guards when in use. Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains and other moving parts of equipment must be guarded if the parts are exposed to contact by employees.
- All hand-held power tools must be equipped with a constant pressure switch that shuts off when the pressure is released. Electric power-operated tools shall be of the approved double insulated type, or grounded in accordance with good electrical practice. Pneumatic power tools must be secured to the hose or whip by positive means. Safety clips or retainers must be maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- Pneumatically driven nails, staplers, and similar equipment provided with automatic fastener feed that operate at more than 100 psi pressure at the tool must have safety devices on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in direct contact with the work surface.
- Hoses shall not be used for hoisting or lowering tools, and hoses exceeding ½ inch inside diameter must have a safety shutoff at the source of supply to reduce pressure in case of a hose failure.
- All fuel-powered tools must be stopped while being refueled, serviced, or maintained.
- Only trained employees may be allowed to operate a powder actuated tool. Such tools must be tested each day before loading to see that the safety devices are in proper working condition, in accordance with manufacturer's recommended test procedure. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employee, and hands shall be kept clear of the open barreled end. Fasteners shall not be driven into very hard or brittle materials such as cast iron, glass block, face brick, hardened steel, or hollow tile.
- For driving into materials that are easily penetrated, appropriate backing must be available to prevent the pin fastener from passing completely through.
- All employees using abrasive wheels must use eye protection, and other tools must be operated using appropriate personal safety equipment.

j) LADDERS

Use of Ladders and Folding Step-Ladders

- This regulation applies to all ladders and pairs of steps, but not roof ladders and crawling boards.
- Ladders Must:

i) be fixed near the top if practicable, or near the bottom if not suspended; they must be secure.

ii) be placed (except when suspended) on a firm level base; they must not stand on loose packing (e.g. bricks).

iii) be intermediately secured, where necessary, to prevent swaying and sagging, and

iv) be supported, or suspended, equally on each stile.

- If a ladder, standing on the ground, cannot be fixed to prevent slipping, then someone must hold it at the base when it is being used.
- A ladder which is not more than 3 m in length, need not be fixed or footed, provided it is securely placed so as to prevent it from slipping or falling. This exemption does not apply to ladders which are used as a means of communication between one working place and another, or to suspended ladders.

- Ladder must:

i) Extended at least 1.05 m above any landing place beyond the highest rung from which a person may be working or have a nearby handhold of equivalent height.

ii) To be placed so that there is space behind each rung for a proper foothold (e.g., no rung should coincide with a scaffold tube).

k) ANTI-MALARIAL PRECAUTIONS

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer in charge, including the filling up of any borrow pits which may have been dug by him.

l) SAFETY CODE

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

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

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

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

v) The excavated material shall not be placed within 1.5 meters of the edge of the trench or half of the depth of trench whichever is more. All trenches and excavations shall be provided with necessary fencing and lighting.

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

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

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

ix) Those who engage in welding work shall be provided with welder's protective eye shields and gloves.

- No paint containing lead or lead products shall be used except in the work of paste or readymade paint.

- Suitable face masks should be supplied for use by the workers when the paint is applied in the form of spray or surface, having lead paint dry rubbed and scraped.

x) Overalls shall be supplied by the Contractor to the painters, and adequate facilities shall be provided to enable the working painters to wash during the period of cessation of work.

xi) Hoisting machines and tackle used in the works, including their attachments, anchorage, and supports, shall be in perfect condition.

xii) The ropes used in hoisting or lowering material or as a means of suspension shall be of durable quality and adequate strength and free from defects.

3. SCOPE OF WORK:

The detailed scope of work and Specifications with estimated quantities are attached as a separate Bill of Quantities attachment & the bidding agency hereby agrees to have understood the same & shall quote the rates in the attached Bill of Quantities in conjunction with the stipulations of this Tender Document. The scope is included with the necessary staging work.

Place :

Date : Signature of the Bidder with seal

PARTICULAR SPECIFICATIONS
PART-I

SECTION I: DEMOLITION, DISMANTLING AND MODIFICATIONS DURING CONSTRUCTION OF BUILDING INTERIORS

GENERAL

SCOPE OF WORK

Work included:

This section covers the requirements of works involving demolition and/or dismantling parts of building interiors not involving the structure or any part of the building that contributes to the integrity and stability of the building

This section includes preliminary works in preparation for demolition such as obtaining permits; disconnection and/or controlled operation of building services; precautionary measures for the safety of the building, its occupants and workers.

This section includes demolition of non-load-bearing masonry and concrete walls; ally types of partitions and wall cladding; doors and windows; suspended ceiling; wall and floor finishes.

This section includes the dismantling of built-in cabinets, counters, furniture and fixtures.

This section includes disconnection, dismantling and controlled operation of electrical systems, water supply, drainage and sanitary systems, HVAC systems and all other building services by skilled operatives competent in their respective fields.

This section includes the salvaging, retrieval and safe storage of all material as required by the contract and the transport and disposal of all unwanted material and debris.

Work excluded:

This section does not include structural demolition or modifications.

RELATED WORK SPECIFIED ELSEWHERE

Temporary works
Electrical
Water supply & drainage
HVAC

SUBMITTALS

The contractor shall submit the following to the architect for review and approval well before the commencement of work.

- Required approvals from all concerned authorities
- Proposed demolition and dismantling plan and day-to-day progress schedule showing clearly the sequence of operations for disconnection of building services, controlled operation of services to retained and safety precautions. This shall be accompanied by description of procedures proposed to be followed.
- Equipment proposed to be used for demolition and dismantling.
- Proposals for temporary works to partition and protect adjacent or nearby areas in use, including dust control and clean-up procedures.

- Proposal for temporary storage of salvaged material and for debris to be transformed off-site.

CONTROL OF PROCEDURES AND SAFETY

The contractor shall devise and be responsible for all procedures to ensure the safety of the building, the workers and the other occupants during the demolition and dismantling work. The work shall at all times be under the direct supervision of experienced foremen under the overall supervision of the contractor's site engineer.

HANDLING, STORAGE, TRANSPORTATION, AND DISPOSAL

Handle and store materials retrieved from the demolition and dismantling in accordance with IS:7969. Whenever there is a conflict in the requirements of IS:7969 and the provisions herein, the more stringent of the specifications shall apply.

Store debris and salvaged material separately in designated places approved by the submittals procedure described above. All salvaged material shall be classified and stored separately by categories agreed upon prior to commencement of demolition.

Do not pile up material in a manner that will cause the structure to be overloaded. Stack material so that the stacks are stable and do not cause obstruction to movement.

Do not allow debris to accumulate beyond the capacity of the approved area for temporary storage. Do not dump debris in public rights-of-way, in private property without the owner’s consent, in municipal garbage receptacles etc. The contractor shall dispose of debris only at dumping grounds approved by the local authority in A manner not objectionable to the authority.

Transport debris to the approved dumping grounds at times permissible by law and acceptable by local practice. Take precautions to avoid spillage of debris from the transport vehicle en-route.

MATERIALS AND PRODUCTS

SCAFFOLDS AND LADDERS

Scaffolds and ladders used in the demolition and dismantling shall be in accordance with IS:3696 Part 1 and Part 2.

The scaffolding shall be designed and erected by the contractor in accordance with the requirements of the work, by experienced workers. All scaffolding material shall be in good serviceable condition and assembled to be stable in the conditions of the work being performed.

MECHANICAL EQUIPMENT

Do not use mechanical equipment without the prior approval of the architect.

Do not use gas cutting and electric welding or cutting without the prior approval of the architect. Take special precautions to prevent fire if permission is granted for gas and electrical cutting and welding.

EXECUTION

GENERAL

Survey and mark out clearly the portions that are to be demolished or dismantled. Proceed with demolition and dismantling strictly in conformance with the plans, sequence, schedules and procedures proposed by the contractor and approved by the architect.

Proceed with work only in the presence and under control of skilled supervisors.

Do not proceed with work if latent conditions contrary to expectations or assumptions are encountered as work proceeds. Do not proceed with work if any part of the building assumed to be non-structural and non-load-bearing is discovered or suspected to be structural and contributing to the stability of the building. Report to the architect and obtain approval to proceed further.

Maintain in a journal with serially numbered pages, inventories of all salvaged items as the work proceeds.

WATER SUPPLY AND SANITATION PIPES, FIXTURES AND FITTINGS

Dismantling of water supply, drainage and sanitary installation shall be carried out under the supervision of a licensed plumber, employing competent skilled workers.

Coordinate dismantling work with related permanent work to be installed, if any.

Shut off water supply and drainage pipes by closing valves or by providing plugs to isolate the systems to be dismantled from those to be retained. Ensure that areas in use are not disturbed during the progress of work by providing temporary service connections. If possible complete and protect proposed permanent modifications before commencing dismantling and demolition work.

Fixtures and fittings shall be removed only by skilled technicians to salvage them with minimum damage. Dismantle in the following sequence:
- Fittings such as faucets, showers, taps, valves, meters, gauges etc.
- Fixtures such as wash basins, WC's, urinals, pumps etc.
- Pipes, tanks, and heavy equipment
- Brackets, supports, hangers and foundations

Complete dismantling of water supply, drainage and sanitary installation before commencing demolition of walls and partitions, flooring, ceiling etc. Closely coordinate the works if this is not practically possible.

ELECTRICAL

Dismantling of electrical installation shall be carried out under the supervision of a licensed electrical contractor, employing competent certified electricians.

Carefully survey the entire existing system and coordinate dismantling work with related temporary permanent works, if any. Modify the existing system, if required before commencing dismantling work to ensure that the functioning of systems outside the demolition areas are not affected.

Shut off and isolate electric supply to the demolition and dismantling area. Take precautions to ensure that the disconnected circuits may not be accidentally re-energized.

- Disconnect supply cables and isolate all distribution boards within the work areas. Disconnect and remove the distribution boards. Provide temporary service connections to the work areas from a temporary DB fed by an exclusive cable tapped from a board outside the work area with an isolation switch close to the temporary DB. Do not provide temporary services through any existing circuits in the areas to be demolished.
- If DB and circuits located within the demolition areas cannot be disconnected or diverted, they shall be clearly marked out and identified with cautionary signs to distinguish them from others that are to dismantled.
- Have a skilled electrician on standby.
- Fixtures and fittings shall be removed only by skilled technicians to salvage them with minimum damage.

- Complete dismantling of electrical installation before commencing demolition of walls and partitions, flooring, ceiling etc.

OTHER SERVICES

Carefully survey each of the existing systems in its entirety and coordinate dismantling work with related temporary and permanent works, if any. Modify the existing system, if required, before commencing dismantling work to ensure that the functioning of systems outside the demolition areas are not affected.

Systematically shut off and isolate each system from the demolition and dismantling area. Take precautions to ensure that the portions to be retained are clearly marked out and identified with cautionary signs to distinguish them from others that are to dismantle.

Follow a sequence of dismantling by which valuable equipment, fittings and other material are recovered with minimum damage.

Complete dismantling of all services before commencing demolition of walls and partitions, flooring, ceiling etc.

SECTION II: CAST IN PLACE PORTLAND CEMENT CONCRETE

GENERAL

SCOPE OF WORK

Work included

This section cover the requirements for supply of materials, mixing, forming, placing, compacting, finishing, jointing, curing and all other works as required for cast-in-place concrete.

The scope of work includes testing of concrete as required by this specification.

Work not included

Concrete reinforcement

RELATED WORK SPECIFIED WORK ELSEWHERE

Concrete reinforcement

Metal decks

QUALITY CONTROL

The contractor shall be fully responsible for quality control inspection and testing. All concreting operations shall be at all times under the supervision of a qualified and experienced engineer.

The quality control supervisor shall be responsible for the following regular tests and inspection:

- Consistency measurements such as slump, air-content, temperature, cement content etc.
- Taking and testing of specimens from concrete pours and having them tested in accordance with the codes and standards.
- Inspection and approval of framework and reinforcement
- Inspection and approval of batching and mixing facilities
- Inspection and approval of concrete placement, consolidation, finishing and curing operations.

- Inspection and approval of form removal.
- Maintaining complete, up to date records, throughout the contract of all concreting operations, inspection, tests etc.
- The standard age of concrete for tests is 28 days, but seven day test may be used to predict probable 28-day strength, provided that the relation between 7-day and 28-day test strength is established and the 28-day tests are subsequently performed for confirmation. The acceptance criteria for concrete shall be as set out in NBC, Part VI, section 5, table 5.
- Any concrete, which is deemed by the architect not to comply with this specification shall be broken and replaced, including all reinforcement.

TRANSPORTATION, HANDLING AND STORAGE

Cement and dry admixtures shall be stored in dry, water proof, well ventilated housing or silos. Liquid admixtures shall be stored in clean, isolated containers.

Packaged cement
Packaged cement shall be delivered to the mixing site in original moisture proof, sealed packages, which shall be labeled with the weight, name of manufacturer, brand and type specified. Cement received in broken or damaged packages shall not be used.

Packages of cement, which vary in weight by +/- 3% shall not be accepted.

Bulk cement
Bulk cement shall be stored separately from packaged cement. Bulk cement shall be stored in dry, weather tight, well ventilated bins with provisions for prevention of moisture absorption or the intrusion of foreign matter.

Facilities for sampling of cement shall be proved at the weighing hopper, or at the feed line immediately before entering the hopper.

Different brands of cement, or the same brand of cement from different sources, shall not be used without prior notification by the contractor.

Aggregates
Aggregates shall be transported and stockpiled separately according to their sources and gradations. Aggregates shall be handled in a manner, which will prevent segregation and contamination with earth or foreign materials.

If the aggregates show segregation, or if the different grades become mixed, the aggregates shall be re-screened before placing in the proportioning bins. Contaminated aggregates shall not be used.

Aggregates shall not be transferred directly from trunks, railroad cars or barges to the proportioning bins when moisture content or/and water absorption is such that it will affect the accuracy of the proportioning of the concrete mixture. In such cases, the aggregates shall be stockpiled until the excess moisture drains off.

Muddy or oil-leaking equipment shall not be allowed to operate on the stockpiles.

Formwork

All formwork materials that may be affected by moisture or whether shall be stored in dry, weatherproof, well ventilated housing.

All formwork material shall be handled and stored to prevent damage.

FORMWORK

Forms are designed by the contractor to have sufficient strength to carry the hydrostatic head of the concrete as a liquid without deflecting beyond acceptable limits. Besides the weight of concrete and reinforcement, the formwork shall be designed for loads and lateral pressures due to construction operations.

Maximum deflection of facing materials which reflect in concrete surfaces exposed to view shall be not greater than 1/240 of the span between structural supports.

Where necessary to maintain the tolerances indicated, the framework shall be cambered to compensate for anticipated deflections due to the weight and pressure of the fresh concrete and also due to any other construction loads.

The surface of forms is to be designed to provide the correct finish, as specified in the subsection herein.

CURING:-
Exposed Surfaces of concrete shall be kept continuously in a damp or wet condition for at least seven days from the date of placing of concrete.

Approve curing compounds may be used in lieu of moist curing with the permission of the Architect/Engineer-in-charge. Such compounds shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set.

COVER:-
To maintain the specified amount of concrete cover to the reinforcement small precast concrete blocks of grade similar to that of concrete to be placed shall be used as indicated hereunder unless otherwise specified in the drawings.

a) At each end of reinforcing bar, not less than 25mm, nor less than twice the diameter of bar.
b) For a longitudinal reinforcing bar in a beam, not less than 25mm, nor less than the diameter of the bar.
c) For a longitudinal reinforcing bar in a column, not less than 40mm nor less than the diameter of the bar.
d) For tensile, compressive, shear or other reinforcement in a slab, not less than 15mm, nor less than the diameter of the bar.
e) For Vertical or horizontal reinforcement in concrete walls not less than 15mm nor less than the diameter of the bar.
f) For reinforcement in footings, pile caps and raft foundations not less than 50mm.

ADMIXTURES:-
Plasticizers may be used in the concrete work to achieve better workability admixtures or cement containing additives (Such as accelerators, retarders, water proofing agents, etc.) shall not be used unless specified or otherwise directed or approved by the Architect/Engineer-in-charge.

COARSE Aggregate:-
The Coarse aggregate for the reinforced concrete work shall consist of crushed gravel, black trap, granite or other stone to the approval of the Architect/ Engineer-in-charge and shall be free from dust. If considered necessary by the Architect / Engineer-in-charge the aggregate shall be washed specially until an approved cleanliness is obtained. The use of laminated stone, flat or flaky material will not be permitted. The combined coarse aggregate shall in all respects be so graded as to allow 95% to 100% by weight to pass a 20mm BIS Sieve; 25% to 55% by weight to pass a 10mm BIS Sieve and 0% to 10% by weight to pass a 5mm BIS Sieve. The aggregates of different sizes shall be stored in separate stacks in clean state and free from all dirt.

The coarse aggregate where absorption of water after 24 hours immersion is more than 5% by weight shall not be used.

When required by the Architect/Engineer-in-charge tests indicated in BIS 383 shall be carried out by contractor at this cost to show the acceptability of the materials.

Stored piles of aggregate shall have good drainage, preclude inclusion of foreign matter and preserve the gradation.

FINE AGGREGATE:-

Sand shall conform to BIS: 383 and relevant portion of BIS: 515. It shall pass through a BIS: Sieve 4.75mm (3/16-B.S.) test sieve, leaving a residue not more than 5%. It shall be from natural source or crushed stone screenings, chemically inert, clean, sharp, hard, durable, well graded & free from dust, clay, shale, large pebbles, salt, organic matter, loam, mica or other deleterious matter. The sum of percentage of all deleterious materials in sand shall not exceed 5% by weight. It shall be washed, to reduce the percentage of deleterious substances to acceptable limits. Sand shall not contain any trace of salt and it shall be rejected.

The fine aggregate for concrete shall be graded within limits as specified in BIS: 383 and the Fineness modulus may range between 2.60 to 3.20.

The fine aggregate shall be stacked carefully on a clean hard dry surface so that it will not get mixed up with deleterious foreign materials. If such a Surface is not available, a platform of planks or iron sheets or brick floor or a thin layer of lean concrete shall be prepared.

The sand for plaster shall be screened & washed.

TESTING:-

All G. I. pipes and fittings may be tested to a pressure of 10.5 Kg/cm2 to ensure that pipes have proper threads and that proper materials (such as white zinc and spurnyarn) have been used in jointing. All leaky joints must be made leak- proof by tightening or redoing at contractors expense.

MATERIALS AND PRODUCTS

CEMENT

Cement shall be ordinary Portland conforming to IS: 269 and shall meet the following additional requirements:

Compressive strength
At 3 days ------- 160 Kg/Cm2 minimum
At 7 days ------- 220 Kg/Cm2 minimum

Time of setting (vicat):
Initial set ------- 30 minutes minimum
Final set ------- 5 hours maximum

COARSE AGGREGATES

Coarse aggregates shall comprise clean crushed or uncrushed gravel, crushed stone or a combination of the tree free from adherent coatings deleterious materials, organic impurities and salts in accordance with IS:383.

The coarse aggregates shall be selected, screened to various particle sizes and rinsed as necessary to meet the acceptance criteria.

The normal size of coarse aggregates used for different purposes shall be as given below:

Reinforce concrete – 20mm maximum; 4.75 mm minimum
Floor screed up to 75mm thick over existing concrete slab – 8mm maximum, 1mm minimum
Un-reinforced mass concrete – 40mm maximum; 4.75mm minimum

The coarse aggregates shall comply with the requirements set forth below:

Slake durability index using distilled water as slake fluid – 99.0% minimum
Clay lumps and friable particles – 1.0% maximum
Water absorption – 2.5% maximum
Sodium chloride – 0.03% maximum

FINE AGGREGATES

Fine aggregates shall comprise clean natural sand with rounded or sub-rounded particles free of adherent coatings, deleterious materials, organic impurities, and salts in accordance with IS:383.

Fine aggregates shall be selected, screened, and rinsed as necessary to meet acceptance criteria.

The aggregates shall comply with the requirements set forth below
Clay lumps and friable particles – 1.0% maximum
Material finer than 75 micros – 2.0% maximum
Water absorption – 1.0% maximum
Sodium chloride – 0.05% maximum

WATER

Water for rising aggregates, for in Company in the concrete and for curing shall be clean potable water free from injurious amounts of oils, acids, salts, alkalis, organic matters and other potentially deleterious substances when examined in accordance with IS:3025 and when compared with the limits specified in this specification.

The maximum permissible concentrations of chemicals and organic and inorganic solids shall be in accordance with NBC, Part VI, Section 5, paragraph 4.1.3.2. The pH value of water shall generally be between 6 and 8.

FORM MATERIALS

The selection of materials suitable for formwork shall be made by the contractor unless specified otherwise based on maximum quality consistent with the specified finishes and safety.

The use of proprietary forming systems is recommended and should be used where possible.

MISCELLANEOUS MATERIALS

Water stops to the used in water tight concrete construction joints shall be polyvinchloride (pvc) of the size and type shown on the drawing.

Other inserts and embedment shall be as shown on drawing.

Form release agents to prevent concrete adhering to formwork shall be non-staining, non-reactive, rust preventive and guaranteed to be compatible with subsequent surface applications to concrete.

CONCRETE GRADES AND MIXES

General
Controlled concrete or designed concrete mix is concrete of which the constituted proportions have been determined by preliminary tests to meet the acceptance criteria of the grade of concrete required.

Ordinary concrete or normal concrete mix is concrete of which the constituent proportions ar based on nominal mixes without preliminary tests.

Only controlled concrete shall be permitted for use in reinforced concrete and concrete used in building structures. Ordinary concrete shall generally not be used except by written approval of the architect preceded by a written request for use of ordinary concrete by the contractor giving reasons why he wishes to do so. Concrete in this specification shall always mean controlled concrete.

Grades of concrete are denoted by a designation consisting of the letter 'M' followed by a numeral indicating the 28-day cube compressive strength in Kg/cm2.

Each grade of concrete may consist of one or more 'mixes' determined by cement content, quantity and gradation of aggregates, water cement ratio, slump, type of admixtures etc.

Each mix within a grade shall be considered a specific type given an appropriate distinctive nomenclature and will require approval by the architect. The contractor shall use the approved the approved mix for approved uses.

Strength requirements of concrete

The strength requirements of concrete for the various grades of concrete shall be as given below, determined on the basis of the compressive strength of 150mm cubes at 28 days after mixing in accordance with IS: 516

Grade of concrete	**Preliminary test Comp. Strength in Kg/sqcm (min)**	**Works test Comp. Strength in (Kg/sqcm (min**
M100	135	100
M150	200	150
M200	260	200
M250	320	250
M300	380	300
M350	440	350
M400	500	400

For explanation refer NBC, Part VI, section 5, table 1.

Concrete mix proportions for ordinary concrete:

The concrete mix proportions for ordinary concrete shall be as given below:

Grade of	**Total quantity of dry**	**Proportion of**	**Qty of water**
Concrete	aggregate by volume per 50 Kg of cement being the sum of individual volumes of fine and coarse aggregates (max in ltrs)	Fine aggregates to coarse aggregates in ltrs)	per 50Kg of cement (maximum
M100	300	Generally 1:2 but	34

M150	220	subject to an upper	32
M200	160	limit of 1:1 ½ and	30
M250	100	lower limit of 1:3	27

For explanation refer NBC, Part VI, section 5, table 3and 4.

SECTION III: BURNT CLAY BRICK MASONRY

SCOPE OF WORK

Work included

This section covers the requirements for the supply of materials and workmanship for the construction of load bearing and non-load bearing burnt clay brick masonry including all types of mortar, grouting and masonry accessories.

This section includes architecturally exposed burnt clay brick masonry in association with stone masonry.

RELATED WORK SPECIFIED ELSEWHERE

Stone masonry
Cast-in-place Portland cement concrete
Concrete reinforcement
Plastering

QUALITY CONTROL

The contractor shall be responsible for the quality of the burnt clay brick masonry. The masonry work shall at all times be under the direct supervision of an experienced foreman under the overall supervision of the contractors site engineers. The bricks shall comply with I.S.1077.

EXECUTION

GENERAL

The setting and layout of masonry shall be the contractors responsibility and shall be in strict conference with the drawings.

The contractor shall accurately locate openings, returns, offsets etc. in accordance with the drawings.

The contactor shall layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings. Use of less than half size bricks at corners, jambs and other locations shall be avoided.

Cut bricks carefully to prevent disintegration and to obtain clean, sharp, un chipped edges. Cut-bricks may be used not more than twice in a straight-run course.

COORDINATION WITH OTHER WORK

The contractor shall coordinate and schedule the masonry work with other related work and trades to avoid cutting and breaking of masonry after erection and for proper sequencing.

ACCURACY AND TOLERANCES

Erect walls and columns true to line and plumb, with courses level with joints of uniform thickness and spacing. Corners, returns, jambs etc. shall be square or true to angles shown on drawings.

Acceptable tolerances are as given below:

Variation from means plan: Walls shall be constructed as true planes. When tested with a 3 meter straight edge, placed anywhere on the wall in any direction, the maximum deviation from a true plane shall be within 5mm.
Variation from plumb: Variation from plumb shall be within 5mm in 3meters height.
Variation from level: Variation from the level for any masonry course shall not exceed 6mm in any 6 meter bay.
Variation from positions: Variation from positions shall not exceed 6mm from the designated position shown on the drawing.

CONCRETE WORK
All concrete work associated with masonry shall proceed keeping pace with masonry.
Concrete lintels, sills, and stringer courses etc. shall be flush with the masonry surfaces, unless otherwise indicated.

CURING
Cure the masonry construction by continuously keeping moist for at least 7 days

SECTION – IV - JOINERY

1. **General:** The type of shutters for doors, windows, ventilators etc. viz. paneled glazed wire gauzed and flush shall be as indicated and detailed in the drawing.

2. **Flush Door shutters:** Door shutters shall be 35 mm thick flush door shutters/solid core type non decorative factory made confirming to IS- 2202 and ISI marked with block board core (confirming to the requirements as per IS-1659 1969) with internal hard wood clippings and both faces commercial ply veneered. Adhesive used shall be phenyl form aldehyde synthetic resin conforming to BWP types specified in IS-848-1974.

3. Contractor shall obtain the approval for the name of the manufacturer of the flush door shutters from the Site Engineer/Architect before placing the supply order. While asking for the approval, copy of the "Bureau of Indian Standard" letter under which manufacturer has been authorized to mark the product with ISI marking should be attached. Site Engineer and Architect before giving the approval shall ensure that the validity date of license has not expired.

4. **Testing of Flush Door Shutters**: On receipt of the shutters at site the Site Engineer or the Architect shall be entitled to get the samples of door shutters tested in any approved laboratory. From each lot of approximately 100 shutters, one shutter shall be selected at random by the Site Engineer/Architect. The cost of replacement of the door shutters selected as samples, their transportation to the laboratory and cost of testing by the laboratory shall be borne by the contractor.

5. **Glazed & Gauzed Door Shutters:** Shutters shall be 35mm thick. These shall consist of first class i.e. champ, haldu, hillock, jamun, mango wood styles, top, bottom and lock rails as per details shown on drawings. Timber to be used for these shutters shall be of good quality, seasoned of material growth and conforming to IS-4021-1963. Seasoning and ASCU treatment shall be done as per IS-402-1962. Styles and rails of shutters shall be in one piece only. Styles and rails shall be jointed to

each other by tonen or mortice at right angles. Mountings and glazing bars shall have joints and shall be shrub tanned to the maximum depth, which the size of member would permit.

6. **Wire gauge shutters:** Provisioning and fixing of wire 35mm thick gauge shutters to all external doors including main entrance door and all openable windows is in the scope of work of this contract. Wire cloth shall be securely housed in rebates by giving a right angled bend and fixing by means of suitable staples at intervals of 75mm. Over this wooden bead of specified size shall be fixed with nails, or screws, where indicated to cover the rebate fully. The space between the beading and the rebate shall be filled with putty to give it a neat finish. Exposed edges of the beads shall be rounded.

7. Door and windows shutters shall be provided as per details shown on the drawings.

8. The bottom of door shutters shall be 5mm above the finished floor level.

9. The glass panes shall be free from flaws, specks or bubbles and shall have square corners and straight edges. The glass panes shall be so cut that it fits slightly loose in the frames. The glass pane shall be fixed to the shutter with first class hardwood beading of size as indicated properly screwed to the shutter with steel nails and necessary adhesive as per details as shown on drawings.

10. Glazing to windows/doors shutters shall be as follows of quality as approved by Project Engineer &Architect.

(a) Fan light of Doors shutters : 4 mm thick plain sheet glass.
(b) Door Shutters fully glazed : 5.5mm thick plain sheet glass.
(c) Windows (openable & fixed) except for toilets: 4 mm thick plain sheet glass.
(d) Windows openable and fixed of toilets : 4 mm thick pin head glass.

NOTE: On all toilet door shutters, aluminum sheet 18 gauge bent to U shape shall be provided at the bottom of the flush shutters. This sheet shall be up to 30cm height on the inner face of the shutters and up to 20cm height on the outer face of the shutters. This shall be fixed with 12mm steel Nails.

SECTION – V – ALUMINUM DOORS, WINDOWS & VENTILATORS.

1. The Aluminium extruded sections shall conform to Designation 63400 given in IS 737-1986 and shall be of manufacturers such as JINDAL or Hindalco or INDAL or equivalent manufacturers to be approved by the Architect/ Site Engineer.

2. The Aluminium Doors, Windows, Ventilators and Glazing sections shall be anodized (anodic coating shall conform to IS 1868) as per colour approved by the Architect and Site Engineer.

3. The fabrication shall be carried out having mechanical joints, accurately machined and fitted to form hair-line joints, with the vertical and horizontal sections at the corners to meet in 45 degrees mitered. The jointing shall be either with accessories such as cleats and cleating screws or by crimping with Hydraulics Press on to heavy duty extruded Aluminium cleats. The relevant arrangement shall be got approved by the Architects. The Glazing shall be fabricated and anchored to withstand wind pressures as per the Indian Standards.

4. Before proceeding with any manufacture, Shop Drawings for each typical elevation shall be submitted for the approval of the Architect and no work shall be performed until the approval of the shop Drawings is obtained.

5. All Glazing shall be airtight and watertight, using appropriate extruded EPDM gaskets/as manufactured by Anand Lescuyer Pvt. Ltd., or equivalent; and sealant which shall be of high quality and performance requirements.

6. Each Glazing shall be tailor-made as per openings at Site. No cutting and making good of exposed grit wash plaster surfaces shall be permitted.

7. All the Aluminium sections shall be wrapped with self-adhesive non-staining thick layer of PVC tapes as Manufactured by M/s. Bhor Industries or equivalent as approved by the Architects, and shall be duly packed for avoiding scratches or blemishes to the powder coated surface of the sections till the installation is completed.

8. The frames shall be fixed to concrete/masonry /brick work with dash fasteners and the method of fixing shall be got approved by the Architects before installation. The drilling of holes for inserting the dash fasteners shall be carried out with drilling machines and the frame shall be fixed in plumb, line and level at jambs, sills and heads.

9. The perimeter gap between the outer frame and the masonry shall be sealed with poly sulphide sealant as per the make approved by the Architect.

10. **Glazing:** The glass panes shall be free from flaws, specks or bubbles and shall have square corners and straight edges. The glass panes shall be so cut that it fits slightly loose in the frames. The glass pane shall be fixed to the shutter with Aluminium beading and E. P.D.M gasket properly shaped as per the drawing. The glass panes shall be of make as specified.

SECTION VI - BUILDERS HARDWARE

1. Manger shall be provided to all doors/windows/ventilator/shutters with necessary matching screws of suitable size

2. Fittings and fixtures to all doors window and ventilators etc. shall be Aluminium anodised Matt finish ISI marked of make as specified. These shall be ISI marked where manufacturer contractor shall obtain the approval of the name of the manufacturer and brand of fittings from page of Director/Architect before placing the supply order. While asking for the approved copy of bureau of Indian Standard letter under which the manufacturer has been issued the license and authorised to make the items of builder hardware with ISI marking should be attached and one sample of each fillings of the particular brand duly ISI marked shall be given by contractor.

3. Butt hinges for doors shall be ISI marked cold rolled mild steel heavy quality of size as specified with mild steel pin and shall be oxidized finish. These shall be welded to pressed steel frames as specified.

4. Handles for window shutters shall be 75mm long & door shutters shall be 125 mm D-Type Aluminium anodised.

5. Link chain and sliding channel shall be sturdy of CP brass and shall be provided to main entrance door of all units as specified.

6. Magic eye for entrance door shall be wide-angle best quality. This shall be fixed at 1400mm height from finished floor level.

7. One sample piece of each fitting shall be produced for approval of Site Engineer /Architect. The bulk supply order shall be placed by the contractor only after approval is accorded by Site Engineer/Architect.

Schedule of Builder's Hardware: Schedule of Hardwares/fittings to door, window and ventilator shutters shall be as per drawing.

9. **Mortice Latch (Vertical Type):** Mortice latch (Vertical type) shall confirm to IS 5930-1970. Specification for mortice latch (Vertical type). These latches shall be capable of being operated inside and outside and shall be provided with a pair of Aluminium anodized lever handle fitted on the handle plate in order to close the door. The latches shall be of brass alloy. Faceplate shall be provided in front of the ease plate; size of latch shall be 65mm.

10. **Mortice Locks:** These shall conform to IS 2209-1976. Specification for Mortice locks (Vertical Type). These shall have body, body covers, cast plate, faceplate, skirting plate lever, follower of cast brass and locking bolt and latch bolt extruded brass. Lever spring and latch spring shall be of phosphor bronze. The locks shall be supplied with 2 Nos. stainless steel keys. Locks shall be 6 lever. The lock shall be easy working with lever and shall be capable of being opened with from both inside and outside and shall be provided with a pair of Aluminium anodized lever handles on the handle plate in order to close the door from both side.

11. **Hydraulic Door Closer (Floor Type):** The Contractor shall provide double acting Hydraulic Door Closer Model No. F-32, Cat No.1204 with SS Plate, Capacity to carry door weight upto 380Kg of EVERITE brand or Cat No. OFS 9621 of OPEL brand. These shall be of approved brand and manufacturer as above (Confirming to IS-6315) for Aluminium door including cost of cutting floor as required, embedding in floors and cover plate etc.

NOTE:

i) It shall insure that all builder's hardware are from one manufacturers only for the entire work, However, if due to any reason contractor progress to provide part quantity from other manufacturer approved in Para 2 above, then he may be permitted but he will have to obtain specific approval of Project Engineer/Architect for this change in brand. This will be subject to that all items and fixtures in any particular blocks shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in all of the particular blocks.

ii) Project Engineer before giving the approval of the name of the manufacturer and brand shall ensure that the validity date of license for making the fittings, as ISI marked has not expired.

iii) Those fittings which are not manufactured, as ISI marked shall also be of the one brand of which the ISI marked fittings are approved by Project Manager.

SECTION VII: CERAMIC WALL AND FLOOR TILING

SCOPE OF WORK

The tiles will be selected by the owner and the cost of tiles delivered at site will be adjusted against the allowance for this item provided in the contract documents.

The scope of work under this specification section covers the unloading of materials at site, storage and safekeeping, furnishing of all other materials, accessories, labour, tools, equipment and the installation of tiles.

RELATED WORK SPECIFIED ELSEWHERE

Stone masonry
Burnt clay brick masonry
Cast-in place Portland Cement concrete
Lath and plaster
Structural wood work

QUALITY CONTROL

The tiling shall be carried out under the direct supervision of an experienced tiller foreman who shall continuously check the work of the tiling teams to ensure stringent quality control.

COORDINATION WITH OTHER TRADES AND CONTRACTORS

The tiling work shall be coordinated with other trades and contractors. The contractor shall check and ensure that all work preceding tiling is complete before commencing the work

PROTECTION

Protect other finished work during tiling work to prevent damage and protect the finished tiling work from any damage after completion.

FLOOR AND WALL TILING AND PAVING

SCOPE OF WORK

This section covers the furnishing of all materials (other than those supplied at site by the owner) equipment and labour for floor and wall tiling and paving including but not limited to:
Marble to floors and walls
Polished granite to floor and walls
Granolithic flooring with surface hardener
Cast-in-place Portland cement concrete pavement –external.
Polished granite and marble steps & risers
The owner will provide at site the following material against allowances in the contract documents:
Marble for floors and walls cut to sizes as determined by the contractor according to site conditions.

RELATED WORK SPECIFIED ELSEWHERE

Cast-in place Portland cement concrete
Ceramic wall and floor tiles
Stone masonry

TILES

The tiles will be selected by the owner and the cost of tiles delivered at site will be adjusted against the allowance for this item provided in the contract documents

The contractor shall order take delivery and arrange for the transportation of the tiles to the site from the suppliers nominated by the owner. Costs for ordering, transportation etc. upto delivery at site will be adjusted against the allowance.

EXECUTION

LAYOUT OF TILES

Plan the layout of tiles on all continuous surfaces to ensure that:
The horizontal joints of tiles on walls are all in line.

The layout of tile pattern is in accordance with the design intent.
As far as practicable, jambs, sills and heads of windows, doors and other opening correspondent to tile joints.
Cut tiles will not be less than half tile.
At external corners the tiles may be joined with 45 degree mitered joints.
When required, floor and wall tile joints are aligned.
When floor tiles continue through adjacent rooms the joints are continuous.
At jambs, sills and heads of windows, doors and other openings the finished surface of tiles should match the construction details of the windows and doors and other openings.

PREPARATORY WORK FOR LAYING TILES OVER MASONRY OR CONCRETE

Ensure that all sub-surface installation is in place, tested and approved. Plan ahead, in coordination with all trades involved, so that the requirements of the checklist will be met.
Roughen concrete surfaces, wet the surface and apply a bond coat of rich cement-sand slurry.

Wet masonry surfaces.

Apply a leveling coat of cement or cement lime plaster as specified for plastering in a single coat to a minimum thickness of 15mm and score the surface as a bond for subsequent application. Allow the surface to set and proceed with the application of tiles.

QUALITY CONTROL

The contractor shall be responsible for the quality of materials supplied by him and all workmanship. The work shall be executed under the direct supervision of competent foreman and the quality control staff of the contractor. All defective work shall be replaced by the contractor.

COORDINATION WITH OTHER TRADES AND CONTRACTORS

The contractor shall schedule and coordinate the work under this specification with other trades and contractors to prevent avoidable cutting and patching after installation.

MATERIALS AND PRODUCTS

MARBLE

The marble slabs for use in flooring shall be un-polished 3.4” uniformly thick slabs selected by the owner / architect against the allowance in the contract documents. The sum allowed in the contract shall be inclusive of taxes for delivery within the municipal limits of Mumbai.
The marble slabs for use in wall cladding shall be tin-oxide polished ¾” uniformly thick slabs selected by the owner / architect against the allowance in the contract documents. The sum allowed in the contract shall be inclusive of taxes for delivery within the municipal limits of Mumbai.
The contractor shall place orders and take delivery from the owners nominated supplier and arrange for the transportation and delivery to site. All costs for ordering, taking delivery and transportation from within the

municipal limits of Mumbai to the site shall be adjusted against the contractors rate outside the allowance in the contract.
The contractor shall cut the basic slabs to the sizes and shapes required.

POLISHED GRANITE TILES AND SLABS

The granite tiles and slabs for use in flooring shall be polished ½" or ¾" uniformly thick slabs selected by the owner / architect against the allowance in the contract documents. The sum allowed in the contract shall be inclusive of taxes for delivery within the municipal limits of Mumbai.
The granite slabs for use in wall cladding shall be polished ¾" uniformly thick slabs selected by the owner / architect against the allowance in the contract documents. The sum allowed in the contract shall be inclusive of taxes for delivery within the municipal limits of Mumbai.
The contractor shall place orders and take delivery from the owners nominated suppliers and arrange for the transportation and delivery to site. All costs for ordering, taking delivery and transportation from within the municipal limits of Mumbai to the site shall be adjusted, against the contractors rate outside the allowance in the contract.

The contractor shall cut the basic tiles and slabs to the sizes and shapes required.

GRANOLITHIC FLOORING

Cement shall be ordinary Portland cement.
Coarse and fine aggregate shall be clean washed quartz of grading between 6mm and 100 microns.
Water shall be clean potable water free of salts, organic, mineral or other deleterious material.
Surface hardener and sealer shall be of an approved manufacturer specializing in the manufacture of concrete additives and treatment materials,

CAST-IN-PLACE PORTLAND AND CEMENT CONCRETE PAVEMENT

Concrete shall be as specified in the specifications in the specification section titled 'CAST-IN-PLACE PORTLAND CEMENT CONCRETE'.

Steel reinforcement shall be as specified in the specification section titled 'CONCRETE REINFORCEMENT'.

SETTING BED FOR FIXING TILES AND SLABS

Setting bed for fixing tiles and slabs shall be cement / sand mortar as specified in specification section titled 'STONE MASONRY'

JOINT GROUT

Joint grout shall be finely ground marble dust mixed with White Portland Cement and colour pigment to match colour of tile or as directed by the architect.

CUSHIONING

Cushioning below setting bed shall be clean river sand.

EXECUTION

CONSTRUCTION AND EXPANSION JOINTS

Floors shall be laid with construction joints cut through the setting bed to the base at regular intervals in every third joint in both directions.
Expansion joints shall be provided at intervals varying between 5 meters to 6 meters directions as indicated on drawings or instructed by the architect on site.
Granolithic and cast-in-place concrete paving shall be installed in preplanned alternatively bays of approx 4 meters x 4 meters as indicated on drawing or instructed by the architect at site.
Expansion joints shall be filled with a flexible joint grout and finished neatly.

INSTALLATION OF MARBLE FLOORS

Install as per details given on drawings.
Spread sand cushion to obtain the required slopes and lightly moisten by sprinkler water.
Install the setting bed of cement / sand mortar to an even thickness and dab on a thin coating of neat cement paste.
Place the pre-soaked title and firmly tamp into position with a wooden mallet, level the surface with respect to the adjacent tiles and the required finish level. Adjust joint thickness by means of spacers. Cut through setting bed, to bed at construction joints as previously explained.
Clean off excess cement paste from joints as required for grouting.
Trim tiles to suit junctions with walls and other trimming lines.
After the setting bed has reached final set, clean the surface with a damp cloth without excess water. Rake and clean joints in preparation for grouting.
Grout the joints with a thick slurry of a grouting and ensure that the joints (except expansion joints) are filled completely with grout.
Cure the installation with clean water by ponding for a period of 7 days.
After the grout has been cured and hardened; commence grinding of the surface, to level out all unevenness of joints. Use a mechanically operated rotary grinder polishing machine using abrasive stones of appropriate grade.
After the surface has been ground level, clean the surface by flushing with water two or three times to clean the surface of all grinding slurry. When excess water has dried off and the surface is in a moist conditions, reapply grout, rub into the entire surface and build up an even thickness throughout. Cure for minimum period of four days by ponding.
After the grout has hardened, polish the surface with a mechanically operated rotary grinder / polisher using finer abrasive stones until the surface is smooth and even, to receive sealer and polish. During the final grinding operation, sprinkle the surface lightly with powdered oxalic acid crystals to remove minor score and scratch marks. Clean of all traces of acid by through flushing with water.
Project the floor from on-going construction activities until final sealing and polishing.
Prior to substantial completion and handling over, apply an approved sealer and then polish and buff the surface to a fine sheen using a silicon wax polish.
Tolerance : The finished surface when tested with a 3 meter long straight edge placed anywhere in any direction shall not show a gap of more than 3mm. Provided that no abrupt differences are discernible.

INSTALLATION OF POLISHED GRANITE FLOORS

The flooring shall be from pre-polished granite tiles or slabs cut to size and shape required with their edges ground smooth.
Spread sand cushion to obtain the required slopes and lightly moisten by sprinkling water.

Install the setting bed of cement / sand mortar to an even thickness and dab on a thin coating of neat cement paste.
Place the pre-soaked title and firmly tamp into position with a wooden mallet, level the surface with respect to the adjacent tiles and the required finish level. Adjust joint thickness by means of spacers. Cut through setting bed, to bed at construction joints as previously explained.
Clean off excess cement paste from joints as required for grouting.
Trim tiles to suit junctions with walls and other trimming lines.

After the setting bed has reached final set, clean the surface with a damp cloth without excess water. Rake and clean joints in preparation for grouting.
Grout the joints with a thick slurry of the grouting mix and ensure that the joints (except expansion joints) are filled completely with grout. After the grout has dried, thoroughly clean the surface to remove all traces of grout from the surfaces.
Project the floor from on-going construction activities until final sealing and polishing.
Prior to substantial completion and handling over, apply an approved sealer and then polish and buff the surface to a fine sheen using a silicon wax polish.
Tolerance : The finished surface when tested with a 3 meter long straight edge placed anywhere in any direction shall not show a gap of more than 3mm, provided that no abrupt differences are discernible.

INSTALLATION OF POLISHED MARBLE AND KOTAH STONE WALL CLADDING

The cladding shall be form pre-polished marble or granite slabs cut to the size and shape required with their edges ground smooth.
Cladding shall be installed using dabs of neat cement paste behind the cladding.
Align surfaces and joints accurately using temporary plaster of paris dabs to keep tiles or slabs in place till the setting dabs are fully set and hardened. Grout the voids behind the tile with cement / sand slurry. When the slurry has set, remove the excess slurry and plaster of paris dabs and clean the surface and lightly rake the joints in preparation for grouting.
Grout the joints and point to a neat finish and thoroughly clean the surface to remove all traces of grout from the tile surfaces.
Apply surface sealer and polish prior to handover.

INSTALLATION OF GRANOLITHIC FLOORING

The installation of granolithic flooring shall generally be in according with the specification section titled 'CAST-IN-PLACE PORTLAND CEMENT'
The finish shall be unformed finish type U3.
The surface hardener and sealer shall be applied in accordance with the manufacturers specifications.

PROTECTION AND CLEANING

All work covered by this specification shall be protected after installation and handed over in good condition after thorough cleaning

SECTION – VIII - WALL FINISHES

1. **General**

a) **Scope:** This section shall cover internal and external plastering/rendering works as shown in the drawings.

b) **Mortar:** The mortar of specified mix shall be used.

c) **Scaffolding:** Stage scaffolding shall be provided for plastering work as per standard practice and as directed by Architect/Site Engineer. This shall be independent of the walls.

d) **Preparation of Surfaces:** Joints of brickwork wall s hall be raked-out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scraping, shuttering imperfections of all concrete shall be roughened by hacking with chisel and all resulting dust and loose particles cleansed and the surface shall be thoroughly hacked or bush hammered to the satisfaction of Architect/Project Engineer. The surface shall be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

e) **Approval of Architect/ Project Engineer to be taken:** No plastering work shall be started before all conduits, pipes fittings and fixtures clamps, hooks etc. are embedded, grouted and cured and all defects removed to the satisfaction of Architect/Project Engineer. Special approval shall be taken from Architect/Project Engineer before starting each plastering work. No cutting of finished plaster shall be allowed. No portion shall be left out initially to be patched up later on.

f) **Mixing:** The ingredients shall be mixed in specified proportions by volume. The mixing shall be done in a mechanical mixer on water-tight platform. The cement and sand shall first be mixed thoroughly dry in the mixer. Water shall then be added gradually and wet mixing continued for at least a minute until mortar attains the consistency of a stiff paste and uniform colour. Mortar shall be used within 30 minutes of addition of water. Mortar which has partially set shall not be used and removed from the site immediately.

2. **Internal Surfaces**

i) Plastering shall be started after the completion of ceiling plaster from top and gradually worked down towards floor. It shall not, at any place be thinner than as specified. To ensure even thickness and a true surface plaster of about 15cm x 15 cm shall be first applied horizontally and vertically at not more than 2m interval over the entire surface to serve as gauges. The mortar shall then be applied to the wall/surface between the gauges and finished even. All corner junctions and rounding shall be truly vertical or horizontal and finished carefully. Inspecting the work at the end of the day plaster shall be cut clean to line, where recommencing the plastering, edge of old work shall be crapped, cleaned and wetted with cement putty before restarting plastering

ii) Cement plastering internally on all internal surfaces including soffits of RCC slabs, chajjas, lintels, alround shelves, inner side of parapets and alround of parabolas etc. shall be as shown on drawing. Wherever not shown it shall be as under:

(a) 12mm thick plaster in cement mortar 1:6 (1 cement: 6 parts 75%: fine sand & 25% coarse sand) mixed with 10% of lime water over brick and concrete surfaces. Dubbing out wherever required (i.e. bringing up the undulation on the rough face of brick work in level with proudest points) shall also be executed in the same mix along with rendering coat.

(b) 6 thick plaster in cement mortar 1:3 (1 cement: 3 fine sand) on soffits of RCC slabs, chajjas, lintels and kitchen platforms and all round of shelves and para golas.

(c) 10mm x 6mm grooves shall be provided in ceiling plaster at junction of wall and ceiling.

(d) 12mm thick plaster in cement mortar 1:4 (1cement: 4 parts 75% fine sand & 25% coarse sand) mixed with water proofing compound CICO-1 (liquid) as per manufacturer's instruction to be done on the inside face of the book shelves and cupboards.

(e) 15mm thick plaster in cement mortar 1:4 (1 Cement: 4coarse sand) mixed with water proofing compound CICO-1(liquid) as per manufacturer's instruction to be done on the internal surfaces of parapet walls including dubbing wherever required.

(f) Before plastering it should be ensured that brick masonry joints are raked out (at least on even surfaces) to a depth of 12mm and all concrete surfaces are rough enough for proper adhesion of plaster. If not, they shall be made rough by hacking or bush hammering at intervals of 2". Efflorescence if any and dust/dirt shall be removed. The surfaces shall be wetted adequately before plastering.

(g) G.I. Chicken wire mesh of 24 gauge and 20mm mesh shall be fixed all along RCC Surface adjoining brick work given 150mm lapping on either side of the junction in double fold or as called for using

nails etc and cement slurry before plastering. Ensuring equal thickness of plaster on both sides of the mesh.

(h) Sand used in plaster shall be within the grading zones as stipulated in the IS silt contents shall not exceed 4% by weight. Brick surface shall be raked out at the end of day brick work to afford key to plaster. Plaster surface shall be hard and even without patchy appearance. If they flake or show scratch marks if rubbed by appointed nail the plaster shall be rejected, dislodged and redone.

SECTION – IX - WHITE WASH, DISTEMPER AND PAINTING

GENERAL

SCOPE OF WORK

Work Included: This section covers the surface preparation, field priming and field painting or finish coating of all wood, plaster, concrete and metal surface (both interior and exterior) as called for in the finish schedule. In addition, all surfaces, schedule or not, such as piping, tanks, equipment and machinery shall be painted when called for in the finish schedule or in their respective section of these specifications. Contractor shall finish all labour materials, tools and equipment required to complete the work.
Surface not to be painted: The following surfaces shall not be painted stainless steel, aluminum, brose, copper, lead, brass, factory pre-finished surfaces and installed surfaces. In addition surface of steel member which ate to have concrete cast against them or are to be fully embedded in concrete shall be pointed.
Shop primed Equipment: Final field painting or touch-up of manufacturer's shop primed or shop painted equipment shall not be done until operational testing has been complete and certified.

RELATED WORK SPECIFIED ELSEWHERE

Quality Control
Structural Steel
Lath and Plaster
Architectural woodwork
Cast-in-place Portland Cement concrete.

MOCK-UPS

In addition to the requirement for submitting colour samples, the contractor shall, prior to proceeding with paint application, provide mock-up or field samples, for each substrate to be painted. The mock-ups or field samples shall be painted to demonstrate method of application, finish texture, colour and quality of workmanship. The size and location of the mock-up or field samples shall be determined by the architect.

PRODUCTS

ACCEPTABLE MANUFACTURES

All coating material (paints) shall be furnished be a manufacture, regularly engaged in the manufacture of coatings shall be the manufacturer's best-grade for the intended substrate.

MATERIALS

Coating materials are listed herein by generic type (vehicle) for various substrates. A1 materials proposed will be subject to review and acceptance by the architect.

Coating accessory materials such as linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve the finished specified shall be of high quality and as far as possible from the manufacturer of the coating material.
Coating shall be ready-mixed, expect for field-catalyzed coatings. Pigments shall be fully ground maintaining a soft past consistency, capable of being readily and uniformly dispersed to a complete homogeneous mixture for brush, roller or airless spray application, as recommended by the manufacturer.
Coating shall have good flowing properties and be capable or drying or cutting free of streaks, runs or sags. Colours, texture and degree of gloss shall be as shown on the finish schedule. Tint, prime and intermediate coats shall be approximately to the shade of the final coat but with sufficient variation to distinguish them from the preceding coat. Use products of the same manufacturer for succeeding coats. Where red lead primer is used, subsequent coats may be the produce of another manufacturer.
If ferrous metals are shop primed, the contractor shall make every effort to determine the type of primer used. If this is not possible or the primer is not compatible with the proposed finish coat as recommended by the coating manufacturer may be required prior to application of finish coat

PAINTS SELECTION GUIDE

Exterior Surface	
Ferrous Metals (unprimed)	
First Coat	Organic Zinc rich primer
Top Coat	Chlorinated Rubber
Ferrous Metals (Unprimed)	
First coat	Chlorinated rubber Modified Alkyd.
Second Coat	Acrylic Epoxy Enamel
Top Coats	Acrylic Epoxy Enamel

Concrete

First Coat	Acrylic primer/ Sealer.
Second Coat	Acrylic or Vinyl Emulsion
Third Coat	Acrylic or Vinyl Emulsion
Top Coats	Acrylic or Vinyl Emulsion

Cement Plaster

First Coat	Acrylic Latex.
Second Coat	Acrylic Latex.
Top Coats	Acrylic Latex.

Wood Designated Painting.

First Coat	Alkyd Primer
Second	Alkyd Enamel.
Top Coats	Alkyd Enamel.

Galvanized Steel:

First Coat	(Where not passivating coat as recommended by coating shop Bonderized) manufacture followed by a Zinc chromate Primer
First Coat	(Where Galvanized Iron primer Bonderised)
Second Coat	Alkyd Enamel.
Top Coats	Alkyd Enamel.

Interior Surfaces.

Ferrous metals (Unprimed)	
First Coat	Red Oxide Primer
Second Coat	Alkyd Enamel
Top Coats	Alkyd Enamel.

Concrete:

First Coat	Acrylic primer/Sealer
Second Coat	Acrylic or Vinyl Emulsion.
Top Coats	Acrylic or Vinyl Emulsion

Gypsum Plaster :

First Coat	Latex Sealer.
Second Coat	Acrylic Latex.
Top Coats	Acrylic Latex.

Cement or Cement lime Plaster

First Coat	Alkali resistant primer.
Second Coat	Acrylic Latex.
Top Coats	Acrylic Latex.

Gypsum Board :

First Coat	Acrylic primer / Sealer (Note required on Moisture resistant board)
Second Coat	Acrylic or Vinyl Emulsion.
Top Coat	Acrylic or Vinyl Emulsion.

Wood Designated for painting :

First Coat	Alkyd primer
Second Coat	Alkyd Enamel.
Top Coats	Alkyd Enamel.

Wood designated for staining and polishing:

First Coat	Alkyd standing Sealer
Second Coat	Modified Polyurethane.
Top Coats	Modified Polyurethane.

Galvanized Steel :

First coat	(Where passivating Coat as recommended by Manufacture followed by a Zinc)
First Coat	(Where Galvanized iron primer Bonderized)
Top Coats	Alkyd Enamel.

SECTION – X - INTERNAL PLUMBING WORK (INTERNAL WATER SUPPLY PLUMBING, INTERNAL DRAINAGE)

GENERAL

1.1. The form of Contract shall be according to the "Conditions of Contract". The following clauses shall be considered as an extension and not in limitation of the obligation of the Contractor

1.2. Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required. The Contractor is required to completely furnish all the plumbing and other specialised services as described hereinafter and as specified in the schedule of quantities and /or shown on the plumbing drawings.

2. Scope of internal water supply, plumbing, internal sewerage and drainage shall consist of providing and fixing of the following for each units of each unit blocks/other buildings as shown on drawings.

3. The entire work shall be carried out by licensed plumbers

(a) CPVC/UPVC/GI pipe with fittings and valves for cold and hot water supply.
(b) Sanitary fixtures, CP fittings and accessories.
(c) Soil, waste, vent, rain water pipes and fittings
(d) Overhead water tank at Terrace with supports.
(e) Internal Drainage including gully traps.

4. **Water supply.**

(a) All GI/CPVC/UPVC pipes and fittings from overhead tank to all taps, wall mixers, wash basins, cisterns, sinks, geyser points, washing machine and showers as shown on drawings.

(b) Provision of hot and cold water supply lines in all toilets and kitchen.

5. **MATERIALS**

6. All GI pipes shall be galvanised steel tubes medium grade conforming to IS-1239 and ISI marked of makes Jindal Hissar/Prakash. All CPVC/UPVC pipes shall conform to the relevant IS standards.

7. All GI fittings shall be conforming to IS-1879 and ISI marked.

8. Valve shall be heavy Gun metal full way confirming to IS-778-1971 class I and ISI marked.

LAYING, FIXING AND FITTINGS OF GI PIPES

9. All GI pipes below ground shall be laid in trenches and shall have minimum cover of 600mm.

10. The runs of the pipes shall be straight and pipes shall not run diagonally. Proper bends, elbows, tees at turnings/corners shall be used.

11. All pipes with necessary fittings wherever they are laid on internal faces of the walls shall be concealed in chase. On external faces they will be laid on walls fixed with clamps or on M.S. angle iron brackets as shown in drawings.

12. In the concealed portion of plumbing no joints shall be provided in the pipe lines except in the fittings i.e., bends, elbows, tees and nipples where required.

13. All pipes for water supply (Hot or cold) within toilets and kitchen shall be laid on walls only. No pipe shall be laid in sunken portion of toilets/kitchen.

14. For each unit the size of down comers, branch pipes from the ring (at terrace) from overhead tank and branch pipes from down comers shall be of sizes as shown on drawing.
15. Pipes and fittings shall be jointed with screwed fittings, care shall be taken to remove burrs from the end of the pipe after cutting by a round file. Genuine white/red lead and a few strands of cotton thread shall

be applied. All pipes shall be fixed in accordance with layout shown on the drawings. Care shall be taken to avoid air pockets. Pipes inside toilets shall be fixed in wall chases at least 30cm above the floor.

16. Pipes in shafts and other locations shall be supported by clamps of design as indicated in the typical detail. Pipes in wall chases shall be anchored by iron hooks.

17. **Unions:** Contractor shall provide adequate number of unions on all pipes to enable dismantling later. Unions shall be provided near each gun metal valve, stop cock, or check valve and on straight runs as necessary at appropriate locations.

18. **Puddle Flanges:** Puddle flanges shall be provided to all connections i.e. inlet overflow, and scour of the overhead tank, wherever required.

19. **Pipe Protection:** All pipes in chase or under floors or below ground shall be protected against corrosion by applying two coats of bitumen paint, covered with polythene tape and finished with a final coat of bitumen paint.

20. **Painting:** All exposed pipes shall be painted with two coats of oil paint over one coat of primer. Pipes shall be painted to the standard colour code as approved by the Project Engineer/Architect.

21. **Overhead Tanks**

a. The tanks shall be of moulded HDPE and shall be one of the following make.

i) Unitank, ii) Polycon iii) Sintex

b. These tanks shall be located on the roof terrace as shown on the drawing. Placed on supports as per the details shown on drawings.

c. Each overhead water tank shall be complete with the following.

(i) Lid and cover with a locking arrangement.

(ii) Inlet, outlet, overflow (25mm), scour pipe (20mm) and Air vent pipe with all fittings.

(iii) Mosquito proof coupling shall be provided to overflow and air vent pipes.

(iv) The inlet pipe to the overhead tank shall be provided with ISI marked 25mm brass body ball valve with polythene ball.

(v) The inlet pipe to the overhead tank shall be provided with 25mm ISI marked full way gunmetal brass valve and each outlet pipe shall be provided with ISI marked full way gunmetal valve of size of outlet pipe.

(vi) The overflow pipes shall be brought down up to the finished terrace level and laid up to nearest khurra on terrace.

d. The water tank will rest over 100 mm thick RCC 1:2:4 (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) platform with nominal reinforcement of 8mm dia 6”c/c both ways,

supported over ISMBs resting on brick wall supports over terrace and finished with cement plaster 1:6 all around as shown in drawings.

22. Vent pipes: Each down take pipe shall be provided with a vent pipe. The height of the vent pipe shall be 150mm above the top of the water tank.

23. **Testing of pipes :**

a) All pipe lines shall be tested hydraulically to pressure of 7 kg/Sq.cm for a minimum period of 24 hours for check for leakage.

b) The pipe line in chase or under floors/ground shall be covered up only after the testing is carried out satisfactorily and passed by Architect/Site Engineer.

c) The instrument, equipment and water for testing shall be arranged by the contractor without extra charges. (i.e. Hydraulic testing machine with pressure gauge)

d) A test register shall be maintained by the Site Engineer and all entries shall be signed and dated by contractor, Architect and Site Engineer.

24. **Insulation**: 24 Hot water lines in chases shall be provided with 20 mm thick insulation by wrapping 6 mm dia asbestos rope and finishing with a coat of 85% magnesia.

25. **Approval of layout of pipes and position of fixtures at site:** The contractor shall mark the location of all fixtures and fittings and layout of GI pipes on the terrace walls/ ground at site and take approval of Site Engineer/Architect before commencement of cutting chases for GI pipes within the building and digging trenches outside the building.

25. Sanitary Fixture and CP Fittings and Accessories

All sanitary ware shall be first quality white-vitreous china and shall be inclusive of all fixing devices nuts, bolts and hangers/Brackets.

These shall be from one of the following manufactures:

(a) Hindustan Sanitary Ware
(b) Parry Ware
(c) CERA (Madhu Sudan Ceramics)
(d) NEYCER Ceramic

26. It will be ensured that all sanitary fixtures are from one manufacturer only for the entire work i.e. for all the units. However, if due to any reason contractor proposes to provide part quantity from other manufacturer as approved above, then he may be permitted, but he will have to obtain specific approval of Site Engineer/Architect for this change in brand. This will be subject to that all items and fixtures in

any particular block/other buildings shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in all of the toilets of particular block/other buildings.

27. **Kitchen sink and draining Board**: Kitchen sink and draining boards shall be of stainless steel (Salem stainless steel ISI-304) 1.0mm thick. The sink and draining board shall be in one piece of following sizes with rectangular compartment/bowl. Each sink shall be provided with one CP brass waste and PVC waste pipe.

Overall size (LxW)	=	1060x510mm
Bowl size (LxWxD)	=	500x400x200mm

28. The Stainless steel sink and draining board shall be of one of the following makes:-

    (a) NIRALI.

29. Kitchen Sink shall be supported on RCC/ Kadappah platform having suitable cut for the bowl of the sink as per the details shown on the drawings.

30. All bib cocks, stop cocks, angle-valves, pillar taps, mixtures, showers rose & arm, bottle traps, CP waster and inlet connections and other minor fittings shall be brass chromium plated. These shall be ISI marked where manufactured. Contractor shall obtain the approval of the name of the manufacturer and brand of CP brass fittings from Site Engineer/Architect before placing the supply order. While asking for the approval, copy of the Bureau of Indian Standard letter under which the manufacturer has been issued the license and authorised to mark the five items of CP brass fittings as listed in hereinafter below with ISI marking should be attached and one sample of each fittings of the particular brand duly ISI marked shall be given by contractor. The fittings shall be of CONTINENTAL range from Jaquar Make.

31. Project Engineer before giving the approval of the name of the manufacturer and brand shall ensure that the validity date of license for marking the fittings as ISI marked has not expired.

32. Those CP brass fittings which are not manufactured as ISI marked shall also be of the same brand of which the ISI marked CP brass fittings are approved by Site Engineer as per para above.

33. It will be ensured that all CP fittings are from one manufacturer only for the entire work i.e. for all units in D' unit blocks/other buildings. However, if due to any reason contractor proposes to provide part of quantity from other manufacturer approved in para hereinafter then he may be permitted, but he will have to obtain specific approval of Site Engineer/Architect for this change in the brand. This will be subject to that all items and fittings in any particular block/other buildings shall be always of one manufacturer only. In no circumstances items of two manufacturers shall be used in any of the toilets of particular block/other buildings.

34. All chromium plated brass fittings and accessories shall be provided with CP cast brass wall flanges.

35. For fixing of CP brass fittings wherever required CP brass extension pieces shall be provided.

36. Fixing screws shall be half round head chromium plated brass screws with CP washers.

37. All exposed pipes, if any, within the toilets and near the fixtures shall be chromium plated brass except otherwise specified.

Schedule of Sanitary and CP Brass fittings in all buildings shall be as under:

(a) Kitchen

(i) Stainless steel Sink with drain board
(ii) CP Brass waste
(iii) Sink Mixer
(iv) GI Waste pipe 40mm dia from CP Waste to floor drain grating

(b) Toilets: - All vitreous china sanitary wares shall be "white". The fittings and fixtures in toilets of each unit shall be as under:-

(A) Wash Hand Basin

(i) Vitreous china first quality wash basin 550 x 400mm wall mounting type on MS Angle brackets.
(ii) Same as above, but Oval Shape under counter WB.
(i) CP Brass waste 32mm dia. with overflow
(ii) CP Brass bottle trap with CP brass pipe to wall with CP cast brass wall flange
(iii) Brass pillar taps 15mm
(iv) CP Brass Basin Mixer
(v) CP Brass angle valves with CP copper
(vii) Connecting pipes with nuts and washers.
(viii) CPVC waste pipe 32 mm dia

Note: Outlet of CP brass bottle trap shall be connected to nearest floor trap by GI waste pipe (concealed) as per details shown on drawings

(B) Water Closets and Cisterns

(1.) European type white vitreous china ware and cistern with S-trap without vent horn

(2.) White 10.00 Liter capacity low level HIP flushing cistern water bird "COMMANDER MODEL"ISI marked complete with Delrin valve and float, fittings and specials of standard make & 40mm white flush bend, over flow with mosquito proof coupling, all washers and rubber bed etc. complete including fixing accessories

(3.) CP brass angle valve with CP copper connecting pipe with nut and washer

(4.) Bakelite solid type seat and cover ISI marked Type 1A (IS-2548-1983) with CP brass hinges Commander brand (black colour)

(C) Urinals

(i) Range of one and three urinals
(ii) Chinaware cistern
(iii) Bottle trap
(iv) CP brass angle valve with CP copper connecting pipe with nut and washer.

(D) Shower and Taps

i. CP brass wall mixer with bend for overhead shower with central control knob for three positions, for supply to spout, second to stop and third for supply to shower.
ii. 125mm dia CP brass shower rose 15mm with ball joint and 230mm long CP brass extension pipe.

(E) **Towel Rail:** CP brass towel rail 20mm dia 16 guage600mm long including brackets.

(F) **Towel Ring:** CP brass towel ring 200 mm dia with CP brass brackets fixed to wall with Flanges & CP brass screws.

(G) Mirror of size as specified in the items and 5mm thickness over every wash hand basin. The mirrors shall be of make Modifloat or Atul Brand made from Tata Ashi float glass. The mirror shall have marine ply backing 6 mm thick mounted on kail wood frame ¾" x $1\frac{1}{2}$" with Aluminium angle 30 x 15 x2mm alround & hung on to wall with key hole hooks.

(F) **Peg Sets: Aluminium Anodised with 3 hooks**

(J) **Gratings:**

(i) All floor traps (FT) and floor drains (FD) shall be provided with 125mm and 100mm round stainless steel gratings respectively of approved design and shape. The weights of 125mm dia and 100mm dia gratings shall not be less than 130gms and 100 gms respectively.
(ii) Gratings for floor drain (FD) below sink in kitchen shall have suitable hole for passing GI waste pipe from sink.

38. **Geysers:** Scope for arrangement of fixing of Geysers included in this contract is as under:

(a) Arrangement for fixing electric geyser vertical type one each in toilets and kitchen.

(b) In all the units from the provision of common hot water supply shall be made.

(c) Hot water supply of all units shall be from the respective Geysers/Solar heater installed therein.

(d) At the inlet pipe of all Geysers one number CP brass angle valve shall be provided.

(c) The ends of inlet and outlet pipes shall be connected with one PVC connecting pipe with CP brass nuts & washers. This is to pass the water from inlet to outlet till Geyser is installed at a later date.

(d) Provisioning and fixing of Geysers is beyond the scope of this contract.

39. Installation of Sanitary Fittings:

(a) European Type water closets shall be fixed with brass screws of suitable length with PVC plugs or phill plugs embedded in the floor after drilling hole in floor. It should be coupled with low level flushing cistern complete with rubber cone adapters etc, all as per manufacturer instructions.

(b) Wash hand basins shall be fixed firmly to wall with MS angle iron brackets. The brackets shall be given two coats of white enamel paint over a coat of primer. In addition the wash basin shall be securely fixed to walls with a pair of 25x3mm MS clips screwed with rawl plugs to walls (placing of basin over the brackets without secure fixing on wall shall not be accepted).

(c) Indian type Water Closets shall be embedded firmly in the floor and its surrounding packed with cement concrete 1:3:6 (1 cement : 3 coarse sand : graded aggregate 40mm graded aggregate) below the level of top of the Closet to receive the top layer of floor finish. WC shall be set in the CI trap in cement concrete 1:3:6 (1cement:3 coarse sand:6 graded stone aggregate 20mm nominal size), joint between WC and Flush pipe will be made in the pre-moulded rubber joint.

(d) Urinals: Urinals shall be lipped type half stall (small) white glazed vitreous china of first quality and size 610x 400 x 380 mm size.

(i) Half stall urinal shall be provided 15 mm dia spreader, 32 mm dia CP domical waste and C.P. cast brass bottle trap with pipe and wall flange, and shall be fixed to wall by one CI bracket and two CI wall clips complete as recommended by manufacturer's directives/Site Engineer.

(ii) Half stall urinals shall be fixed with C.P. brass screws.

(iii) Flushing cistern for urinals shall be automatic type vitreous china as given in the schedule of quantities. Each flushing cistern shall have a copper siphon and inlet nozzle cock to control the flow. Flushing cistern shall be fixed to wall with R.S. or C.I. brackets painted with two coats of white enamel paint.

(iv) Flush pipes shall be G.I. pipes concealed in wall chase but with chromium plated bends at inlets and outlets.

(v) Urinals may be flushed with flush valves as described in the item.

(vi) Waste pipes for urinals shall be any of the following.

a. G.I. pipes. b. Rigid PVC

Waste pipes may be exposed on wall or concealed chase as directed by the engineer-in-charge. Specifications for waste pipes shall be same as given in Section II.

(e) **Urinal Partitions**: Urinal partitions shall be white glazed vitreous chinaware marble or stone of size specified in the schedule of quantities. Porcelain partitions shall be fixed at proper heights with C.P. brass screws with anchor fasteners and MS clips as recommended by the manufacturer and directed by engineer-in-charge.

(e) All fixtures shall be fixed at proper heights, as shown in drawings and workmanship which shall be of acceptable standards.

40. **Internal Drainage:** Scope of internal sewage disposal and drainage system for all buildings/blocks included in Schedule A part I under this contract will include the following and shall be provided as per the layout/locations shown on drawings:

(a) GI floor drains in toilets and kitchen
(b) HCI waste pipes and their connections upto Gully traps.
(c) HCI soil pipes and their connections upto nearest manholes.
(d) Vent pipes with vertical stacks
(e) All floor traps and gully traps.

Note: SWG sewerage lines from Gully Trap and nearest manholes onwards shall be measured and paid separately under schedule A part III (External sewerage)

41. **Soil, Waste, Vent and Rain Water Pipes:** All pipes shall be sand cast iron and shall comply to IS-1729 of 1979 and shall be ISI marked. Where shown on drawings the floor drains (FD) shall be of GI pipe medium grade ISI marked.

42. All cast iron pipes fittings like bends, branches, floor traps, tees 'Y' junctions, in waste, soil and vent pipes shall be sand cast iron comply with IS 1729 of 1979 and shall be ISI marked. These shall be spigot and socket "Access door shall be made up with 3mm thick insertion rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal later. The fixing shall be air and water tight".

43. **Cast Iron Traps:** Floor trap shall be cast iron, deep seal with an effective seal of 50mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) and extended to 40mm below finished floor level. The concrete portion at top of the floor trap inlet shall be finished smooth and water proofed by applying neat cement slurry mixed with water proofing compound. Size of the blocks shall be 30x30cms of the required depth. The trap shall be 100mm inlet and 100mm outlet for kitchen and for toilets. Traps shall have extension pieces to receive waste lines as indicated in typical details.

Urinal Traps: Urinal traps shall be cast iron P&S trap with or without vent and set in cement concrete block specified in para above without extra charge.

Cleanout Plugs: Contractor shall provide cast brass clean out plugs as required. Cleanout plugs shall be thread and provided with key holes for openings. Cleanout plugs shall be fixed to the pipe by a G.I. socket lead caulked.

PVC pipes & fittings: PVC pipes for drainage system shall be rigid upvc pipes conforming to I.S. 13592 Type B.

i. Fittings for the pipes shall be injection moulded with approved type of sockets and 'O' rings joints.

ii. Jointing shall be done as per the manufacturer's recommendation. The pipes and fittings must have matching dimensions for a perfect joint. Loose or excessively tight joints in the system shall not be accepted. Fittings must have sufficient gap (approx. 10 mm) for permissible thermal expansion of pipes.

Fittings

i. Fittings shall conform to the same Indian Standard as for pipes. Contractor shall use pipes and fittings of matching specifications.

ii. Fittings shall be of the required degree of curvature with or without access door of rear, LH or RH.

SECTION XI: GYPSUM BOARD PARTITIONS AND CEILING

GENERAL

It is intended that these specifications cover principal requirement of new gypsum board partition and ceiling construction.
To prevent weakening due to calcimine, gypsum wallboard should not be exposed to temperature over 125F (52 C) for extended periods of time.

The Contractor shall furnish all materials, labour and scaffolding required to complete satisfactorily of all gypsum board partitions and ceiling work shown on the Drawings and / or specified.

MATERIALS

All materials shall be of an approval manufactures (India gypsum or equivalent) and shall comprise of the following:
G.I Framing for suspended ceiling
G.I Framing for partition and wall cladding.
G.I. corner beads and edge trims.

Dry-wall screw.
Regular gypsum wall board shall be ½" thick. Long edges shall be squire. Joint treatment materials shall be.
Joint Tape
Joint compound to be ready-Mixed
Fast hardening joint compound.
Topping compound to be ready-mixed.
Adhesive materials shall be joint compound for board application and wallboard /panel adhesive for board for framing application as recommended by manufacturer.

INSTALLATION

Preparation of work :
Commerce gypsum board and ceiling only after all work are complete.
Examine and inspect materials to which gypsum board is the be applied. Remedy all defects prior to installation of drywall. Any defects in the finished installation due to misaligned framing or the work performed under that section of the specification and such defects shall be remedied under that section of the specification.
Installation of wallboard:
Gypsum wallboard shall be applied to wall. Board of maximum practical length shall be used so that an absolute minimum number of end joints occur. Board edges shall be brought into contract with each other but shall be forced into place.
Wallboard joints at opening shall be located so that no end joint will align with edges of opening unless control joints will be installed at these points. End joints shall be staggered, and joint on opposite sides of a partition shall not occur on the same stud.
Gypsum wallboard shall be held in firm contract with framing member while fasteners are being driven. Fastening shall proceed from center portion of the wallboard toward the edges and ends. Fasteners shall be set with the heads slightly below the surface of the wallboard in a dimple formed by the hammer or power screwdriver. Care shall be taken to avoid breading the face paper of the wallboard. Improperly driver nails or screws shall be removed.

SECTION XII: ARCHITECTURAL WOODWORK

SCOPE OF WORK

Work included

This section covers the furnishing of all materials, equipment, accessories and labour for architectural woodwork, including but not limited to:

Wall paneling
Staircases
Railings and balustrade
Wood flooring and decks
Built-in-cabinetry, including plastic emulsion

Miscellaneous finished woodwork
Rough carpentry and framing associated with the above
Preservative treatment of wood
Metal fasteners, accessories and adhesives

Work not included

The following work are not included in this section and are covered elsewhere:

Structural woodwork
Wood doors
Wood windows

RELATED WORK SPECIFIED ELSEWHERE

Structural woodwork
Wood doors and windows
Painting and finish coatings

QUALITY CONTROL

The contractor shall be responsible for the quality of all work and material used in the work and shall implement a programme for inspection and testing to monitor the quality of work.

Wood shall be of the best select grade free of defects in accordance with IS:1629

COORDINATION WITH OTHER TRADES AND CONDITIONS

The contractor shall schedule and coordinate the structural woodwork with other trades and contractors whose work may be affected by the Architectural woodwork.

MATERIALS AND PRODUCTS

WOOD

Generally wood for all architectural wood work shall be teak, except for parquet flooring for which the wood shall be Laurel.
The moisture content of wood shall be in conformance to IS:287 and shall generally be between 12% to 14%.
All wood shall be heartwood from mature trees, of the best grade, with minimum sapwood, free of defects, selected for goods finished appearance.
All grades of wood with the following defects shall be prohibited for use:
Timber with loose grain, splits, compression wood in coniferous timber, heartwood-rot and sap rot and wraps.
Worm holes and pitch knots
Wood, that has been badly stored and damaged.

LAMINATES

Plastic laminates shall be from an approved manufacturer, shall conform to IS: 2046 and shall be of new stock & 1.0-1.5mm in thickness.

PLYWOOD

Plywood shall be of new stock from an approval manufacturer, complying IS:303 BWR (and preservative treated respectively)
Plywood having the following defects shall be prohibited for use:
Damaged surfaces
Loose joints between ply
Badly stored

FASTENER AND ACCESSORIES

Screws shall be of Mild steel, complying to IS:451
Mild steel wire nails shall be in compliance with IS:723
Copper wire nails shall be in compliance with IS:725

ADHESIVES

Adhesive shall be synthetic resin adhesives complying with IS:851, Fast setting glues such as Rubber solutions/ "Zat Pat" shall not be used.

IRON MONGERY

Flanges, bolts, hasps, screws and other hardware shall be brass of the best quality approved by the architect. Locks and architectural finish hardware such as handles and knobs will be selected by the owner against the allowance made in the contract documents.

The contractor shall order, take delivery and arrange for the transportation of the hardware from the supplier nominated by the owner. The costs for ordering, transportation etc. upto delivery at site will be adjusted the allowance.

EXECUTION

GENERAL

The preservative treatment of wood shall be performed after conversion of lumber to the required sizes in construction so as to keep subsequent working on them to a minimum.
Brush supply two heavy coats of the same wood preservative chemical to any surfaces which were exposed by cutting, sawing, drilling etc.
Set out all architectural woodwork accurately in accordance with the contract drawings or approved shop drawings, true to line, angles, slopes and panes.
All members shall be in continuous lengths between supports without any immediate joints or splices unless otherwise shown on the drawings.
All sizes shown on the drawings are the finished dimensions and shall be within the tolerances given below:
- For measurement upto and including 100mm in width or thickness +/- 0.5mm.
- For measurement above 100mm in width and thickness +/- 0.1mm

All bearing surfaces shall be constructed to achieve full contract between surfaces over the entire bearing area.
All joints shall be worked to achieve accurate and tight fit with full contract between surfaces.
As far as possible grain and of wood shall be matched for adjacent pieces.

PANELING

Install the wall paneling in accordance with the design and details shown on the drawings.
Check alignment, plumb, plane and dimensions of the backing which is to receive paneling. Make necessary corrections prior to commencing paneling.
Layout paneling in accordance with actual dimensions obtained at site location. Adjust detailed dimensions to obtain the intent of the design.

Install sub-frames and grounds and secure them firmly to the backing, tree to line, plumb, alignment and plane to avoid adjustment while installing paneling.
The panel frames shall be true to dimensions, sections, profiles, mouldings etc. as shown on the drawings. Members shall be in one piece between joints.
Panels shall be of the thickness and profiles shown in the drawings. When a large panel is required to be built up from two or more pieces, the joints shall be tongue and grooved flush joints, glued and drawn tight by means of vices, clamps or other means to obtain permanently indiscernible joints. The colour and grain of the wood shall be matched to conceal the joints.
The frames and panels shall be planed and sanded smooth to remove all tool marks before assembly.
The panel frames shall be jointed by 'all wood' joints without metal fasteners by means of the most appropriate glued mortise-and-tenonned joints and wood pins. Mortises and tenons shall be tooled to obtain intimate contact between their surfaces and shall be fully glued with glue.
Joints shall be tightened with vice, clamps, draw straps or other means to obtain tight, indiscernible joints.
The grain of wood pins shall match the surface grain of the frames.

Mouldings shall be mitered at 45 degrees to obtain a perfect match of lines, edges and profiles between abutting pieces.
After assembly the joints shall be tooled and sanded to remove minor unevenness at joints.
Planted mouldings and architects shall be fixed by means of headless-nails, neatly punched below the surface of wood.

Tolerances:
- Plane surfaces when tested with a straight edge placed anywhere, in any direction shall not show a gap of more than 1mm between the surface and the edge in any 2 meter length, provided that there is no noticeable abrupt differences in smaller areas.
- Straight lines and edges when tested with a 2 meter long straight edge shall not show a variation of more than 2mm, provided that there are no noticeable abrupt differences.

WOOD VENEERS AND PLYWOOD

Wood veneered plywood shall be 4mm. thick of an approved manufacture. Veneered plywood shall be selected from the best quality new stock for grain and colour appearance.
Plywood shall comply with IS: 5509 and IS :5539

ADHESIVES AND FASTENERS

Adhesives shall be synthetic resin adhesive complying with IS: 851
Screw shall be of brass.
Copper wire nails shall be in compliance with IS:725

TREATMENT AGAINST DECAY AND INSECT ATTACK

Treatment against and insect attack shall be by means of an approved proprietary product, proven to have outstanding durability under any conditions of exposure, to provide long-lasting protection against decay producing fungi and insects.
The material used for treatment shall be clean, oil-free. Odorless and harmless to people, planes and animals, evens when exposed to fire.
The material shall be spray or brush applied for deep-penetration, fiber- fixed to prevent leaching. The treated wood shall be capable of being subsequently painted or stained without being discoloured.
No coal –tar based products shall be used for preservative treatment.
The material used for preservative treatment shall be compatible with the material used for fire retardant treatment.

HARDWARE

All hardware for wood doors and wood windows will be selected by the owner.
The Contractor shall order, take delivery and arrange for the transportation of the hardware from the supplier nominated by the owner. The costs for ordering, transportation etc. up to delivery at site will be adjusted against the Allowance.

GLASS

Glass All shall be float glass of glazing quality conforming to BS:952 part 1 or other acceptable standard.
Wired glass: All wired glass shall be polished both sides with square pattern stainless steel wire mesh complying to BS:925, part 1 or other acceptable standard
Insulating glass insulating glass units shall consist of one exterior pane of tinted glass and one pane of clear glass, separated by a 15mm. Thick spacer filled with moisture absorbing desiccant. Each unit shall be hermetically sealed with primary butyl rubber sealant completely covering the unit's edge.
Glass and sizes and thickness shall be as shown on the contract Drawings.
All glass shall bear the label of its manufacturer and the standard to which it is manufactured.

Glazing gaskets: All glazing gaskets shall be 'U' shaped of flexible vinyl or synthetic rubber (neoprene) to fit the glass thickness.
Setting blocks: All setting blocks shall be of synthetic rubber to provide the necessary edge clearance from frames for the glass.
Glazing components: These shall be clear silicone sealant.

WEATHER STRIPS

The weather strips to seal the perimeter gaps between sashes and frames shall be flexible vinyl or synthetic rubber suitable for heavy-duty application.
Sealant caulk for sealing joints between frames and structural opening shall be a one –part polysulphide sealant suitable for application by a caulking gun.

List of Material
Of
Approved Maker/Brands: Civil Works

The contractor shall quote for the best of the materials specified below with ISI mark wherever applicable. The contractor shall obtain prior approval from the Institute / Architect before placing order for the specific materials agencies. In case of non-availability of any of the approved /specified materials /agency. During the execution of the work, the Institute /Architect may approve suitable equivalent brand/agency and his decision shall be final and binding on the contractor and the price variations. If any, shall be adjusted accordingly.

S. N.	Materials		Manufacturers
1.	Grey Cement (43 or 53 Grade) White Cement Putty		A.C.C., Ultratech, Ambhuja, Jaypee Birla White, J.K. Birla White Putty
2.	Steel (Thermo Mechanically Treated Steel) High-strength deformed bars or mild steel reinforcement		TATA, SAIL, JSW, or equivalent
3	Clay Bricks		Good quality locally available material approved by Engineer / Architect
4	Pressed Steel frames for Doors		Fabricated P.S. frames approved by Engineer/Architect.
4a.	Pressed Steel frames for Aluminium-Windows, Ventilators.		Jindal of 25 microns approved by Engineer/Architect.
5	Flush Door Shutters		Century/ Anchor / Archid / Green / Samrat / Kenwood or equivalent
6	Particle Boards/Block Boards (Wardrobe Shutters and Kitchen Cabinets on with Laminates)		Century / Anchor / Archid / Greenply /Marino / Samrat/ Kitply or equivalent
7	Glass (Plain / Pin Headed) and Glass Tinted		Modi Float / Triveni / Hindustan Pallington / Asahi / Saint Gobain or equivalent
8	Aluminum Hardware/fittings		Argent / Classic / Shalimar or equivalent
9	Brass Mortice Locks & Latches		Godrej/ Link or equivalent
10	Latches with Internal locks		Godrej / Link/ Vijayan or equivalent
11	Floor Type Hydraulic door closer (Floor spring)		Everite / Hypper / Hemco or equivalent
12	Aluminum door, window and ventilator sections.		Jindal / Hindalco or equivalent
13	Water proofing material/ compound.		BSF/Roff/Fosroc/Sikka/or equivalent

14	Glazed Tiles		Johnson & Johnson/ Nitco/ Kajaria or equivalent
15	Ceramic Tiles (Non-Skid)		Johnson & Johnson/ Kajaria/ Nitco/ Bell or equivalent
16	Cement Concrete (Chequered) Tiles		Nitco / Bharat or equivalent
17	Vitrified Tiles		Kajaria/Johnson/Nitco or equivalent
18	Glass Mosaic Tiles		Italia or equivalent
19	Synthetic Enamel Paint		Jenson & Nicholsan/ Asian/ Nerolac/ Berger or equivalent
20	Oil Bound Distemper		Jenson & Nicholsan/ Asian/ Burger/ Nerolac or equivalent
21	Plastic Paint		Jenson & Nicholsan/ Burger/ Nerolac/ Asian or equivalent
22	Paneled Doors		National/ Century/ Swastik/ Kitply or equivalent
23	P.V.C. Doors		Sintex / Mihir / Fixopan or equivalent
24	Rolling Shutter & Grills		Good quality locally available material.
25	Hardeners		"Ironite" or equivalent.
26	Red Oxide		"Asian" or equivalent.
27	Waterproof cement paint / acrylic paint		Snocem India, Nerolac, Nitcocem or equivalent.
28	Glazing		"Hindustan Pilkington" Tiveni, Modi
29	Water seal (Epoxy-sterarate)compound.		As approved by Architect / Engineer
30	Medium-density fibre-board in lieu of partitions panelled doors and flush doors.		Nuwood, Mangalam or equivalent
31	Screws		GKM/ mettle fold or equivalent
32	Brass Hinges		Reliance/ Punit heavy duty or equivalent
33	Iron monjires and brass fittings		Jiranna / CIEF/ Shalimar / Everite.
34	Drawer sliding fitting		Earl bhihari or equivalent
35	Hardware		Shalimar, Everite/ Reliance Brass powder coated
36	Drawer Shutter Lock		Vijayan/Godrej (3 set of keys or equivalent)
37	Ball Catch		Magnetic (M-2) / Brass or equivalent
38	Veneer		Anchor / Kitply / Uro / Durian / Century or equivalent
39	Adhesive		Fevicol (SH) for furniture, laminates, Araldite of Hindustan Ciba Geigy Ltd. for Steel/Mirror
40	Polish		French/Zinc Oxide / Melamine (Asian) or equivalent
41	Wood Preservative		Asian paint / British paint or equivalent
42	Sun control film		Garware or equivalent
43	Polyure than foam		'U' foam or equivalent

PLUMBING WORK

S.No	Materials		Manufacturers
44	Vetreous china sanitary ware (ISI mark)		Hindustan sanitary ware/ parry ware/ Cera or equivalent
45	Seats & Covers solid (W.C.)		Commander/ Admiral/ Supreme or equivalent
46	PVC Low level flushing cisterns		Commander / Parryware / Hindustan or equivalent
47	C P Fittings / Toilet Accessories ISI Marked		Jaquar / Aquel / ESS ESS / Marc or equivalent
48	UPVC Pipes (S/W/R Pipes)		Diplast / Supreme / Finolex / Prince or equivalent
49	Centrifugal cast CI Pipes & Fittings		RIF / Neco or equivalent
50	G.I. Pipes (B-Class)		ITC / Tata / Zenith or equivalent.
51	G.I. Fittings (ISI Brand)		Unik / AMCO or equivalent.
52	Gunmetal valves (Full way, check and globe valves)		Leader / Zoloto (with ISI mark) / Sant or equivalent.
53	S.W. Pipes / Fittings & Gully traps		Perfect / Tirmurti / Bharat or equivalent.
54	Ball valves		Voltec / Zoloto or equivalent.
55	Stainless steel sinks		Nirali / Neelkanth or equivalent.
56	HDPE Tanks		Sintex / Polycon / Unitank or equivalent.
57	Mirrors		Modiguard or equivalent.
58	C.I. Manhole Cover		RIF / BIC / Neco or equivalent.
59	Concrete Man holes SFRC		CICO
60	Hydropneumatic Systems		Grund Fos / Crompton or equivalent.
61	Water lifting Pump		Grund Fos / Crompton or equivalent.
62	Submersible Pump		Grund Fos / Crompton or equivalent.
63	Chemical Doser		Asia Lmi / Prominent / Ion Exchange or equivalent.
64	Pressure Gauge		H. Guru or equivalent.
65	Level Indicator		RM or Equivalent Approved Make
66	Air Relief Valves		RB / Zolto or equivalent.
67	Water Meter		Dasmesh / Capstain / Kaycee or equivalent.
68	PVC Encapsulated footrest.		KGM or equivalent approved make
69	C.I. Sluice valves		Kirloskar, Leader or equivalent with ISI mark on the boAsst.
70	A.C. Pipes		Everest Ramco or equivalent
71	R.C.C. Pipes		Indian Hume pipe or equivalent
72	Brass & Gun metal globe, gate valves, feet valves		Leader NETA or equivalent with ISI marking on the boast.

73	Sanitary Fixture		Hindware / Parryware / Cera or equivalent.
74	Storage Heaters		Recold, Spherehot or equivalent.
75	Fire Hydrant		Approved by local fire Bridges Authority
76	Sand cast soil pipes and fittings		NECO sand cast / B.I.C. or equivalent.
77	Bracket supports		Hi-tech/MS brackets as per drawings
78	Towel rail / ring		Jaquar / ESS ESS or equivalent.
79	Connection pipe-PVC		Kohinoor/Viking or equivalent.
80	Butterfly valve		Intervalve
81	PVC Fittings (Moulded)		Clarion / Finolex / Prince or equivalent.
82	Non-return valve		Intervalve or equivalent
83	UV filter		Alfa-level or equivalent
84	Stainless Steel		Salem Steel or equivalent
85	Marble Mosaic Tiles		Nitco / Bharat / Himalayan or equivalent
86	Fire Door		RDG / Shakti / Metdor or equivalent
87	RCC pipe		Indian Hume Pipe Co. / Spun Pipe Co. or equivalent
88	Stoneware Pipe and fittings		Trimurti / Perfect Potters / Bharat

SPECIFICATIONS FOR ELECTRICAL WORKS
SPECIAL CONDITIONS OF CONTRACT

1. COMPLETENESS OF TENDER:-

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

2. RATES: -

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

3. WORKS TO BE DONE BY THE CONTRACTOR :-

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

- Main Switches, Main L T Panels, meter board and external cable connection.
- 11 KV HT Panel.
- 11 KV / 0.433 KV Transformers.
- D. G. Sets with fuel tank, piping, fuel pump, exhaust piping with lagging and supports, cooling system complete.
- Sub and branch distribution boards, MCB's and RCCB's etc.
- Mains and Sub mains between various panels, meter boards and distribution boards.
- Point wiring with Conduits for all type of wiring including circuits, sub mains, light, fans, power and AC etc.
- Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with accessories complete.
- Earthing and Lightning Protection with earth leads/strips.
- Conduits and wiring for Telephone, EPABX, TV system, PA system, Music system and Computer networking, fire alarm, broad band etc.

- Cables and other allied works.

- Provision of emergency electrical supply and distribution for complete light, fans and other specified points are also included in the scope of work. For the purpose of emergency distribution separate DB's shall be installed for Light/fans **and fax machines & staircase** lighting at every place, so that these can be separated.

- Lighting Fixtures fans and exhaust fans. (If these are supplied by the client, then the contractor will erect the fixture as required without any extra payment beyond the contract)

- External lighting including underground cables and connection with the external cables and earthing.

- Feeder pillars with circuit breakers.

- Underground cables.

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

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

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

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

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

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

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

   (ii) Opening, inspecting and reporting all damages and short supply items.

   (iii) Arranging to repair and/or re-order all damaged and short supply items.

   (iv) Storing at site with suitable all weather protection.

(v) Assemblies, erection and complete Installation.

(vi) Necessary coordination between work done by other Contractors.

(vii) Final check-up, testing, and commissioning in the presence of the Owner's representative.

(viii) Obtaining the Owner's written acceptance of satisfactory performance.

4. INFORMATIONS REQUIRED FROM CONTRACTOR

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

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

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

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

v. Type test certificates for all equipment on similar types of equipment.

vi. Final Single line diagram, complete with cable sizes, etc.

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

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

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

x. Protection relay settings.

xi. Cable schedule & interconnection chart.

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

xiii. Test certificates.

xiv. Instruction manuals of all major equipment.

xv. Test Procedures at sites.

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

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

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

5. PRICES

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

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

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

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

6. ELECTRIC POWER SUPPLY AND WATER SUPPLY:

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

7. PROVISIONS AGAINST ACCIDENTS AND SAFETY MEASURES

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

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

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

8. SPECIFICATIONS

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

9. VARIATION IN QUANTITY

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

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

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

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

10. SITE VISIT

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

11. TOOLS FOR HANDLING AND ERECTION :-

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

12. CO-ORDINATION WITH OTHER AGENCY: -

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

13. CARE OF BUILDINGS :-

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

14. STRUCTURAL ALTERATIONS TO BUILDINGS :-

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

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

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

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

15. WORK IN OCCUPIED BUILDINGS: -

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

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

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

16. STATUTORY REGULATION AND APPROVALS :-

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

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

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

17. STANDARDS AND CODE OF PRACTICE:-

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

a) National Electrical Code

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

c) IS: 732 -1989: Electrical wiring installation

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

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

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

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

h) IS: 3043 -1987: Earthing

i) IS: 3646 (Part-1) -1992: Interior Illumination

j) IS: 3661 (Part-2) -1967: Current rating for cable

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

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

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

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

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

18. MATERIAL SAMPLES AND SHOP DRAWINGS:-

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

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

19. ELECTRICAL DRAWINGS: -

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

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

20. TESTING AND COMMISSIONING: -

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

21. GUARANTEE

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

22. COMPLETION DRAWINGS

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

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

b. Size of conductor in each circuit.

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

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

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

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

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

h. Layout and particulars of all cables.

i. Location of all equipments with dimensions and connections.

23. INSPECTION

All equipment *I* material covered under this specification is liable for inspection by the Owner/ his representative. The vendor shall inform two weeks in advance for inspection to be carried out at the manufacturer's works. The contractor shall furnish data Sheets & other details. Additional information, if desired by the bidder can also be furnished separately.

GENERAL & TECHNICAL

1 POINT WIRING:-

1.1. DEFINITION:-

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

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

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

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

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

1.2. SCOPE:-

Following shall be deemed to be included in point wiring.

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

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

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

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

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

vi. Control switch or MCB, as specified.

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

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

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

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

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

1.3 MATERIAL :-

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

2. MEASUREMENT:-

i. Contractor shall measure the work jointly with the site engineer and prepare measurement sheets in triplicate. Three copies of measurement sheets shall be submitted along with running account bills. Bills received without proper measurements of work shall not be considered submitted.
ii. Should the contractor neglect to measure the work, then the measurement taken by Engineer/Architect or a person approved by the Bank shall be final and binding to him. Such measurements shall be taken in accordance with the mode of measurements wherever specified or as per actual executed quantities.
iii. All authorised extra works, omissions and all variations made without the Engineer/Architect/Bank's knowledge, or subsequently sanctioned by him in writing (with the prior approval of the contractor in writing) shall be included in such measurement.
iv. All bills for the work shall be submitted in the tender price bid format.

2.1. POINT WIRING (OTHER THAN SOCKET OUTLET POINTS) :-

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

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

2.2 POINT WIRING FOR SOCKET OUTLET POINTS :-

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

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

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

2.3 GROUP CONTROL POINTS WIRING:-

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

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

2.4 TWIN CONTROL LIGHT POINT WIRING: -

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

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

2.5 MULTIPLE CONTROLLED CALL BELL POINTS WIRING:-

i. In the case of call bell points with a single call bell outlet, controlled from more than one place, the point shall be measured in parts i.e. (a) from the call bell outlet to one of the nearest ceiling roses meant for connection to bell push, treated as one point and (b) from that ceiling rose to the next one and so on, shall be treated as separate point(s).

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

3. CIRCUIT AND SUBMAIN WIRING:-

3.1. CIRCUIT WIRING:-

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

3.2. SUB MAIN WIRING:-

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

4. MEASUREMENT OF CIRCUIT AND SUBMAIN WIRING:-

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

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

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

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

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

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

5. SYSTEM OF DISTRIBUTION AND WIRINGS:-

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

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

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

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

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

6. BALANCING OF CIRCUITS:-

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

7. WIRING SYSTEM :-

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

ii. Lights, fans and call bells shall be wired in the ‘lighting’ circuits. 15A/16A socket outlets and other power outlets shall be wired in the ‘Power’ circuits. 5A/6A socket

outlets shall also be wired in the "Lighting" circuit both in residential as well as non-residential buildings.

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

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

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

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

8. PASSING THROUGH WALLS OR FLOORS:-

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

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

9. JOINTS IN WIRING:-

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

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

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

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

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

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

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

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

11. GENERAL REQUIREMENTS OF COMPONENTS:-

11.1 QUALITY OF MATERIALS :-

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

11.2 RATING OF COMPONENTS:-

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

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

11.3 CONFORMITY OF STANDARDS:-

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

11.4 INTERCHANGEABILITY: -

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

SWITCHES & RECEPTACLES (Modular Type)

1. CONTROL SWITCHES FOR POINTS:-

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

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

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

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

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

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

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

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

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

2. SOCKET OUTLETS: -

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

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

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

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

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

3. SWITCH BOX COVERS :-

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

SWITCHES & BOXES (Modular Type)

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

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

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

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

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

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

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

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

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

SWITCHGEAR AND CONTROLGEAR

1. GENERAL ASPECTS:-

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

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

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

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

v. **Independent earth terminal block.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work

including all Civil material shall be included in contractor's scope for proper completion of work.

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

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

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

4. WORKMANSHIP:-

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

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

5. COMMISSIONING ON COMPLETION: -

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

6. COMPLETION PLAN AND COMPLETION CERTIFICATE:-

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

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

a) General layout of the building.

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

c) Position of all points and their controls.

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

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

7. ADDITION TO AN INSTALLATION:-

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

CIRCUIT BREAKERS

A. MINIATURE CIRCUIT BREAKERS (MCB):-

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

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

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

MCBs shall be DIN mounted.

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

MCBs shall be C-curve.

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

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

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

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

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

- **System of operation**

ELCB/ RCCB/RCBO shall work on the principle of core balance transformer. The incoming shall pass through torroidal core transformer. As long as the currents in the phase and neutral

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

- **Mechanical Operation**

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

- **Neutral Advance Feature**

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

- **Testing Provision**

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

C. MOULDED CASE CIRCUIT BREAKER (MCCB's)

The rated normal current should be specified at 40°C

1. General

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

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

2. Construction

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material; operating handle shall be quick make/quick break. The operating handle shall have suitable Rs. ON' Rs. OFF' and Rs. TRIPPED' mechanical

indicators notable from outside. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phases.

Suitable arc extinguishing device shall be provided for each contact. **Tripping unit shall be thermal-magnetic type upto 250A and Microprocessor based above 250A (or as specified specifically in Bill of Quantities and drawings)** provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Tripping device shall have IDMT characteristics for sustained over load and short circuits.

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

4. Accessories

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

5. Interlocking

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

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

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

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

6. Rupturing capacity

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

100 / 125 Amp : 25 KA

160/200/250 Amp : 35 KA

300/400/630/800 Amp : 50 KA

7. The MCCB shall be **current limiting type** and comprise of quick make – break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. For thermal magnetic protection the O/L adjustment should be 75%-100% and for

microprocessor-based release the adjustment should be 40%- 100% and S/c for 2 to 12 times .All MCCBs rated 200 Amps and above shall have adjustable magnetic short circuit pick-up.

8. Electrical Features

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

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

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

10. Installation

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

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

Phase barrier should be provided as a standard feature.

11. Testing

a) Original test certificate of the MCCB as per BS 3871 or JS-C-8370 shall be furnished.

b) Pre-commissioning tests on the switchboard panel incorporating the MCCB shall be done as per standard specifications.

D. AIR CIRCUIT BREAKER

1. General

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

2. Type and construction

Air circuit breakers shall be of enclosed pattern, dead front type with trip free operating mechanism. Air Circuit breakers shall be **withdrawable type with horizontal drawout carriage.** The mechanism shall be mechanical if not specifically mentioned for electrical. The ACBs shall be strong and robust in construction with suitable arrangement for anchoring when in fully engaged or fully drawn out positions. The carriage or cradle on which the breaker is mounted shall be of robust design made of fabricated steel, supported on rollers. Cradle shall also comprise of main and secondary separable contacts and all drawout mechanisms in a completely fig welded assembly short circuit on top. There shall be no dependence upon the panel board frame for any critical alignment. The withdrawal arrangement shall be such as to allow smooth and easy movement.

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

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

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

3 - Isolated position - all circuits disconnected.

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

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

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

3. Operating Mechanism

Air circuit breaker shall be provided with a **quick-make, trip-free** operating mechanism. The operating mechanism shall be strain-free spring operated. The operating shall be "handle front of the panel" type. The design shall be such that the circuit breaker compartment door need not be opened while moving the breaker from completely

connected, through test, in to the disconnected position. The spring shall be charged automatically during the closing operation. Mechanical Indication of the position of the spring charge shall be provided.

4. Interlocking and safety arrangement

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

i) It shall not be possible for breaker to be withdrawn when in Rs. ON" position.

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

iii) The breaker shall be capable of being raked in to Rs. testing' isolated and maintenance positions and kept locked in any of these positions.

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

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

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

vii) Mechanical interlocks shall be provided between the operations of different breakers (if specified in Bill of Quantities).

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

1 Contact portion indicator (on/off)
2. Stored energy status indicator
3. Trip indicator on fault

5. Rating

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

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

6. Accessories

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

Circuit breakers shall be provided with the following Accessories: -

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

8. Mechanical indicators

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

- main contacts closed "ON"
- main contacts open "OFF"
- springs charged
- springs discharged
- circuit breaker in "service" position (drawout only)
- circuit breaker in "test" position (drawout only)
- circuit breaker in "isolated" position (drawout only)

9. Mounting

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

10. Testing

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

i) Impulse withstand test

ii) Insulation test

iii) Di-electric rigidity /Insulation test

iv) Mechanical operation checking

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

11. Protection

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

12. Setting range of protection release

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

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

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

PVC CONDUIT WIRING SYSTEM

1. SCOPE:-

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

2. APPLICATION:-

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

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

3. Special precautions:-

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

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

a) In concealed/ inaccessible places of combustible construction where ambient temperature exceeds 60^{o}C.

b) In places where ambient temperature is less than 5^{o}C.

c) For suspension of fluorescent fittings and other fixtures.

d) In areas exposed to sunlight.

3. MATERIAL:-

3.1 CONDUITS:-

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

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

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

iv. **WIRING CAPACITY:-**

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

3.2 CONDUIT ACCESSORIES:-

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

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

iii. Flexible conduit accessories shall be of threaded type.

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

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

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

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

4. INSTALLATION:-

1. COMMON ASPECTS FOR BOTH RECESSED AND SURFACE CONDUIT WORKS.

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

ii. **CONDUIT JOINTS :-**

a) All joints shall be sealed/cemented with approved cement. Damaged conduit pipes / fittings shall not be used in the work. Cut ends of conduit pipes shall have no sharp edges or any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

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

iii. **BENDS IN CONDUITS:-**

a) All bends in the system may be formed either by bending the pipes by an 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.

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. **PAINTING:-**

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

5. ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORK:-

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

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 Engineer-in-charge. Where it is not possible to use these for fixing, suitable clamps with bolts and nuts shall be used.

6. ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK:-

i. **MAKING CHASE:-**

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

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

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

ii. **FIXING CONDUITS IN CHASE:-**

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

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

iii. **ERECTION IN RCC WORK:**

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

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

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

iv. **FIXING INSPECTION BOXES:**

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

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

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

v. **FIXING SWITCH BOXES AND ACCESSORIES:**

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

vi. **FISH WIRE:-**

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

7. BUNCHING OF CABLES:

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

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

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

8. EARTHING REQUIREMENTS:-

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

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

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

TABLE - 3
DIMENSIONAL DETAILS OF RIGID NON-METALLIC CONDUITS.
(All dimensions in mm)

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

TABLE - 4
MAXIMUM NUMBER OF PVC INSULATED 650/ 1100 VOLT GRADE COPPER CONDUCTOR CABLE THAT CAN BE DRAWN INTO RIGID PVC CONDUIT

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

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

TABLE - 5

ORDINARY CLIPS OR GIRDER CLIPS.

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

EARTHING

1. SCOPE:-

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

2. INSTALLATION:-

1. ELECTRODES:-

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

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

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

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

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

3. WATERING ARRANGEMENT:-

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

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

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

4. EARTHING CONDUCTOR (Main earthing lead):-

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6. EARTH RESISTANCE:-

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

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

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

7. MARKING: -

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

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

CABLES

1. GENERAL

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

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

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

Cable Identification

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

(i) Manufacturer's name or trade mark
(ii) Voltage grade
(iii) Year of manufacture
(iv) Type of insulation
(v) Printing of cable length on each meter

Core Identification

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

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

Tests

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

(ii) Routine tests on each drum of cables.

(iii) Acceptance tests on drums chosen at random for acceptance of the lot.

(iv) Type tests on each type of cable, inclusive of measurement of armour D.C. resistance of power cables.

2. MATERIAL

11 kV HT Cables

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

L T Power Cables

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

Control Cables

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

Cable Termination

a) HT Cable Terminations

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

b) L T power, control cable termination

(i) L T cable termination shall be provided with compression cable glands of brass suitable for holding the armour of the cable.

(ii) Lugs shall be crimping type and shall be of copper suitable for copper conductor cable and of aluminum for aluminum conductor cable.

(iii) Termination shall be carried out as per details furnished in this specification.

Compression Glands

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

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

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

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

L. T. PANEL

1. CONSTRUCTION FEATURES

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

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

c) All panels shall be extensible on both sides.

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

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

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

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

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

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

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

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

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

m) Strong concealed type hinges shall support all doors.

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

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

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

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

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

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

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

2 BUS AND BUS TAPS

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

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

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

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

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

f) The busbar size shall be of similar size as of busduct.

3 CHANGEOVER SWITCHES

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

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

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

d) The switches shall be provided with operating handle compartment door and shall be so interlocked that on the hinged compartment door and shall be so interlocked that:
   i) The door can be opened only when the switch is in OFF position.
   ii) It shall not be possible to close the switch when the door is open.

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

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

4 FUSES

a) All fuses shall be HRC cartridge link type.

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

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

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

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

5 CONTACTORS

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

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

c) Main contacts of contactors shall be silver faced.

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

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

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

6 OVERLOAD RELAYS

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

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

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

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

7 CAPACITORS

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

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

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

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

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

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

8 AUTOMATIC POWER FACTOR CONTROL RELAY

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

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

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

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

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

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

9 COOLING

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

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

10 CURRENT TRANSFORMERS

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

b) Accuracy class of the current transformers shall be:
   (i) Class 5P20 for protection.
   (ii) Class 1.0 for metering.
   (iii) Class PS for differential Protection & REF.

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

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

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

11 VOLTAGE TRANSFORMERS

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

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

12 RELAYS

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

13 CONTROL AND SELECTOR SWITCHES

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

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

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

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

14 INDICATING METERS AND INSTRUMENTS

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

15 INDICATING LAMPS

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

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

16 PUSH BUTTONS

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

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

17 POWER AND CONTROL CABLE TERMINATION

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

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

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

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

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

18 INTERNAL WIRING

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

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

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

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

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

The following wiring codes shall be used.

Instrument Transformer : Red, yellow or blue depending upon phase with which wire is associated.

A-C phase wire	:	White
A-C Neutral wire	:	Black
Earth connection	:	Green

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

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

19 TERMINAL BLOCKS

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

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

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

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

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

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

20 GROUND BUS

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

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

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

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

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

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

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

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

21 SPACE HEATERS

Each cubicle shall be provided with thermostat controlled space heaters.

22 AC/ DC POWER SUPPLY

a) The panels shall be suitable to receive following power supplies.
AC Supply : Single Feeder
DC Supply : Double Feeder

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

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

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

23 NAME PLATES

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

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

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

24 TROPICAL PROTECTION

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

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

25 PAINTING

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

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

c) The panels shall be finished with two coats of Siemens Grey (Shade RAL 7032)

powder coated / Polyester enameled.

26 TESTS & INSPECTION

a) The following routine and acceptance tests shall be carried out during final acceptance list.
   i) Mechanical operation test.
   ii) Electrical operation test.
   iii) High voltage test on power circuits.
   iv) High voltage test on control circuits.
   v) Millivolt test on the circuit breakers.
   vi) Millivolt Drop test on Busbar joints

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

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

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

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

BATTERY & BATTERY CHARGER

1. BATTERY

General

a) The battery shall be maintenance free type

b) The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load.

2. BATTERY CHARGER

General

a) The charger shall be natural air cooled, solid state type with full wave, fully controlled, bridge configurations.

b) The charger shall be provided with automatic voltage regulation, current limiting circuitry smoothing filter circuit and soft start feature.

c) Voltage control shall be step-less, smooth and continuous.

d) The charger shall be self-protecting against all A-C and D-C transients and steady state abnormal currents and voltages.

e) Voltage setters shall be provided for setting the output of float boost charge. Setting shall be independent of each other so that setting of one voltage shall not require resetting other.

f) There shall be separate transformers for float and boost charger.

g) Charger A-C input and D-C output shall be electrically isolated from each other and also from panel ground.

h) Isolation shall also be provided between power and control circuits.

i) Batteries shall also be housed into the Battery Charger cubical.

Construction

a) The charger shall be freestanding, floor mounted with sheet steel enclosure with all access from the front.

b) The panel shall conform to the degree of protection IP 42. Minimum thickness of sheet metal used shall be 2 mm.

c) Access door shall be with concealed hinges and neoprene gaskets. Ventilating louvers shall be covered with fine wire mesh.

d) All equipment within the panels shall be arranged in modular units and laid out with sufficient space for easy maintenance.

e) Switches, meters, relays etc. shall be flush mounted on the front of the panels. Nameplates of approved size and type shall be provided for all circuits and devices.

Charger Equipment

a) All power diodes and control rectifiers shall be silicon type. Rectifier Transformer shall be dry type, double wound, with copper conductor and class B insulation.

b) Blocking diodes shall be fully rated and redundant so that failure of a single diode shall not incapacitate the system in any way.

c) Isolating switches shall be heavy duty, load break type, operated by an external handle with provision for padlocking in ON and OFF position.

d) Changeover switch shall be 3 position, 4 pole, load break type with 2 NO + 2 NC auxiliary contacts.

e) Contactor shall be air-break type with thermal overload relays having in built single phase preventor.

f) Fuses shall be HRC type and arranged for easy replacement. Semi conducting device

fuses shall be fast-acting.

g) Indicating lights shall be low-watt filament type with series resistor. Both lamp and lens shall be replaceable from front.

h) Meters shall be 96 x 96mm switchboard type, 250 deg. scale, antiglare glass, :!: 2% accuracy with zero adjuster on the front.

Alarms

a) One (1) ten-points alarm facia shall be provided on charger panel, complete with proper actuating devices, circuitry and legends.

b) The arrangement shall be such that on occurrence of a fault the corresponding window will light up and stays lighted until the fault is cleared and reset button is pressed.

c) Each time a window lights up, a master relay will get energized to provide group alarm signals for Owner's remote panel.

d) Following minimum annunciation shall be provided:
   i) A. C. Supply failure *
   ii) D. C. Voltage low *
   iii) D. C. Voltage high *
   iv) D. C. System ground *
   v) Charger overload *
   vi) SCR fuse blown
   vii) Filter fuse blown
   viii) D. C. Output fuse blown

e) Alarm points marked with an asterisk (*) shall have electrically separate spare set of contacts wire_ up to the terminal block for Owner's use.

f) Alarm contacts shall be rated 2A at 24V D. C. And SA at 240V A.C.

Outgoing Feeders

a) Each Outgoing feeder shall be provided with double pole switch and with HRC fuses.

b) Outgoing feeders shall be located in separate module forming part of charger panel with separate cable alley for terminated outgoing cable.

Lamp / Space Heaters *I* Receptacles

a) The charger panels shall be provided with:
   - Internal illumination lamp with door switch.
   - Space heater with thermostat control.

b) Lamp, heater circuits shall have individual switch fuse units.

Wiring/ Cabling

a) The panels shall be completely wired-up. All wiring shall be routed through wiring troughs. Wires shall be ferruled at both ends for identification.

b) Panels shall have removable gland plates at the bottom for cable entry. All incoming *I* outgoing cables shall be terminated in suitable terminal blocks.

c) Control terminal blocks shall be box-clamp type ELMEX 10 Sq. mm or approved equal.

Grounding

a) The charger panels shall be fully rated ground bus with two ground terminals, one at each end.

b) Each terminal shall comprise two-bolt drilling with M10 G.I. bolts and nuts to receive Owner's ground connection of 50 x 6 mm G.I. flat.

Tropical Protection

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

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

Painting

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

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

c) The panels shall be finished in powder coated Siemens Grey, RAL7032.

Tests

a) All equipment and components there of shall be subject to shop tests as per relevant IS standards. The tests shall included but not limited to:

b) Tests on battery charger.

- Dielectric tests.
- Voltage regulation check from 0 to 100% load with ±10% input voltage variation.
- Ripple content measurement.
- Heat run test on current limiting value.

Test Witness

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

3. REQUIREMENT

Battery

i)	Type	:	Lead Acid
ii)	Nos. of Cells per Battery	:	12
iii)	Battery nominal voltage	:	24 V
iv)	Ten hour rating to 1.85 Volt/Cell at 27 deg. C.	:	300 AH

Battery Charger

i)	Charger	:	Float & Boost
ii)	Type	:	Solid state, rectifier
iii)	Rating	:	40A
iv)	A.C. Input Supply 50Hz.,	:	415V, 3ph,4 w/230V, 1Ph., 2 wire.
v)	Ripple content in charger DC output	:	± 1%
vi)	Outgoing feeders - 12 Nos	:	Each consisting of double pole MCB of 32A.

INSPECTION SCHEDULE

Witness of routine / Type test (as per relevant standards/ agreed schedule) of various equipments shall be carried out at the works of manufacturer by Owner/ owner's representative. The Contractor shall furnish the following details and freeze this schedule within 2 weeks after placement of LOI in consultation with Owner/ Consultants.

ITEMS	TESTING DATE OF INSPECTION	PLACE	NAME OF MANUFACTURER

NOTE

It is the obligation on the part of the Contractor to inform the actual date of inspection 2 weeks in advance.

Contractor's engineer shall be present in all inspections.

In some cases, the Owner/ Owner's Representative may give a waiver of inspection.

In all cases, test certificate shall be furnished by the contractor, and the same shall be approved by owner/ Consultant.

…….....

Bidder's Signature

APPROVED LIST OF MAKES FOR ELECTRICAL WORK

S. N.	Equipment / Materials	Recommended Manufacturers
A	**Electrical Works**	
1	LT Panels (TTA Panels) OEM Manufactured	Legrand / L&T / Schneider Electric / ABB / Siemens
2	LT Panels (Non TTA Panels) and Motor Control Centre	Legrand / L&T / Schneider Electric / ABB / Siemens
3	Sandwiched Construction Bus Duct and Rising Mains	Schneider Electric / Legrand / L&T
4	Distribution Board	Hager / Legrand /Siemens / L&T / ABB
5	Motor Starter	L & T / Schneider / Siemens / ABB / Legrand
6	Air Circuit Breaker	L&T (U-Power) / Schneider Electric (Master Pact NW) / Siemens (3WL) / Legrand (DMX3) / ABB (Emax)
7	Moulded Case Circuit Breaker (MCCB)	Schneider Electric (NSX) / L&T (D-Sine) / Siemens (3VA) / Legrand (DPX3) / ABB (Tmax)
8	LT Switchgears: Miniature Circuit Breakers (MCB) Residual Current Circuit Breaker (RCCB) Residual current operated Circuit Breaker (RCBO) Motor Protection Circuit Breakers (MPCB) Isolators	Hager / Legrand / Siemens / ABB / Schneider Electric / L&T
9	Power / Auxiliary Contactor	Legrand / Schneider Electric / Siemens / L&T / ABB
10	Energy Monitoring System	Legrand / Socomec / Schneider / L&T / ABB
11	Change Over Switch	Havells / Socomec / L&T / Legrand / ABB
12	ATS – Auto Transfer Switch	Vitzrotek / ASCO / Socomec / Schneider Electric / Legrand / L&T / ABB / Siemens / GE
13	Control Transformers / Potential Transformers	Automatic Electric / Indcoil / Pragati / AE / Kappa / L&T / Precise / Elmex / Ashmor / ECS / Kalpa
14	Relays	L&T / Siemens / Enercon / Legrand / Trinity / Schneider Electric / Beluk / Ducati / EPCOS / ABB

15	Indicating Lamps (LED type)	L&T / Salzer / Schneider Electric / ABB / Legrand / Siemens / GE / As per OEM Standards
16	Push Buttons and Bush Button Set	L&T / Salzer / Schneider Electric / ABB / Legrand / Siemens / GE / C&S / As per OEM Standards
17	Selector Switch	L&T / Salzer / Kaycee / Schneider Electric / ABB / Legrand / Siemens / MECO / As per OEM Standards
18	Terminal Blocks	Connect Well / Elmex
19	Connectors (Colours as per Phases and Neutral)	WAGO / Phoenix Contact / Connect Well
20	Meters / Energy Meters & Load Managers (Digital)	L&T / Siemens / Schneider Electric / Legrand / ABB
21	Meters (Analog)	L&T / Siemens / Schneider Electric / Legrand / ABB
22	Electric Timers	L&T / Legrand / Siemens / Schneider Electric / ABB / MECO / BCH
23	Rotary Switches	Siemens / Kaycee / Salzer / L&T / Legrand / Schneider Electric / As per OEM Standards
24	LT Capacitors	L&T / Siemens / Legrand / Schneider Electric / ABB
25	Low Voltage Cables	Finolex / KEI / Havells / Polycab / RR Kabel
26	Cable Glands (Double / Single Compression type)	Comet / Cosmos / 3D / HMI / Hex / Jainsons / Dowells / Braco / Polycab
27	Cable Lugs / Cable Terminations	Comet / Cosmos / 3D / HMI / Hex / Jainsons / Dowells / Braco / Polycab
28	Cu. Conductor Wires (FRLS)	Finolex / Havells / Anchor / Polycab / RR Kabel / KEI
29	PVC Conduits and related accessories	Precision / AKG / Polycab / Anchor / Asian
30	MS / GI Conduit (ISI approved)	AKG / BEC / Vimco / Precision / Steelcraft / Anchor
31	HDMI Cables / USB Cables / Audio Cables	Legrand / AMP / Molex
32	TV Co-Axial Cables	Finolex / Havells / Polycab / RR Kabel / KEI / Molex
33	Modular Switches & Sockets / Modular Base Frames with Plate and GI Switch Boxes	Legrand (Myrius & Arteor) / MK (Blenze Plus & Orna) / Crabtree (Murano) / Schneider (Opale) / Norisys / Panasonic (Europa) / L&T (Englaze) / GM Modular (GX10 Series or equivalent) Model shall be as approved by Architect & Client. Contractor to provide minimum 03 Nos. samples of different makes for approval of Client & Architect

34	Occupancy Sensor / Motion Sensor	Legrand / Schneider / Wipro / Phillips / Siemens
35	Industrial type Sockets (Metal Clad / Splash Proof / Water Proof / Weather Proof)	Legrand / Schneider Electric / L&T / ABB / Siemens / Hager / Hensel
36	Ceiling Fan – BLDC / Exhaust Fans	Atomberg / Superfan / Havells / Crompton
37	Exhaust Fans	Crompton / Havells / Usha / Atomberg
38	Lighting Fixtures	
	a) Internal	Philips / Eveready / Havells / Trilux
	b) Decorative	Luker / Phillips / Eveready / Trilux
	c) Indoor Gaming / Sports	Philips / Eveready / Trilux / Harrison
	d) External	VAK / Lime Light / KLight / Philips / Eveready / Trilux / Luker
	e) Poles for External Light	Eveready / Bombay Poles / Rajan Tubes / Bajaj
39	Junction Boxes	Hensel / Sintex / Clipsal / Spelsberg / SCAME
40	Aviation light	Bajaj / Insta power / Spectrum / Crompton
41	Cable Trays (Ladder Type / Perforated)	OBO Bettermann / Legrand / Indiana / Profab / MK / Erico
42	Floor Raceways / Floor Trunking	MK / Legrand / OBO Bettermann / Asian Ancillary Corporation / Profab / Indiana / Erico / Schneider
43	Floor Junction Boxes	MK / Legrand / OBO Bettermann / Asian Ancillary Corporation / Profab / Indiana / Erico / Schneider
44	UPVC Trunking	MK / Legrand / OBO Bettermann
45	Fire Sealant & Fire Retardant Paint	3M / HILTI / OBO
46	Lightning Protection System / Surge Arrestor	Axis / LPI / OBO / Dehn / Indelec / ABB Furse / Purcel / Eltech / Tercel
47	Earthing System	OBO Bettermann / JEF / JMV / Axis / Dehn / Eltech / Indelec / ABB
48	UPS	Eaton / APC-Schneider / Legrand (Numeric) / Vertiv (Emerson) / Delta
49	SMF Batteries for UPS	Exide / Amara Raja / Rocket / Amaron / Standard / AMCO / Prestolite / Tata Green

50	RCC Hume Pipes	Dhere / KK / Indian Hume Pipe / Pranali
51	DWC Pipes / HDPE Pipes	Rex / Natni / Polymer / Gemini
52	Anchor Fasteners	HILTI / Fischer
53	Solar Power	Rayzon / Vikram / Novasis / Sova

NOTE:

Sr. No.	Description
1.	The choice of the final makes shall be made by the owner/ consultant
2.	The samples or Cat. No. of all types of switches & light fittings should be approved before execution.

CONVENTIONAL FIRE ALARM AND ANNUNCIATION SYSTEM

SCOPE OF WORK

1.1 The scope of work covers the supply, installation, commissioning and testing of Conventional Fire Alarm System meeting the intents of these specifications. The work shall cover.

i. Conventional Fire Alarm Control Panel (FACP)

ii. Conventional Alarm initiating devices

iii. Audio-visual annunciation

iv. All wiring

a) From alarm initiating devices

SUBMITTALS

2.1 All details comprising the following shall be submitted:

i. System configuration & capability vies a vies the specifications.

ii. Compliance from the specifications.

iii. Makes and catalogues.

FIRE ALARM SYSTEM

3.1 The main fire alarm control panel shall be microprocessor-based signal initiating devices, local and remote operator terminals and all other system-controlled devices.

3.2 Supervise all signaling and notification circuits throughout the system through the circuit interface modules.

iii. Detect activation of any signal initiating devices such as smoke detectors, heat detectors and break glass units and location of alarm condition.

a) Acceptance switch that changes the alarm signal from blinking mode to steady mode and silence all remote alarm sounders.

b) Signal silence switch to silence all the programmed silence able notification appliances.

c) Reset switch to bring all initiating and output devices to normal condition.

d) Test switch to initiate automatic testing of alarm conditions and all such tests shall be displayed and recorded.

The detailed requirements and system capacity are shown in the drawings.

3.3 The FACP shall be modular in construction and shall be enclosed in a sheet-steel rust-inhibited cabinet of appropriate size to accommodate atleast 25% expansion of all modules. The cabinet door shall have a glass window for all display and shall be provided with a key lock.

3.4 The main power supply unit shall operate on 230 VAC 50 Hz meeting the needs of the FACP and notification appliance circuits. The unit shall incorporate a battery charger with duel rate charging facility.

SIGNAL INITIATING DEVICES

4.1 Each detector shall be provided with power LED's and an output connection for remote indication. Both LED will be blinking mode during normal operation. And will be in steady mode indicating an alarm mode.

Detector sensitivity shall automatically compensate for accumulated dust or slow environmental degradation. All detectors shall include a temper proof twist-lock base which shall be common interchangeable for all detectors.

4.2 All detectors shall be low profile with sealed sensing chambers and suitable for stable operation in an ambient temp of 0 to 49C and against 7.5mps air velocities. Detectors shall be optical type enclosed in a heat retardant plastic body. The heat detectors shall operate at 59C with a rate of rise element of 9.5C per minute

4.3 Response indicators shall be LED powered from the Signal-initiating device.

INSTALLATION

5.1 The installation shall be carried out in accordance with the specifications and drawings and complying with IS 2189, any local codes and proprietary manufacturers instructions. Where the provisions are conflicting, areas of such conflict shall be identified and clearly brought out in the 'Deviations form Tender' Appendix II together with the financial implications, if any.

5.2 All wiring shall be carried out with armored cables as specified in the schedule of work. All junction boxes and conduit accessories shall be galvanized steel.

6.0 TESTING

6.1 The system shall be tested and commissioned by a qualified specialist technician to establish system performance in all its aspects and all such tests shall be witnessed and test readings attested by the Consultant.

6.2 All cabling shall be checked for proper connections and tested for
I) Continuity

ii) Ground faults
iii) Short circuits
iv) Insulation resistance by a 1000V meggar

6.3 Test all Circuits and device for verification trouble/fault signals in the FACP and performance compliance All test results shall be verified and authenticated by the Consultant and shall be included as part of the Instruction manual.

6.4 During the period of verification and testing the contractor should associate atleast 1 person from the client's side for training in all aspects of system operation and maintenance, and fire drill etc.

7.0 MODE OF MEASUREMENT

The mode of measurement shall follow the schedule of work.

PUBLIC ADDRESS SYSTEM

1.0 SCOPE OF WORK

1.1 The scope of work covers the supply, installation, commissioning and testing of the Public Address System relating to the Fire Alarm System meeting the intents of the specifications. The system may have centralized or distributed amplifiers.

1.2 The system could be combined with other paging functions or piped music or any other announcements.

2.0 AMPLIFIERS

2.1 All amplifiers shall be suitable for Fire Protective Signalling Systems.

2.2 The power amplifiers associated with FACP shall have adequate continuous (RMS) power output to meet with centralized or distributed configuration as the case may. The unit shall be capable of delivering the rated output watts with less than 0.5% harmonic distortion in the design band width. The amplifier shall have a broad band frequency response of 20 Hz to 20 KHz with a signal to noise ration greater than – 90dB. The output voltage and impedance shall meet with the system requirements. Amplifiers shall be protected against over loads and output shorts and a special thermal overload on the heat sink.

2.3 The distributed audio amplifiers shall be magnetically coupled switch mode type with three input signal sources selectable manually or automatically by the fire alarm system. The amplifier shall incorporate a push to talk switch and paging over ride. Output wattage and volts shall be as shown in the schedule of work or as required to meet the needs of the PA system.

2.4 All amplifiers shall have adequate back up battery support to power the PA System for at least 4 hours. The battery system shall have facility for recharging the battery.

2.5 Power as well as audio amplifiers shall be mounted in suitable wall mounted/floor standing enclosures shall have lockable and removable doors with vision panel, all suitable for fire alarm systems.

3.0 SPEAKERS

3.1 Speakers shall be especially designed for broadcasting high quality, integrated emergency fire alarm signals and voice communications and approved by an appropriate authority for use in such

situations. Speakers shall be ceiling or wall mounted as shown in the schedule of work and shall be completed with mounting brackets accessories etc.

3.2 Speakers shall be of high efficiency yielding maximum output at minimum power acress 400 – 4000 Hz frequency range. Speakers shall have a line matching transformer with power – doubling multiple taps and shall yield a sound pressure level of 84 DBA @ 3.0 when on the lowest tap. Speakers shall be mounted in a rugged metal housing with vandal resistant grille.

3.3 Speakers external appearance shall be approved by the Architects.

3.4 Speakers and strobes shall be capable of being mounted on a 100 x 40 mm junction box. There shall be appropriate terminal strips for incoming and outgoing wires, Pigtail type connections are not acceptable.

4.0 P A SYSTEM WIRING

4.1 PA System wiring shall follow the specifications under "conduit wiring".

5.0 Testing and Commissioning

5.1 Entire PA System shall be tested to establish the following.

i. Functionally of the PA System

iii. Acceptable audibility of the public address in all spaces and record sound pressure levels of the Public address vis a vis the ambient noise levels.

5.0 AV SYSTEM

I. System Features and System Design Overview The designing of system, the following various design steps, which ensures that the audiovisual system meets requirements and expectations. The minimum required equipments are based on different type of programs to be held in this hall. a) The area should be absolutely cluttered free without any equipment on the table. b) To provide visuals without sacrificing the aesthetics c) To provide input-output connectivity that is future ready for connecting any other conferencing equipment accessories. d) All systems should have the computer and video compatibility and upgradability. e) Audio system should have the compatibility to Visual system and the microphones should true diversity, echo suppression and compact. It should give noise free sound quality.

II. Technical Specifications:

Interactive Display:

Resolution: 4K UHD (3840 x 2160 pixels).

Panel Type: IPS (In-Plane Switching) for wide viewing angles.

Touch Technology**:** Infrared (IR) or capacitive, supporting 20-40 simultaneous touch points

Brightness: Around 450 nits (typical).

Contrast Ratio: 1100:1 or higher.

Glass: Anti-glare, often with 8H tempered hardness for durability

Operating System: Android (e.g., Android 8.0, 14) with access to Play Store.

CPU/RAM: Inbuilt quad-core or octa-core processor with 8GB RAM (varies by model).

Storage: 64GB or 128GB internal storage.

OPS Slot: Optional Open Pluggable Specification slot for adding a Windows PC module.
Ports: Multiple HDMI (in/out), USB-C, USB 3.0, LAN, RS232.
Wireless: Built-in Wi-Fi (2.4/5GHz) and Bluetooth 5.0.
Audio: Integrated stereo speakers (e.g., 2x20W) and sometimes a built-in camera/mic array.
Stylus: Includes 2 or more writing pens/stylus.
Software: Whiteboard functions, screen capture, spotlight, palm eraser, sharing tools.
Screen Sharing: Wireless screen sharing for multiple devices.
Panel Life: 50,000+ hours

12x Presenter Tracking PTZ Camera

- Resolution: Up to 4K (3840x2160) @ 30/60fps or 1080p @ 60fps.
- Sensor: 1/2.8" or 1/2.5" CMOS (Sony often used) for high SNR (Signal-to-Noise Ratio).
- Optical Zoom: 12x (often combined with 12x digital zoom for 144x total).
- Field of View (FOV): Around 72° to 80.8° (horizontal/diagonal) for wide shots.
- PTZ Movement: Smooth, silent pan (±170°) & tilt (up to +90°/-30°), with quick preset recall (up to 256).

Tracking & AI Features

- AI Tracking Modes: Presenter (follows person), Zone (tracks within defined areas), Hybrid.
- Human Detection: Advanced AI for accurate subject detection and tracking.
- Voice Tracking (Optional): Uses microphone arrays for automatic speaker detection.
- Auto Framing: AI-based auto framing for dynamic shots.

Connectivity & Control

- Video Outputs: Simultaneous HDMI, USB 3.0, and IP (Ethernet).
- IP Streaming: Supports protocols like RTSP, RTMP, NDI|HX.
- Control: IP (Web UI), RS232/RS485 (Visca, Pelco-P/D).
- Power: PoE+ (Power over Ethernet) supported on many models.

Image & Performance

- Low Light: Excellent performance (e.g., 0.5 Lux) with 2D/3D Noise Reduction.
- WDR (Wide Dynamic Range): For balanced exposure in challenging lighting.
- Shutter Speed: Fast options (e.g., 1/10,000s).

20 x PTZ Audience Camera

- Optical Zoom: 20x optical zoom is a standard feature, allowing for clear close-ups of subjects from a distance, such as a speaker on a stage or a specific section of an audience.
- Resolution: Typically supports Full HD (1080p) or UHD 4K video resolutions, often at 50 or 60 frames per second (fps).

- Sensor: Commonly utilizes a high-quality Sony 1/2.8" or 1/1.8" CMOS image sensor to ensure good performance, even in low-light conditions.
- Pan/Tilt/Zoom (PTZ) Range: Wide range of motion, often around ±170° to 340° pan and +90° to -30° tilt, with variable speeds for smooth, quiet movements.
- Presets: Supports a large number of preset positions (commonly up to 255) for quick and easy switching between different camera angles.

Connectivity and Features

- Video Outputs: Multiple simultaneous outputs are typical, including:
  - HDMI
  - 3G-SDI
  - USB 3.0
  - IP/Ethernet (RJ45) with support for PoE (Power over Ethernet)
- Streaming Protocols: Compatibility with various protocols for seamless integration into live streaming workflows, such as NDI|HX, RTMP(S), RTSP, SRT, and ONVIF.
- Control Methods: Can be controlled via:
  - IR Remote Control
  - Web GUI (browser interface)
  - RS-232/RS-485 serial connections
  - Software/Apps (e.g., PTZ View Assist)
- Audio Input: Typically includes a 3.5mm line-in audio jack for embedding external audio into the video stream.

Dual-channel amplifier

Continuous Rated Power Stereo/Mono
8Ω : 700W + 700W RMS, 4Ω : 1200W + 1200W RMS
THD + N
< 0.1%
Frequency Response (-1dB)
20-20,000Hz
Low Pass Filter
80/120Hz @ 24dB per octave
Power Bandwidth (0.5% THD)
20-20,000Hz
Input Sensitivity
0dBu (775mV) & 4dBu (1.23V) (Selectable)
Input Impedance
10k Unbalanced, 20k Balanced
Signal To Noise Ratio
> 100dB
Channel Separation
> 65dB at 1kHz

Damping Factor (8W)
>1000
Slew Rate
20V/μs
Protections
Temperature, DC, RFI, Short Circuit, Overload, Overvoltage, Built-in Limiter (ON/OFF) AC: Circuit Protector 16A; ± DC: Fuse 2×16A (T 16A L)
Input Connectors
2×XLR, Stereo Phone Jack 6.3mm
Output Connectors
Speak on 4-Way and heavy-duty Binding Post for each channel
Cooling
2 × Variable Speed DC Fan with Temperature Sensing
Front Panel Controls
2×41 Step Level Attenuators
Indicators
Power ON/FAULT, Signal, Clip, Temperature, Protect (Ch. A & B)
Power Consumption (Rated)
2800VA @ 220-240V ~ 50/60Hz

Digital Signal Processor

Key Performance Metrics

- MIPS/MMACS/MFLOPS: Million Instructions/Multiply-Accumulate/Floating-point Operations Per Second, indicating raw throughput.
- Clock Speed: Measured in MHz/GHz, showing operating frequency.
- MAC Units: Hardware for single-cycle Multiply-Accumulate, crucial for filters.
- Latency/Throughput: How fast operations complete, affected by pipelining and Harvard architecture.

Architectural Features

- Harvard/Super Harvard Architecture: Separate program/data buses for simultaneous fetching, enhancing speed.
- VLIW (Very Long Instruction Word): Executes multiple operations per cycle.
- On-Chip Memory: Caches (instruction/data) and scratchpad RAM (X/Y memory) for fast access.
- DMA (Direct Memory Access): Offloads data transfers from the CPU.
- Special Instructions: Hardware loops, bit-reversal, etc., for signal processing.

Other Important Specs

- Bus Width: Data bus size (8-bit to 256-bit).
- Power: Operating voltage, power dissipation, low-power modes (STOP, WAIT).
- Peripherals: Interfaces for I/O (serial, PCI).
- Debugging: JTAG, On-Chip Emulation (OnCE).

Example Application Specs (Audio DSP)

- Sample Rate: e.g., 48kHz.
- Frequency Response: e.g., 20Hz-20kHz.
- THD+N: Total Harmonic Distortion + Noise (e.g., 0.004%).
- Noise Floor: e.g., -90dBu.

Digital Wireless handheld microphone

Wireless Microphone System:

It should be supplied with 2 Wireless Handheld microphones The receiver should have 1 number mixed Output The Microphones & Receiver should work on UHF frequency band. The Microphone should have a frequency response of 40Hz to 17000 Hz or better

Interface: It should have as 2x Antennas It should have 1x output port as 6.3mm phono type

Mount: It should have 1 Rack unit height with ability to mount in rack

Power: It should be supplied with 12 VDC power adapter

Gooseneck Microphone:

Microphone Form Factor Gooseneck Microphone

Polar Pattern / Directionality Bidirectional (Figure-8)

Microphone Transducer Type Dynamic

Frequency Response Range (Lower Limit) (Hz): 40-60

Frequency Response Range (Upper Limit) (Hz): 15-18

Sensitivity (mV/Pa): 2-6

Signal to Noise Ratio (dB): 70-90

Multi-windowing Processor

1. Video Inputs/Outputs:

- Ports: Common types include HDMI (up to 4K), 12G-SDI (for SDI models), and Network (Ethernet for IP streams).
- HDMI: Often supports HDCP 2.2/2.3 and resolutions like 4096x2160@60Hz (4:4:4).
- SDI: For professional video feeds, supporting 12G-SDI.
- Windowing & Scaling: Number of Windows: Typically supports 4 independent sources (e.g., 4x1) with stacking for more.
- Layouts: Customizable window positions, sizes, and aspect ratios.
- Scaling: Advanced scaling (e.g., Extron Vector™ 4K) for high-quality image presentation.
- Backgrounds: Support for static images or live backgrounds behind windows.
- Output Capabilities: Resolution: Scaled output up to 4K UHD (3840x2160) or DCI 4K (4096x2160) at 60Hz.
- Simultaneous Outputs: Often provides duplicate outputs (HDMI, HDBaseT) for local and remote displays.
- Audio Features: Audio Matrix: Switch audio streams independently from video.
- Embedding/De-embedding: Can extract or embed audio from/to video signals.

- Control & Management: Web Interface: Built-in web UI for easy configuration (cropping, scaling, positioning).
- Remote Control: RS-232, LAN, or CEC for integration with control systems.
- APIs: Direct Control APIs for custom programming.
- Advanced Features: Annotation: On-screen drawing, shapes, and pointers.
- Keying/Transitions: Video keying, logo insertion, and transition effects.
    - Stacking: Linking multiple processors for more windows

HDMI Switcher 4x4

VIDEO:
Number of Monitors Supported 4
Video Ports (4) HDMI (FEMALE)
Max Supported Video Resolution 3840 x 2160 (4K @ 60Hz)
Max Supported Color Depth 12-bit
HDR Support
3D Video Supported
Chroma Sub Sampling 4:2:0; 4:2:2; 4:4:4
Bandwidth 18 Gbps
AUDIO:
Audio Input: HDMI
Audio Specification: LPCM, Dolby Digital/Plus/EX, Dolby True HD, DTS, DTS-EX, DTS- 96/24, DTS High Res, DTS-HD Master Audio
INPUT:
AC Power Adapter: Input Specs (V / Hz / A) 100-240V / 50/60Hz / 0.8A
AC Power Adapter Output Specs (V / A) 12V / 2.5A
Voltage Compatibility (VAC) 100; 110; 125; 127; 200; 208; 220; 230; 240
Input Frequency 50/60Hz
OUTPUT: Frequency Compatibility 50 / 60 Hz
CONNECTIONS:
Number of Ports 4
Firmware Upgrade Port: RS-232 3-Pin Phoenix Connector. Connects to a PC or control system for serial port upgrade or RS-232 command control.
Side A - Connector 1 (4) HDMI (FEMALE) Side B - Connector 1 (4) HDMI (FEMALE)
Input x Output 4 x 4

24 Port POE Network Switch

24 port POE Network switch Connects up to 10x faster than Fast Ethernet Fan less design for quiet Operation.

Network switch having 10/100/1000 Gigabit Switches provide non-blocking, wire speed switching for your 10, 100, and 1000 megabit network clients.

POP UP Box:

Pop-up Boxes provide real ease of use and rapid connection solutions for mobile application such as Laptop, audio and video systems.
Should support all Format i.e. HDMI, DVI-D/DVI-I connector, Display Port, VGA, Stereo Audio on 3.5 mm mini jack.
Input Ports 1 HDMI, 1 DVI, 1 DisplayPort, 1 stereo audio on a 3.5mm mini jack
Output Ports 1 RJ−45 connector.
Maximum Step in Distance 50m (164ft) up to 1080p @60Hz.
Power Consumption 12V DC, 800mA.
Operating Temperature 0° to +40°C (32° to 104°F).
Humidity 10% to 90%, RHL non−condensing
Input Ports 1HDMI, 1 DVI, 1 Display Port, 1 stereo audio on a 3.5mm mini jack

Wi-Fi Router

Wireless Router with 300 Mbps Speed with integrated Antenna

I-Pad

It should have LED-backlit Multi-Touch display with IPS technology.
Pixel Resolution 2732x2048 at 264 pixels per inch
Fingerprint-resistant oleo phobic coating, Fully laminated display, Anti-reflective coating
Brightness : 600 nits
Reflectivity : 1.8%
12 Megapixel Camera
4K video recording at 30 fps or 60 fps, 1080p HD video recording at 30 fps or 60 fps, 720p HD video recording at 30 fps

III. Installation, Testing and Commissioning

1. Integration, installation, testing and commissioning of the system along with all the accessories. Integration requires
2. During warranty period, vendor engineer will visit twice in a month at IGIDR for monitoring of installed AV and VC system and attending any problems. In case of noncompletion of the rectification, party can depute more team members.
3. Civil works, making holes etc., in the brick and RC structure in the wall/ceiling/floor/other are as required for piping, conduits, casing and capping, cables, supports, grouting etc. The scope of the work includes making good the same after completion of works. Any other minor civil works required in connection with the installation of the equipment and system is included in the scope of the contract.

4. Cable routing and termination of the interface cables between main system, pre amplifiers, power amplifiers, Microphones, Interface equipment and speakers.
5. Only one power point at Electrical DB in hall shall be provided. The contractor's scope shall include all wirings from this DB to various equipment connected with the system
6. Inclusion of any other accessories required to enhance the functionality, operational performance, reliability and availability of the complete system.
7. Operating and Maintenance manuals (OEM or Custom) for equipment sr. no. 1, 3, 4, 5, 6, 7 & 8 of Annexure -A and System Schematic diagram for integrated AV and VC system shall be submitted.
8. Demonstration of complete operation and maintenance of the systems to be provided to IGIDR personnel at the system installed location.

6.0 MODE OF MEASUREMENT

6.1 The mode of measurement shall follow the schedule of work.

COMPUTER NETWORKING

SECTION – I INTRODUCTION

1.0 GENERAL REQUIREMENTS:

Computer Net Working System should adhere to relevant and recognized standards.

1.1 The Structural Cabling System shall be a hierarchical star topology utilizing CAT 6 copper cable in horizontal sub system and multi-mode fiber optic cable in the backbone subsystem.

1.2 All components within the cabling system shall be from a single manufacture and shall be covered by the manufacturer's system performance warranty. The warranty shall be independent of application and will support all ratified protocols, and the warranty shall be minimum of 25 years.

2.0 DATA CABLING – UNSHIELDED TWISTED PAIR

2.1 Unshielded Twisted pair (UTP) CAT 6 cable shall be used for LAN connectivity to the Desktop. To enable increased performance UTP-CAT 6 cabling should support 100/1000 Mbps Ethernet and ATM 155 Mbps as per IEEE 802.3ab connectivity standards.

2.2 Unshielded Twisted Pair (UTP) CAT 6 cable and other relevant products shall be in accordance with EIA/TIA 568 standards.

2.3 Unshielded Twisted Pair (UTP) CAT 6 cable shall meet developments in applications technology and shall perform for a worst case four-connector channel to support applications that utilize full-duplex transmission schemes, such as Gigabit Ethernet.

2.4 All cables shall be fitted with strain relief boots.

2.5 Contractor shall furnish 25 Year warranty certificate to cover Bandwidth of the specified and installed cabling system and installation costs.

2.6 Cable shall be manufactured by using 24 AWG solid bare coppers with polyethylene insulation and Flame retardant PVC jacket.

2.7 Cable shall be suitable in operating temperature of –20° C to 60° C.

2.8 The cable shall be tested up to 350 MHz frequencies.

2.9 Delay skew should not be more than 25ns/100m.

2.10 Impedance of the cable shall be 100 Ω +/- 15 Ω.

2.11 Following installation practice shall be followed by the Contractor While laying the cable.

a. Do not place cable near equipment that may generate high levels of electromagnetic interface.
b. Place cabling at a sufficient distance from equipment.
c. Do not over tighten cable ties, use staples or make sharp bend with cables.
d. Tie and dress horizontal cables neatly and with a minimum bend radius of 4 times the cable diameter.
e. Maintain the twist of horizontal and backbone cable pairs up to the point of termination. Do not leave any wire pairs untwisted.
f. Do not create multiple appearances of the same cable at several distribution points (called Bridging Taps)
g. Do not use connecting hardware that is of lower category than the cable being used.
h. Terminate each horizontal cable on a dedicated telecommunications outlet.
i. Use connecting hardware that is compatible with the installed cable.

The contractor shall note that the above installation practices are not exclusive. It is the responsibility of the contractor to ensure that the installation is compliant to required specifications. Installation Practices shall also meet all applicable local and national cades, standards and ordinances. Where a conflict exists between these standards, it is the responsibility of the contractor to detail these conflicts to the consultant prior to installation commencing.

3.0 CAT 6 RJ 45 MODULAR JACK

3.1 Copper outlets shall be presented into work area as an RJ45 connector. The outlet shall have a shuttered cover to prevent the ingress of dust and other contaminates.

3.2 One outlet/Double outlet of required color and type should be provided to each workstation as per the final approval of the consultant.

3.3 All outlets shall be modular type and made out of ABS plastic.

3.4 The outlet shall be provided with icons or circuit identification and labels for poll identification.

3.5 All outlets should include cable management facilities as per standards.

3.6 The modular outlets shall be factory assembled.

3.7 The termination of the installed horizontal cable shall be by insulation displacement connectors.

4.0 UTP JACKS

4.1 UTP Jacks shall be suitable for CAT 6 cable, PCB Based and as per TIA/EIA 568 standards.

4.2 The durability of Modular jack shall be minimum 750 mating cycles and minimum 200 termination cycles for wire terminals.

4.3 Housing of UTP Jack shall be made out of Polyphenylene oxide rated for 94V and wiring block shall be of Poly Carbonate rated for 94 V.

5.0 UTP JACK PANELS

5.1 UTP Jack Panels shall be suitable for CAT 6 cable with 24 port, modular type, PCB based, 1 U height and as per the EIA/TIA 568-B2 standards.

5.2 UTP Jack panel shall have Icons on each of 24 Ports.

5.3 9mm or 12mm labels on each of 24 ports shall be provided as per the final approval of the consultant.

5.4 The durability of Modular jack shall be minimum 750 mating cycles and minimum 200 termination cycles for wire terminals.

5.5 The UTP Jack Panel shall be made out of Powder Coated Sheet Steel with UTP Jack shall be made out of Polyphenylene oxide rated for 94V and wiring block shall be of Poly Carbonate rated for 94 V.

6.0 WORK AREA CABLING

Work area equipment and cables shall be as per ANSI/TIA/EIA-568-A and ISO/IEC 11801.

Equipment Cords are assumed to have the same performance as patch cords of the same type and category.

To ensure consistency of performance, the same manufacturer as the installed cabling shall provide all the work area cables (patch/mounting cords) throughout this project.

The patch cord shall be manufactured out of 24 AWG 7/32, Stranded copper conductor, with PVC insulation, Flame retardant polyethylene jacket and shall have length as mentioned in schedule of quantities as per the standards of CAT 6.

The patch cord shall be provided with matching colored snag-less, elastomer polyolefin boot.

Housing of the plug shall be of Clear Polycarbonate and the Load Bar shall be of PBT polyester.

Terminals shall be made out of Phosphor Bronze, 50 micron gold plating over selected area and gold flash over remainder, over 100 micron nickel under plate.

All cables shall be fitted with strain relief boots.

The onsite fabrication of work area cabling shall not be permitted.

7.0 DATA RACKS

7.1 The contractor shall also examine the location of the Data Rack to Ensure the Air Flow around the same and sufficient clearance is available to allow access for inspection and maintenance.

7.2 The specification for patching frames shall match that detailed in UTP cabling.

7.3 The patch panels shall meet or exceed the transmission Performance requirements of ANSI/EIA/TIA 568-A5.

8.0 TERMINATION AND CONNECTORS

8.1 The wiring schedule used at the point of termination should be Complete with ANSI/EIA/TIA 568-A.

8.2 All termination shall be made using CAT 6 connectors and Panels.

8.3 When terminating both ends of the connection should be tested, Labeled and documented according to the requirement of the OEM and site practices.

8.4 All termination should be made by an approval installer so as to Meet warranty.

9.0 LABELING AND COLOR CODING CONVENTIONS

9.1 All Cables shall be labeled so as to ultimately and the end user in The maintenance and administration of the installed cabling system.

9.2 Contractors shall make allowance for labeling of all cables at both Ends and for the full labeling of all patch panels and outlets with a unique circuit identifier.

10.0 INSTALLATION ACCEPTANCE TESTING SPECIFICATIONS

10.1 Installed UTP Cabling system shall be tested with TIA/EIA 568 Level IIE/Level III hand held testers. Each installed UTP drop shall be tested as per the latest revisions of TIA/EIA 568 CAT5e specifications.

10.2 The contractor shall after completion of the installation, submit a Detailed documentation of the cable plant. The documentation shall cover minimum following:

a. As built diagrams of the Network.

b. Test results for UTP

c. Consolidated Bill of Materials with manufacturer’s part Nos. and quantities used.

d. Warranty certificate from OEM Supplier.

SECTION – II SUBMISSION

1.0 SUBMISSIONS

Contractor to note that the following Minimum Documents shall be furnished along with the Bid.

1.1 UTP CABLING SYSTEM

a. ETL verification of the Cable as per TIA/EIA 568 B.1 standards.

b. Performance characteristics for Attenuation, Pair to Pair and PS NEXT, ELFEXT and PSELFEXR, Return Loss, ACR and PS ACR for 4 – Connector Channel.

c. Certificate of UL listing.

1.2 UTP JACKS

a. Certificate of UL listing.

b. Performance characteristics for Attenuation, NEXT, PS NEXT, FEXT and Return Loss.

1.3 UTP JACK PANELS

a. Certificate of UL listing.

b. Performance characteristics for Attenuation, NEXT, PS NEXT, FEXT and Return Loss.

c. Certificate for termination pattern as per TIA/EIA 568 A and B.

2.0 After the system is fully supplied, installed, tested, Commissioned, successfully handed over and such certified by the Employer, the contractor should carry out his defects liability responsibilities as specified for a period of one year. During this period the Contractor shall carry out all repairs to the equipment and replace all defective components at his own cost.

3.0 TELEPHONE WIRING

Telephone Wiring should be carried out with 0.5 Sqmm Tinned Copper flexible wire through PVC Cassing Caping / Conduit. And terminated in the Jack on workstation and on the krones in the Krone Junction Box place at Server Room.

The Krone Junction Box should be joint less type.

ACCESS CONTROL SYSTEM

SCOPE OF WORK

1.1 The scope of work shall cover the supply, installation, commissioning and testing of entire access control system meeting the intends of the specifications and drawings.

1.2 The system generally covers control of:
- i) Normal door entry and exit.
- ii) Emergency exits.
- iii) Intruder alarms.

1.3 The scope of work shall also cover field training of two of the owner's representatives for a period of 7 working days on the operation and maintenance of the system during normal and emergency conditions.

2.0 STANDARDS

2.1 The systems shall be standard products of adequate field experience and UL and FM listed.

3.0 SUBMITTALS

3.1 The tenderer shall submit along with the tender.

- i) A block diagram of the system proposed.
- ii) Makes of various components and their catalogues.
- iii) Comments on alternate proposals to and variances from the tender specification indicating the financial implication.

3.2 Upon award of the contract the following submittals shall be made

- i) Final block diagrams.
- ii) Layout drawings of all floors showing runs of conduits and cables.
- iii) Layout of security command center (SCC).
- iv) Catalogues and selections of all equipment and component.
- v) Samples of wiring materials, cards with the in scripts and all visible components.

All submittals shall be got approved before procurement

4.0 SYSTEM FEATURES

4.1 The system shall be PC based distributed processing networking an Operator Station (OS) at the Security Command Center (SCC) with Field Controllers (FC) and Terminal Controllers (TC). The system shall be standard product of at least 10 years of experience providing with a select suite of hardware and peripherals, an integral solution to access monitoring and control, intrusion monitoring and alarm, emergency set-up and alarm, video badging / verification and closed circuit video system control, viewing and alarms.

4.2 The cardholder data, system parameters and operator actions shall be programmed into the OS on windows platform. The cardholder data bank shall have his code No, name, company, residential address, office and residence telephone numbers. The same card shall access the car park when authorized, but a separate data bank for cars shall be created showing make, model, and registration No, color and chassis No.

4.3 The data shall be intelligently down loaded to the network controllers like FC & TC and stored. Decision shall be made at all levels on the basis of the stored data and an on board clock. Should communication fail between the OS and FC & TC, the access control functions shall continue undisturbed and all events during that period shall be stored at the network controller level and up-loaded to the OS when normalcy is restored.

4.4 The system shall archive all events of permitted entries, refused entries, breaking, emergencies, communication loss system faults, system updates etc. All updated and changes in access levels, times and passwords shall be validated by naming the authority, and date and tile stamped. The capacity of the hard drives shall be adequate for at least 500,000 events or as specified, whichever is higher.

4.5 The system shall generate reportage of events, data and the firmware performance in any sequence or manner the

operator desires. All reports shall be capable of being displayed, printed or stored for future reviews.

4.6 The system shall provide password protected levels to operators & supervisors and shall enable temporary accesses. All access levels shall be controlled by time periods and system shall provide adequate time slots and holidays schedules. The system shall have the capability of monitoring any card/cards on 'trace mode'.

4.7 Each card holder is to be assigned a code no and identified and sorted as visitor, escort or regular with validity period and access 'to' or 'to and from' Cards of all regular car holders shall have their company logo and photo ID. In the case of regular card holders who are assigned a space in the car park, the system shall include additional data of the car as specified. Visitor profiles shall comprise name, company, visiting person and company. All visitor cards shall have limited time validity.

4.8 Panick bars on emergency staircase doors shall be openable only on emergency release only and forced exits shall be reported as alarms. Guard tour units (GTU) if not activated on scheduled time shall be reported as alarms.

4.9 The system shall have graphic screens showing the locations of various access control and CCTV points in different colours showing points on action so that the operator is able to monitor the whole building from the security command centre. The system shall incorporate a Graphics Use Interface (GUI) for the control and viewing of the CCTV system. During an alarm, the operator shall be able to switch from access control task to alarm investigation using the cameras covering the event area.

5.0 SECURITY COMMAND CENTRE

5.1 The Security Command Centre (SCC) shall act as the hub of all security related matters and operations. The SCC shall house, among others, the following:

i) PC Pentium II 200 mh2 or higher 2 RS 232 ports, 32 M6 RAM, 2 Gb hard disc, 1.4 MD FDD, CD ROM drive, Mouse with pad, 101 key board, Modems, Windows OS.

ii) 20" Colour monitor SUGA 1024 x 768 min. Resolution.

iii) 132 Col DM printer.

iv) Break Glass emergency button for all door access mode.

v) Panick / intruder alarm.

5.2 The command centre shall also accommodate, the fire alarm, panel, multiplexers, switches, monitors etc. All hardware, shall be part of a custom built console/table with two operator swiveling chairs. 2# SB racks for tape storage, 2# steel cupboards for record storage. The SCC layout shall be compact, functional amd aesthetically designed. All cable entry points shall be maintainable with adequate and easy access.

6.0 FIELD CONTROLLERS

6.1 Field Controllers (FC) shall provide multitasking capability through distributed processing network and permit operator interface through Main Controller in the command centre using IS-232 or RS-485 protocol. The FC shall be capable of communicating with 16 addresses of Termianl Control Units (TCU) and have a minimum of reader capacity and 20000 cards. The field controller shall also be capable of accepting a minimum of 200 supervised inputs and 200 outputs from remote peripherals like PIR's, panick button etc. The FC shall be compatible with Access Control System and its access levels, variation of cards etc.

6.2 The Controller shall have adequate access levels, time zone parameters, antipassback facility and a minimum of 5000 event archiving buffer facility with back-up alert and alarm annunciation and suppression. Provision shall be available for necessary ports for programming, networking and printing.

6.3 In the event of loss of communication, the field controller should be capable of operating stand-alone without degrading the security levels specified. The field controller shall power all terminal controllers and other peripherals with a backup battery for full control operations for 8 hours and memory backup upto 48 hours.

6.4 Field controllers shall be totally enclosed in a galvanized sheet steel box with key lock and tamper switch.

7.0 TERMINAL CONTROLLERS

7.1 The Terminal Controller (TC) shall be capable of supporting two readers and shall also have two ancillary ports. Monitor (door contact) and control points shall be dedicated to each reader supported and shall also have two additional monitor and control points.

7.2 Failure of the system communication shall not degrade the TC in any manner affecting the system security. An adequate buffer memory shall maintain the event archiving capability.

7.3 TC's are either powered from the field controller or separately powered with a battery back up for 8 hour full load operation and 48 hour memory functions.

7.4 TC's shall be sheet steel enclosed and surface or recess mounted with a key operated lock and tamper switch. Wherever located outdoors, the TC's shall have IP 55 enclosure.

8.0 CARD READERS

8.1 General Requirements

8.1.1 Card Readers shall be one of the following types as specified in the schedule of work :

a) magnetic stripe insertion or swipe.
b) Proximity
c) Key Pad activated
d) Biometric

8.1.2 Readers shall be weather proof, fire and vandal resistant metal enclosure mounted in a single gang galvanized electrical switch box and there shall be no distortion due to mounting on a metal stud or partition. Readers shall be powered from a terminal controller located upto 200 meters running length. Each reader shall provide a bi-directional data link with appropriate signals for

a) card read
b) entry okayed
c) entry denied
d) communication loss
e) reader tamper with active alarm
f) or any other supervision messages

Alarm should be suitable for remote indication cancellation and reset.

8.1.3 Readers may be provided for:

a) entry only & free exit
b) entry & exit through a push button
c) entry & exit through readers

Readers shall be wired from and to the controller, door lock and door contact using minimum of 0.8 mm copper screened cables drawn in galvanized steel concealed conduits.

8.1.4 All card readers shall be compatible with system controller and shall provide supervised communication.

8.2 SWIPE CARD READERS

8.2.1 Swipe Card Readers shall be capable of unerring and repeated reading of the magnetic stripe. Reader shall have non-wearing plastic slot meeting the general requirements and shall read at swipe speed of minimum 0.2 to the maximum of 1.2 mps with Wiegand formatted cards.

8.3 PROXIMITY CARD READERS

8.3.1 Proximity readers for indoor use shall have a read range of 15 to 20 cm or as required. Reader shall be capable of being installed on metal surface without affecting the performance.

8.3.2 Readers for car park shall have extended read range of 60 cm and shall have a weather proof enclosure. Readers shall be metal mountable and shall be mounted on a galvanized and powder coated steel frame with a 25mm diameter galvanized steel pipes for entry of power and communication cables. Readers shall be located in a manner that it is easy to reach and read from the car.

9.0 CARDS

9.1 Cards shall be of the size of a credit card with a key hole and made of a durable plastic. Each card shall have a unique and non-repeated user code. Cards shall provide facility for the company logo or Photo ID of the user.

9.2 Cards shall be suitable either for swipe or proximity readers as specified and required. Same card should be capable of being used for car parking also wherever authorized.

10.0 DOOR HARDWARE

10.1 Door Hardware shall be long life UL approved multi-read type employing a stable magnet. The contact shall be corrosion resistant and hermetically sealed for fail-proof operation in dusty and high humid areas. The type of contacts shall be suitable for the door, metal or wooden and the application. The door contacts and the sensors (either the number or the type) shall be suitable for the type of doors (single/double) shown in the drawings.

10.2 The contacts shall be NO or NC as required with an appropriate gap spacing but not less than 15mm. Contacts shall not freeze or get stuck if the door is sparingly used. The contact rating shall be to suit the size of door and the power supply of the access control system. Door locks shall be electromagnetic mortise or cylindrical locks suitable for half hour rated wooden doors. Lock will remain open in 'fail-safe'.

10.3 Wiring from the door contact and door lock to the controller and/or reader shall be minimum 0.8 mm shielded cable drawn in a concealed galvanized conduit.

10.4 Panic hardware shall be stainless steel bars suitable for single swing half hour rated fire rated wood or steel door complete with approved trim. Door width will be minimum 750 mm and a maximum of 1200mm.

10.5 Door closers shall be indoor/outdoor non-handed surface mounted hydraulically operated units with adjustable keys for regulating closing and latch speed. Door opening force shall be adjustable and for fire doors it shall not exceed 15 ibf (67) for delatching and farce for moving the door.

11.0 VEHICLE BARRIER GATES (VBG)

11.1 The VBG shall consist of an independent heavy duty steel cabinet with a heavy duty steel frame housing the operating mechanism and a microprocessor based control board. The cabinet and the support structure shall be of rust-inhibited steel or galvanized and painted to an appropriate colour.

11.2 The barrier gate shall be of wood swinging on precision bearing from the control cabinet. The gate shall be painted black and white or yellow as required. The gate shall be 3.5m in length and open/close in 5 seconds.

11.3 The control board shall operate from 240V AC 1Ph 50Hz mains supply and shall have its own voltage and frequency conditioner for trouble free operation during supply voltage and frequency variation. Facility shall be available for change over to manual mode in the event of power failure or control mal-function.

12.0 MISCELLANEOUS

12.1 Tum Stiles shall be two way waist high units with a heavy duty durable aluminium hub, hydraulically controlled arm rotation with stainless steel arms and permanently lubricated bearings. The unit shall incorporate a card reader,

12.2 Guard Tour Unit (GTU) shall be a single key operated unit signaling

i) Guard attendance
ii) Overdue alarm and
iii) Discreet emergency alarm

Guard attendance shall register time of attendance and the overdue alarm shall signal non-attendance at the predetermined time. The emergency alarm shall be signaled by the discreet operation of the key in the wrong direction. Any other system meeting the intents is acceptable.

12.3 Hold-up switch (HUS) shall be a discreetly mounted unit with twin push buttons and a reset key. Pressing of both the buttons simultaneously shall set up alarm and locks-in. The HUS can be reset only by authorized person through a key operated switch.

12.4 Metal Detectors (MD) shall be electronic metal detecting devices built into a pass-thru arch (built by others), providing audio-visual signaling.

13.0 INSTALLATION

13.1 The installation shall be carried out in a work like manner. Network controllers shall be recessed in walls wherever possible. Readers shall be mounted in coordination with the interior designs. Enclosures for all panels, readers shall have IP 54 class of enclosure, and any steel structural members used for mounting the peripherals shall be galvanized after fabrication.

13.2 Wiring shall be through wires drawn through concealed galvanized conduits. Wiring details shown below and on drawings are suggestive, and tenderers may modify to suit their systems.

Key pad to Reader	Multi-core shielded
Reader to R. C.	2 Pair shielded
Door lock & door contact to TC	1 Pair shielded or unshielded
TC to FC	2 pair shielded

14.0 ACCEPTANCE TESTING

14.1 The system shall be tested and validated for its function as an integrated security system conforming to the intents of the specifications. The following functional tests shall be carried out in the presence of the engineer-in-charge.

Card Readers
- Card acceptance & entry clearance
- Card rejection
- Measure maximum distance of card reading (Proximity cards)
- Tamper switch

Doors
- Door contact activation
- Door closing forces for delivering & door opening
- Time to door shut and to latch
- panic/Fire escape hardware operation

Terminal Controller
- Communication Failure mode :

  Full mode operation
  Event recoding
  Supervising the monitoring circuits

- Power failure mode

  Full mode operation
  Event recoding
  Supervising the monitoring circuits

Field Controllers
- Same as for Terminal Controllers
- Uploading from TC's

Main Controller (SCC)
- Same as FC's
- Uploading from TC's
- Databank and retrieval

14.2 All the network components shall be tested 100% and results recorded Engineer in charge may make random verification of any of the components. All such verification shall be recorded.

15.0 MODE OF MEASUREMENT

15.1 The mode of measurement shall follow the schedule of work.

APPROVED MAKES OF MATERIALS		
	ELV & AV Works	
1	Fire Alarm System and all accessories	Edwards / Simplex / Tyco / Honeywell- Notifier / Bosch / Siemens-Fire finder
2	Cables for Fire Alarm System	Finolex / KEI / Havells / Polycab / RR Kabel / Tyco / Calliplast
3	Public Address System (Master Controller, Amplifier, Speakers, Call Station)	Bosch / Simplex / Honeywell / Bose / ATIES / Ahuja
4	Cables for Public Address System	Finolex / KEI / Havells / Polycab / RR Kabel / Calliplast
5	CCTV Cameras	Prama / Sony / Samsung / Honeywell / Bosch / Axis / DV Tel
6	24 X 7 LED Displays	Samsung / Sony / LG / Dell / Lenovo / HP
7	Servers / Workstations / Display	Dell / HP / Lenovo
8	Switches and Accessories (PoE, Non PoE / Network, Core)	Cisco / HP / Legrand / Ruckus / Juniper
9	Cat 6 Cables, Wire, Fiber Optic Cables and Patch Cords, Patch Panels and related accessories	R&M / Legrand / Commscope / Molex / Systimax / AMP / Siemens / Panduit / Cisco
10	LIU and related accessories	R&M / Legrand / Molex / AMP / Siemens / Panduit / Cisco
11	Hard Disk	Seagate / Toshiba / WD-Purple
12	Racks	Valrack / ApwPresident / Rittal / APC / Cisco/ Wipro / Vertiv
13	Network Video Recorder / Digital Video Recorder, Software and related accessories	Prama / Sony / Samsung / Honeywell / Bosch / Axis / Dv Tel
14	Telephone Tag Box	ADC-Krone / Legrand / Cisco
15	Telephone Junction Boxes and Modules	ITL / Krone / MALSON

16	RJ-45 Information Outlets	Legrand (Myrius & Arteor) / MK (Blenze Plus & Orna) / Crabtree (Murano) / Schneider (Opale) / Norisys / Panasonic (Europa) / L&T (Englaze) / GM Modular (GX10 Series or equivalent) Model shall be as approved by Architect & Client. Contractor to provide minimum 03 Nos. samples of different makes for approval of Client & Architect
17	Door Access Control System	Siemens / Honeywell / Bosch / HID / Matrix / Fortuna Impex / eSSL
18	Cables for Door Access Control System	Finolex / KEI / Havells / Polycab / RR Kabel / Calliplast
19	Electronic Door Locks	Yale / Assa Abloy / Onity / Dormakaba / Godrej / Visionline (Vingcard)
20	Interactive Display	Newline/ Hyundai or Equi.
21	UHD Panel	Samsung or Equi.
22	Encoder, Decoder & Software	Zeevee/Lightware/Crestron/ATOLNA.
23	Switch & Access Point	CISCO/linksys/Dlink
24	Video Conferencing	Lumens / Sony or Equi.
25	Audio System	clock Audio/ AUDIOTECHNIC or Equi.
26	Micro phones & Accessories	Biamp/ CLEARONE or EQ
27	Control System	Crestron /RTI or Equi.
28	Switcher Cables & Accessories	Belden / Sommer / Canare or Eq
In case of LAN & Telephone Works, all the passive components shall be of one make or else 100% compatibility shall be ensured. Required certification for compatibility from the component manufacturer to be furnished on demand of Engineer-In-Charge.		
In case of Light Fixtures, all the fixtures and related accessories shall be sourced from the same make / manufacturer.		

AIR CONDITIONING SYSTEM

1.0 INTRODUCTION

These specifications spells out the complete requirement for the proposed Air-Conditioning System for facility of UBI, Nariman Point

The interior of the facility is being done by consultant Architect M/s. Design Ideas, Mumbai. The facility is having the most modern interior correspondingly the equipment offered should also have it's own aesthetic values to suit the kind of the interior.

And therefore, such offers, indicating of highly efficient system, will be preferred.

The H.V.A.C. TENDER consists of HIGH WALL MOUNTED SPLIT/ CASSETE UNITS, WINDOW UNITS and modification of existing ducting to suit the newly designed Interiors.

The tender documents describes the Scope & Extent Of Work, Commercial Terms & Conditions, Specifications, Equipment Schedules, Bill Of Quantities, etc. It also comprises of scheme drawings. Tender submission for the job will be in two-bid system. The first part shall be techno-commercial bid in a separate envelope inside the envelope, name of work etc.

The system will be exposed to people from all walls of life and should be very safe against any type of hazard. The equipment should be designed for complete personal safety and ease of operation and maintenance.

The system will be catering to a most modern facility accordingly the system offered shall be suitable for continuous trouble free operation.

The facility is having no planning for ceiling fans accordingly the system selected should be highly efficient and trouble free with minimum trouble shooting time requirement.

In the event of an order being placed, the Contractor shall supply four copies each of the following within TWO WEEKS from the date of placement of the order-

a. Complete installation drawings showing details of the Indoor & Outdoor units, Refrigerant pipes and their sizes, electrical circuit diagrams, air distribution system etc.

b. Instruction books for operation, maintenance and servicing of all components.

c. List of recommended spares for two years of operation. M/s. Design Ideas, Architects. will provide all the working drawings. However, for items of proprietary nature, working drawings and as built drawings shall be provided by the contractor, which will have to be approved by the Employer / Consultants.

Note

Before taking up the installation work at site the supplier should ensure that the installation drawings are approved by the Employer and Consultants.

2.0 ERECTION

This specification provides for the complete erection including minor civil works like wall cutouts for pipes, ducts etc. However, RCC foundations will have to be provided by the Employer.

The tenderer shall make his own arrangements for the storage of materials & their safe custody at site. The Contractor shall make his own arrangements for providing accommodation for his workmen at site.

The Contractor shall make good all damages to the Purchaser's building, property, equipments and articles, how so ever arising from the erection of the equipment. The Contractor shall indemnify and hold harmless the employer against all claims in respect of injury to any person how so ever arising out of the erection of the equipment in the course of such installation.

The Contractor shall discharge all his obligations under the Indian Workman's Compensation Act & E.S.I. in so far as it affects workmen in his employment.

The Contractor shall make his own arrangements for procuring the necessary labour, skilled and unskilled. He should conform to all local government laws and regulations concerning labour and their employment.

The Contractor and his employees will submit to the regulations in force for controlled entry into the premises where the air conditioning equipment is to be installed.

2.1 TRAINING OF PERSONNEL

The tenderer shall undertake to extend free training in operation and maintenance of Air Conditioning System offered by them to two technical persons of UBI Nariman Point, mumbai. at their works for a period of 15 days and 15 days at the site of Employer. A certificate in this regard will have to be obtained from the Employer by the tenderer. The expenditure in respect of journey and stay necessary for this training will be borne by the successful tenderer. The choice of dates for training is to be decided in consultation with the Employer.

3.0 GENERAL

In order to avoid correspondence and clarification at a later date, tenderers are requested to indicate clearly all technical details and information asked for in the tender document.
Absence of any information on item will be assumed to be negative reply.

3.1 COMPLETENESS OF CONTRACT

All items whether specifically mentioned or not but which are usually required to make a complete working system and to ensure safe and satisfactory operation are to be provided by the Contractor without any extra charge. All appliances, apparatus, labour or material which may complete the work in accordance with the intent or purpose of the specifications shall be considered to be in the scope of work of the Contractor and shall be furnished without extra charge, as if fully described and called for in these specifications and shown in the drawings.

3.2 SPECIFICATIONS

The tenderer shall be deemed to have satisfied him before tendering as to the correctness of the capacities offered after making his own independent calculations. He must guarantee and demonstrate that the installation shall maintain the required indoor design conditions.

The specifications, drawings and other parts of this contract are to be considered as explanatory to each other or should anything appear in the one that is not described in the other or should any discrepancy or any misunderstanding arise on account of such discrepancy, or inconsistency, the site instruction given by the consignee shall prevail. The contractor shall execute the work according to such instructions/explanations given by the different part of this contract, even though such works are not specifically shown and described therein.

3.3 GUARANTEE

The tenderer shall guarantee against manufacturing and installation defects of all equipment supplied by him and carried out by him for a period of 12 months from the date when the equipment is accepted & taken over by the Employer for running purposes as specified. The tenderer shall confirm that he is agreeable to give this guarantee.

3.4 INSURANCE OF WORK

The tenderer will insure entire equipment and materials for transit / storage during erection & up to commissioning against losses, damages, due to fire, earth-quake, war, floods, insurrections etc. No claims will admissible on this account.

3.5 ITEMS INCLUDED IN THE CONTRACT

a. Entire equipment under supply as mentioned in the specification and shown in the drawings including installation, painting (as per the color code mentioned in Annexure-I), trial commissioning, final adjustments and testing.
b. Complete electrical work, including equipment wiring, control wiring, control panels etc. as specified. Employer shall make power with main switch available at main switchboard only. Further wiring from main switchboards to air conditioning equipment shall be in your scope of work.
c. Earthing sets and earth conductors.
d. Drain piping suitably insulated where necessary to the drain points in the equipment rooms, as per drawing.
e. First fill of refrigerant, oil or other contingent material.
f. Any loss of refrigerant, oil etc. due to the defects of the equipment or installation system during guarantee period shall be made good.
g. Operation of system until the time, system is handed over.

3.6 CO-ORDINATION

a. Work shall be carried out in confirmation with specifications, accompanying drawings and with the requirements of the general architectural and structural plans after approval by the Employer. The Contractor shall be responsible for taking actual measurements at site and effecting variations in the work in details, if required, to meet the site conditions. Such deviations shall however be subject to the approval of the Employer.

b. The Contractor shall also co-operate with other Contractors employed by the employer, compare plans, specification & time schedules & shall forward to the Employer copies of all correspondence & drawings so exchanged, failure to check plans and conditions will render the Contractor responsible for bearing the cost of any subsequent change.

3.7 DRAWINGS & LITERATURE / DOCUMENTATION AS PER ANNEXURE ATTACHED

a. Before proceeding with the work, the Contractor shall submit the following documents in duplicate -

i. Descriptive leaflets for all the equipment viz. indoor units, outdoor units, instrumentation Data, Electrical Components, Controls etc. having details of Capacity, Power Consumption, Efficiency, Performance Curves, best duty points, electrical details, mechanical details, dimensional details, operating weight etc.

ii. General layout and assembly drawings.

iii. Foundation drawings / frame details for all equipment.

iv. Operational and maintenance manuals / instruction book.

v. Trouble shooting details.

vi. All working drawings other than Consultants drawings.

vii. Detailed BAR CHART with activity schedules.

b. Approval by the Employer on the drawings shall not relieve the Contractor of any part of his obligation to meet all the requirements of the contract or of the correctness of his drawings.

The Contractor shall be responsible for and pay for all alterations of the work due to discrepancies or omission in the drawings or other particulars supplied by him, whether the Employer has approved such drawings.

c. Six copies of the comprehensive manual for use by the Employer before & during erection and subsequent operation & maintenance of the system shall be furnished after approval of the Contractor's drawings.

d. The Contractor shall furnish and install in the machine room a neatly prepared set of operating instructions securely framed.

e. The Contractor shall furnish information required in the tender document.

3.8 VARIATION OF WORK

The Employer shall have the power from time to time during the course of the work, by notice in writing to instruct the Contractor to make any alteration, omission, addition or variation in the work (herein after referred to as variation).

The difference in the cost of such variation shall be added to or deducted from the contract price as the case may be in accordance with the rates available in the contract, and if in the opinion of the contractor the variation would prevent him from meeting any of his obligations or guarantees in the contract, he shall give the same in writing failing which he shall not be entitled to any modifications in his obligations.

The variation required should never the less be carried out. The matter in difference shall be settled by arbitration.

The Employer shall give a reasonable notice to the Contractor to enable him to make arrangements for variation in work required by him.

3.9 NEGLIGENCE

If the Contractor shall neglect to execute the work with the due diligence or shall contravene the provisions of the contract, the Employer may give notice in writing to the Contractor, calling upon him to make good the neglect or contravention complained of.

If the Contractor fails to comply with such notice within a reasonable period, the Employer shall have the option and be at liberty to determine the contract and to take the work wholly or in part out of the Contractor's hands and complete it either by himself or his agents at a reasonable price. The Employer shall then be entitled to retain any balance payment which may otherwise be then due on the contract.

The cost of execution of such work as aforesaid will be adjusted against the payment due to the Contractor. If the cost of execution shall exceed the balance due to the Contractor, the Employer shall be at liberty to dispose off any of the Contractor's material or consumption system that may be at site and apply the proceeds for payment of the difference of such cost and recover the balance by process of law, or from any moneys due to the Contractor.

3.10 PROGRAM OF WORK & PROGRESS SCHEDULES

The Contractor shall submit along with the offer detailed schedules showing the program and the sequence in which the Contractor proposes to carry out the work with dates and estimated completion times for various parts of the work.

Such schedules shall be approved by the Employer before starting the work and shall be binding on the Contractor. If so required by the Employer, the Contractor shall furnish weekly progress reports.

3.11 INITIAL INSPECTION

a. The equipment offered shall be inspected by Employer/Consulting Engineers at site or at the Contractor's / Manufacturer's premises as per conditions.

b. The Employer or his authorized representatives shall have full power to inspect drawings of any portion of the work or examine the materials and workmanship of the system at the Contractor's works or at any place from which the material or equipment is obtained. Acceptance of any material or equipment shall in no way relieve the Contractor of his responsibilities for meetings the requirements of specifications.

c. All types of routine and type tests shall be carried out at the works of the Contractor or the manufacturers of the components. The Employer shall be free to witness any or all tests if he so desires. If required by the Employer, the Contractor shall permit his representative to be present during any of the tests.

d. Quality plan to be approved by Employer & Consultants.

3.12 EXTRA ITEM

Any kind of extra work not specifically mentioned in the bill of quantity and also other than the variable items, shall be approved based on nearest rates available for any other items closed to the nature of the work of the extra item or by rate analysis or by cost + 15% margin as approved by us.

3.13 COMPLETENESS OF ERECTION & COMMISSIONING OF THE SYSTEM & INSPECTION DURING ERECTION

a. Inspection during erection

The Employer is at liberty to inspect the system during installation and the Contractor free of cost shall remedy defects found.

The Contractor shall furnish all instruments and services needed for the tests. Any defects and deficiencies that are noticed during these inspections will have to be attended by the Contractor from time to time.

b. Completeness of erection & commissioning

Only after the entire installations are satisfactorily completed and the defects found during inspections rectified, the system will be ready for commissioning and then will be subjected to run at least 48 hours to demonstrate its satisfactory performance. The ODU capacities, inside conditions and IDU measurements of DB, WB of return and supply air will be checked. Only then the system will be deemed fit to pass on to seasonal tests.

3.14 SEASONAL TESTS & TAKE OVER

A. "INITIAL TEST" for Air-conditioning Equipment-

The System ready for seasonal tests of summer & monsoon. The contractor shall arrange to carry out various initial tests as detailed below in the presence of & to the complete satisfaction of the Employer or his representative. Any defects or shortcoming found during the tests shall be speedily rectified or made good by the Contractor at his own expenses.
The initial tests shall include but not be limited to-

i. Test & check the proper functioning & settings of switchgear, starters, contractors, safety controls and electrical motors etc, to ensure their proper functioning.

ii. Check the system against leaks in different circuits, alignment of motors, V-belt adjustment, control setting & all such other tests, which are essential for smooth functioning of the system.

iii. No load test to be carried out.

iv. Operate and check the proper functioning of all Components viz, compressors, pumps, air handling units, water softening plant etc.

v. Check and adjust the water flow in the system to the original design through such components viz, chiller and cooling coils etc.

vi. Check air distribution system and provide design air flow in all areas by adjusting the grilles, diffuser and dampers whether specifically shown on the drawing or not.

vii. Check the performance of the equipment on cooling cycle in summer and monsoon taking hourly DB and WB readings in all rooms non-stop for 72 hours (3 days) for trial test.

viii. The initial test performs in the above manner, shall be concluded with reports specifying completeness of all supplied equipments.

B. "CONTINUOUS TEST" for Air-conditioning Equipment-

In addition to the "Initial Tests" the Contractor shall also give continuous running tests of the system i.e. during peak summer and monsoon, when the ambient conditions are close to the design ambient conditions. Each test shall be for (3) three continuous days non-stop in case the System is normally used for 24 hours, otherwise, for the duration of the normal use of the system for six consecutive days. The first summer test may be taken on the completion of the installation and satisfactory commissioning provided the ambient temperature and

humidity are near their peaks. The Employer / Consultant will provide 3-Days notice for conducting the tests.

The Contractor shall provide all necessary tools, instruments, gauges, flow meter, anemometer etc., as may be required for conducting the various tests. He shall also provide necessary

lubricants, refrigerant gas etc. and required personnel for the tests. However, the Employer shall provide water and power for the tests.

C. "PERFORMANCE TEST" -

After erection of various air handling units and fan coil Units, all the units shall be tested for their rated capacity. Following parameters have to be assured by the contractor-

i) TR PRODUCED:

A) By airflow, temperature & humidity of air.
B) By water circulation.

ii) CFM specified at given temp. & R. H. conditions.

iii) Static pressure.

iv) Electric power consumption for each equipment.

v) Any other utilities required shall also have to be measured compared to the committed consumption.

vi) Consumption of items whatsoever nature, not specified in the tender shall be considered as extra consumption and will disqualify the performance test.

vii) Delta T and Delta P to be checked and noted.

viii)

Canvass Temperature	-	°C / °F
Grille Temperature	-	°C / °F
Return Air Temperature	-	°C / °F

3.15 REJECTION OF DEFECTIVE SYSTEM

a. If the completed system or any portion thereof before it is taken over is found defective or fails to fulfill the intent of the specifications, the Contractor shall on receipts of notice from the Employer forthwith make defective system good. Should he fail to do so within a time considered reasonable by the Employer, The Employer may reject and replace at risk, and expense to the Contractor, the whole or any portion of the system, which is defective or fails to fulfill the requirement of the contract.

b. The Employer shall have the right to operate all equipment, if in operating condition, whether or not such equipment have been accepted as complete and satisfactory.

3.16 TAKING OVER

After completion of the installation and satisfactory commissioning of the system, the same shall be taken over by the Employer.

3.17 WARRANTY

Period of 12 months begins from the date of take over.

3.18 CLEAN-UP OF THE WORK SITE

During erection the Contractor shall at all times keep the working and storage areas free from waste or rubbish. On time-to-time, as directed by Employer in Charge, he shall remove all temporary structures, debris, insulation bitumen, EPS wastage and leave the premises neat and clean in a satisfactory condition.

3.19 WORK AND SERVICES TO BE PROVIDED BY THE EMPLOYER

Unless otherwise agreed, the Employer shall provide the following work and services to the Contractor for carrying out the erection work.

a. All major masonary/building work such as construction of platform and air handling unit rooms, foundation for all equipment trenches for pipes, cables, masonary shafts and ducts. The Contractor shall provide minor masonry work such as breaking and making good of openings for pipes and cables. The Contractor shall carry out chipping of holes and grouting of bolts/anchors.

b. The Employer shall provide raw water connection to the expansion tank and cooling tower basin.

c. Electrical cable of sufficient length up to the entire switchboard shall be supplied and laid by the Employer with suitable earthing. The Contractor shall connect the cable to the incoming side of all the panels on the main switch, which shall be supplied by him.

d. False ceiling and boxing for concealing pipes etc.

e. Electrical power for welding machines for site work.

f. Wooden frame for grilles and diffusers.

3.20 WORK AT SITE

Access to the work shall be allowed only to the Contractor and his duly appointed representatives. The Contractor shall not object to the execution of work by other Contractors or tradesman and shall afford them every facility for execution of their works simultaneously with his own.

3.21 DEFECT LIABILITY

a. The Contractor shall guarantee that all material, machinery and components, supplied, fabricated, designed and installed by him shall be free from defects due to faulty material and/or workmanship and that the system shall perform satisfactorily, and the efficiency of the system and all the components shall not be less than the values laid down in the specifications and the capacities shall be at least equal to those specified. The period of the guarantee shall be twelve (12) months from the date of commissioning of one month after the successful final test whichever is later, during which period any or all components found to be defective shall be replaced or repaired free of charge and shortcoming found in the system as specified shall be removed at no extra cost.

The Contractor shall make good any loss of refrigerant and oil at his own cost. The Contractor shall provide the necessary personnel and tools for fulfilling the guarantee.

b. If the defects are not remedied within a reasonable time, the Employer may proceed to get the defects remedied at the Contractor’s risk & expenses without prejudices to his right.

c. The Contractor shall without any cost to the Employer carry out during the guarantee period all routine and special maintenance of the system and attend to any defects that may arise in the operation of the system.

3.22 IMPORT LICENSE

The Employer shall not provide any import license and / or permit for controlled material.

3.23 CONTRACTOR'S CONDITIONS OF CONTRACT

Conditions of contract in Contractor's offer will be treated as null and void unless specifically agreed by the Employer in writing.

3.24 SUBMISSION OF TENDER

The tenderer shall make out his offer in two parts as TECHNICAL and COMMERCIAL.

The technical part shall not carry any indications of the price, but the tenderer shall give details in technical part anything he would like to state/offer. In other words technical parts of the offer will detailed his offer as called for in various sections.

The commercial part shall have nothing but the prices indicated in. Any other qualifying clauses etc. in this part will not be considered. In other words the commercial part will only carry a cross reference to technical part and detail the various prices individually.

The Technical part and the Commercial part of the offer will both be submitted in separate covers duly sealed to client. One copy of technical part will be submitted to the consultants directly on the due date of tender.
Both the above mentioned envelopes shall be enclosed and submitted in another large size envelope duly marked and sealed. In case of any alternate offer submitted these would also be presented both in Technical part and Commercial part.

Tenderer shall reduce to the minimum, the enclosure of printed general conditions to avoid confusion.

Tenderer shall submit BAR CHART of the project along with the tender.

3.25 SAFETY

All equipment shall be complete with approved safety devices wherever a potential hazard to personnel exists and with provision for safe access of personnel to and around equipment for operational and maintenance functions.

These items shall include not only those usually furnished with elements of machinery but also covers, guards, crossovers, stair ways, ladders, platforms, handrails etc. which are necessary for safe operation of the system. The tenderer shall include for all safety devices including but not limited to the following items-

a. Belt Guards

Belt guards shall be designed with approved provision to facilitate belt inspection, adjustment, replacement and general servicing.

b. All couplings are to be covered with an approved guard, fabricated from welded plate and structural steel.

c. Access Ladders and Platforms

Provisions shall be made for access ladders (particularly for cooling tower) and platforms with handrails as necessary to provide operator's safe access to inspection.

2.0 GENERAL DESCRIPTION / BASIS OF DESIGN

5.1 SCOPE

The work stated in these specifications together with Consultant's drawings, cover the design, manufacture, testing performance of manufacturer's work, delivering goods at site, handling at site, installation, commissioning & carrying out performance tests at site of the complete equipment required for the HVAC System for IGIDR Mumbai.

5.2 BASIS OF DESIGN

Project : M/s. UBI,NARIMAN POINT

Application : Comfort Air-Conditioning & Active Ventilation.

ROOF

The exposed roof of the building will be insulated by air conditioning contractor / insulation contractor in such a manner so as to provide an overall transmission factor of 0.12 BTU / hour-FT2 / or better.

WORK TO BE DONE BY AIR CONDITIONING CONTRACTOR

The successful air conditioning contractor will provide complete air conditioning & ventilation system work as detailed in the tender BOQ and as specified in the technical specification.

5.3 POWER SUPPLY

415 V, 3 Ph. 7 Neutral 50 c/s, 4-wire A.C. elec. Power supply including earthing at the main panel will be made available by the Employer.

5.4 DESCRIPTION OF THE WORK TO BE CARRIED OUT

The successful tenderer's scope shall be carrying out complete high and low side work as per BOQ. The scope of work includes Supply, Installation, Testing & Commissioning of system.

The units shall be located as per tender drawings. The electrical power required for outdoor units shall be made available at the main electrical panel supplied by you as required, this panel shall be suitable for outdoor application & confirming IP-55 construction. For Indoor units & ventilation fans single phase power required shall be provided at units from Floor Distribution Board however required control cabling between indoor and outdoor units shall be done by you. The power and water required for installation, erection and commissioning of the system shall be made available by client.

3.0 SPECIFICATION OF EQUIPMENT / MATERIAL AND INSTALLATION STANDARDS

6 REFRIGERANT PIPING

The indoor and outdoor units shall be connected with refrigerant piping. All piping connections for the units should be performed inside the unit. The refrigerant piping should be insulated with

Tubular Nitrile rubber of minimum 12 MM thickness. Lastly, cover up the pipe sections with the help of 36 G Aluminium sheets on straight pipes and 28 G Al. sheet on bends, tees, valves etc.

DRAIN PIPING

Condensate from the evaporator unit shall be drained through properly installed drain piping designed to prevent any accumulation of condensate in the drain pan.

Drain piping shall be made of Kitec type for pipe sizes upto 1" dia and of G. I. for pipe sizes larger than 1" dia of 6 Kg/Sq. cm. pressure rating with water tight threaded connections, leading from the room unit to a suitable drain point. Complete drain piping shall be made leak proof and water tight by means of precise installation and the use of leak proof sealant / adhesives. Insulation of drain piping should be tubular Nitrile rubber of 12.5 mm thickness.

TESTING

1. After completion all such system shall be tested for leakage.

2. The entire air distribution system shall be balanced to supply the air quantities as required in various zones and rooms to maintain the specified room conditions. The final shall be recorded and submitted to the Consultant for approval before acceptance and taking over of the entire system by the Employer.

PAINTING

Angle iron flanges, stiffeners, hangers and supports shall be painted with 2 coats of anti-rust primer and those remaining uncovered shall be further painted with 2 coats of synthetic enamel paints of black color.

6.4 ELECTRICAL WORK

The electrical work will be carried out as per IE rules. The Employer will provide incoming cable with earthing near split units panel supplied by the contractor. The further distribution including power cabling (1100 V Gr.), control cabling (650 V Gr.) and earthing GI shall be carried out by the contractor. The electrical panel required for all the split units will also be provided by the contractor. The power cabling will be of aluminium whereas the control cabling will be of copper. The electrical work will be carried out by the contractor as per the approved drawings.

ANNEXURE – I

1.0 TESTING OF AIR CONDITIONING SYSTEM

1.1 Routine and types tests for various items of equipment shall be performed at the contractor's work and the test certificates furnished. Functional test shall be conducted at site.

1.2 The performance test to determine whether OR not the full indent of the specification is met shall be conducted by the contractor. After notification to the Employer's that the installation has been completed and the plant has run continuously for a period of at least two weeks, the contractor shall conduct under the direction of the Consultant's and in the presence of Employer's representatives test, such test as specified to establish the capacity of various equipment supplied and installed by the contractor.

1.3 The contractor shall operate test and adjust the air conditioning system units, fans, motors, all air conditioning appliances including adjustment of regulators, dampers etc.

1.4 All test equipment, labour, operating personnel, oil and refrigerant required for this test shall be furnished by the contractor to enable the plant to be put in continuous running test for a period of 3 days after all other tests and adjustments have been made.

The contractor will be provided with electrical power for testing by the client. The performance test shall be conducted during peak summer and peak monsoon.

2.0 PROCEDURE

2.1 Design Conditions

The inside and outside conditions will be recorded for 48 hrs. (2 days) duration on hourly basis. The outside and inside Dry Bulb and Wet Bulb temperatures shall be recorded by the means of a sling psychrometer with mercury thermometers. The relative humidity shall be computed from the psychrometeric chart. The inside Dry Bulb Temp. And relative humidity shall fall within the specified limits.

2.2 CAPACITY OF THE SYSTEM

The following aspects shall be checked before conducting the performance tests

1) The outside conditions shall be as close to the design values as possible. The tests shall be arranged during the peak summer and monsoon.
2) The internal loads of various spaces shall be close to the design values as far as possible.
3) The system shall be fully loaded and the temperatures stabilized.
4) Hourly readings of airflow shall be recorded by a calibrated flow meter.
5) Hourly readings of pressure, temperature, electrical current. Voltage and power factor shall be properly recorded.

The capacity of the system and various other equipment and accessories shall be ascertained as follows.

2.3 Cooling coil of Indoor units

The flow of air over the cooling coil will be measured by recording the velocity of air across each filter placed before the cooling coil. The velocity shall be measured by means of an end anemometer.

4.0 FUNCTIONAL TESTS

4.1 Electrical equipment

i) All the cables shall be tested for continuity and absence of cross phasing, Insulation resistance between the phase conductors and earth shall be measured with the help of a 500 v megger.

ANNEXURE – II

MODE OF MEASUREMENT

1.0 The following measurement code shall apply to this contract

1.1 PIPING

a) Piping will be measured in running lengths (meters)
b) No special measurement of bends, elbows, reducers, expanders, tees, cross, etc. will be made. All such fittings/accessories will be treated as normal piping.
c) The length of the piping, including accessories and fittings, will be measured along the enter line of piping.

B) Electrical Work

a) All cables shall be measured in running lengths as finally installed at the site. No wastage measurement will be allowed.
b) Control Cable / wiring for a plant inside the plant room shall be treated as a lump sum item.
c) All measuring instruments, indicating lamps, etc., shall form part of the equipment specified, and no separate measurement shall be made for such items.

Note – Contractor should note that all the measurements should be carried out strictly as per the mode of measurement stated above. However, all the work should be carried out as per the relevant I. S. codes specified.

Place :

Date : Signature of the Bidder with seal

	HVAC APPROVED MAKES	
1	Air cooled Chillers	Trane / York / Carrier / Climaveneta / Kirloskar
2	Chilled water pump	Grundfos / Armstrong / Xylem
3	PIBC valve	Danfoss / Belimo / Honeywell
4	AHU filters/HEPA filters	Freudenberg / AAF / Camfill
5	Magnelic gauges	Dwyer / Warree
6	Differential pressure Transmitter	Dwyer / Greystone / Setra / Omicron / Siemens
7	Readymade ducting profile	Rola Star / Zeco / Radiant / Asawa
8	PIR ducting	Pal / Asawa
9	Airflow Switch	Siemens / Honeywell
10	Balancing Valves	Advance / Castle / Belimo
11	Butterfly valves	Audco / Intervalve / Crane
12	VRV / VRF System (indoor / outdoor units)	Mitsubishi Electric / Daikin / Toshiba / Fujitsu General
13	Double Skin TFA Unit	Zeco / Edgetech / Nutech / Citizen
14	GI Ducts	Jindal / Sail / TATA
15	Grilles and Diffusers	Cosmos / Caryaire / System Air / Airtech / Airpro / Dynacraft / Tristar
16	Ventilation Fans	Kruger / Nicotra / Air Flow / Caryaire / Greenheck
17	Vibration Isolators	Dunlop / Cori / BDK / Resistoflex
18	Fire Dampers	Caryaire / Airtech / Cosmos / Greenheck / Airpro
19	Damper Actuator	Siemens / Honeywell / Belimo
20	Sensors	Siemens / Honeywell / Belimo
21	Motors	Bharat Bijlee / Crompton / Siemens / ABB
22	Starter Panel	Sterling and Wilson / Zenith Engineering / Arrow Engineers / Marine Electricals / Sinerco / Goel Power / Power Control / L&T / ABB / Schneider Electric / GE / Legrand
23	Refrigerant Copper Piping	Mandev / Totaline / Mexflow / Nippon
24	Insulation Materials	
	a) Resin Bonded	Lloyds / Beardsell / Cooline Navair / Pyroguard / UP Twiga / Kimmco
	b) Rock Wool	Vidoflex / Arma Flex / Arma Cell / Thermobreak / UP Twiga
	c) Nitrile Rubber	K Flex/ Armaflex / Superlon

25	Variable Frequency Drive	Siemens / ABB / Schneider / Danfoss
26	Refrigerant Copper Piping Insulation	K Flex / Armaflex / Superlon
27	PVC Pipes and related accessories	Precision / Polycab / Prince / Finolex / Supreme / Astral / Dunlop
28	Filter	Klenzaids / Spectrum / Pyramid / EMW
29	Fire Rated Canvas Connection	Easyflex / Resistoflex
30	Adhesives	Armaflex 520 / Pidlite SR 998 / Foster / IIDL / Napco / Star Bond
31	Central Controller	Daikin / Toshiba/ Mitubishi / Fujitsu General
32	Corded / Cordless Remotes	Daikin / Toshiba/ Mitubishi / Fujitsu General
33	Flow Control Devices	Aldes / Transmonk / Airflow / Belimo/ Seimens / Schneider / Flowcom

We hereby declare that I/we have read and understood the above specifications, terms and conditions that form part of the Formal Contract to be executed between us and the Institute. The same shall be binding upon me/us upon being declared as the Successful Bidder.

Place :

Date : Signature of the Bidder with seal

SECTION - 'G'

ARTICLES OF AGREEMENT

THIS CONTRACT AGREEMENT ("Agreement") made at Mumbai on this _____ **2026**

BETWEEN

INDIRA GANDHI INSTITUTE OF DEVELOPMENT RESEARCH (IGIDR), a Society established by Reserve Bank of India and registered under Societies Registration Act, 1860 and having its office at Gen A. K. Vaidya Marg, Goregaon (East), Mumbai – 400 065, hereinafter referred to as "the Institute" (which expression shall, unless it be repugnant to the meaning or context thereof, be deemed to mean and include its successors and assigns) of the One Part;

AND

M/S _____, a company/Proprietary concern of Mr. _____ and having its office at _____ (address). Hereinafter referred to as "**the Contractor**" **(**which expression shall, unless repugnant to the context or meaning thereof, be deemed to mean and include his heirs, administrators, and executors) of the Other Part.

AND

M/s Design Ideas, (Architecture, Engineering and Project Management), a registered partnership firm, having its office at ……., ……, Mumbai-400 014, hereinafter called "**the Consultants**", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to mean and include the partners or partner for the time being of the firm) of the THIRD PART.

WHEREAS

WHEREAS IGIDR is desirous of awarding the contract for **…….** at its campus situated at Gen. A.K. Vaidya Marg, Santosh Nagar, Goregaon (East), Mumbai 400065, issued a Tender dated ……2026 ("the Tender") inviting bids for procuring certain as stated therein.

AND WHEREAS after having studied the terms of the Tender and upon understanding the requirement of IGIDR, the Contractor has submitted his response vide his letter dated ……. 2026.

AND WHEREAS considering the response of the Contractor, IGIDR has agreed to appoint the Contractor and the Contractor has agreed to undertake the contract for **…….** situated at Gen. A. K. Vaidya Marg, Santosh Nagar, Goregaon (East), Mumbai 400 065 according to the terms and conditions herein.

NOW THEREFORE THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. The Institute is desirous of availing the services of persons/ firms/ companies to carry out **…….** and has caused Bill of Quantities showing and describing

the work to be done prepared by the Institute. The said specifications and the schedule of Quantities have been signed by or on behalf of the parties hereto.

2. The Contractor has agreed to work assigned to it in consonance with the said Agreement and subject to the terms stated there under and has agreed to carry out the work assigned to it under the supervisions of the Institute.

3. The Contractor has agreed to execute upon and subject to the conditions set forth herein and in the correspondence attached hereto and to the Conditions set forth in the Special Conditions, Technical bid and Terms & Conditions of Contract (all of which are collectively herein after referred to as "**the said Conditions**") the works described in the said Specifications and included in the said Schedule of Quantities at the respective rates therein set forth amounting to the sum as therein arrived or such other sum as shall become payable there under (hereinafter referred to as "**the said Contract Amount**").

4. In lieu of the consideration herein mentioned the Contractor will upon and subject to the conditions annexed carry out and complete the work shown upon the Contract and described by or referred to in the Schedule of Quantities and in the said conditions.

5. The Institute shall pay the Contractor the Contract Amount, or such other sum as shall become payable, at the times and in the same manner specified in the said Conditions.

6. The said conditions and Appendix thereto and the correspondence attached hereto shall be read and construed as forming part of this Agreement and the parties hereto shall respectively abide by, submit themselves to the said conditions and the correspondence and perform the agreements on their part respectively in the said Conditions and the correspondence contained.

7. The tender, agreement and documents mentioned herein shall form the basis of this contract.

8. This Agreement is neither a fixed Lump Sum Contract nor a Piece Work Contract, but it is an Agreement for the complete work, the Contract Amount whereof is to be paid for as per the actual quantities at the rates contained in the Schedule of Rates and Probable Quantities or as provided in the said Conditions. The Contractor has to visit the site & acquaint himself with the site condition & also the part work done therein by the previous Contractor. As the nature of the work comprises of completing the balance incomplete work, the new Contractor should carefully study the present site condition & quote the rates accordingly. No claims will be entertained later for any lapse on the Contractor’s part in having studied the present site condition.

9. The Contractor shall afford every reasonable facility for carrying out of all works or other Contractor's appointed by the Institute and shall make good any damages done to walls, floors etc. after the completion of such works.

10. The Institute reserves to itself the right of altering the items to be executed by adding to or omitting any items without prejudice to this Agreement. However, the Contractor shall not be entitled to any payment for the works done exceeding the Tender Quantities unless specifically approved in writing by the Institute.

11. Time shall be considered as the essence of this Agreement and the Contractor hereby agrees to commence the work job from 4th day of issue of work order as provided for in the said Conditions and to complete the entire work within **Six weeks or by 31/03/2026**, subject nevertheless to the provisions for extension of time.

12. The payments for running bills & final bill shall be made subject to quantity and quality check in the format approved by the Institute and the Contractor. The payment shall be processed by the Institute only after recommendation by the Contractor with proper documentation.

13. The Contractor should complete the work as per the work schedule annexed as **Annexure I**. The Contractor also binds to depute its team/ manpower at site during execution work as per enclosed organization chart/schedule.

14. All payments by the Institute under this Agreement will be made only at Mumbai.

15. **INDEMNITY**

15.1 The Contractor agrees to keep IGIDR indemnified against direct losses, damages, costs, expenses, penalties, payments and liability whatsoever, including reasonable legal fees which IGIDR may suffer or incur directly as a result of rendering the Services to IGIDR under this Agreement.

15.2 The Contractor shall keep IGIDR indemnified in case any action is taken against IGIDR by any authorities on account of contravention of any of the provisions of any act or rules made thereunder, regulations, or notifications, including amendments. If IGIDR is caused to pay or reimburse, such amounts as may be necessary to cause or observe or for non-observance of the provisions stipulated in the notifications/bye-laws/acts/rules/regulations, including amendments, if any, on the part of the Contractor, IGIDR shall have the right to deduct any money due to the Contractor. IGIDR shall also have the right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by IGIDR.

16. **TERMINATION**

16.1 It is agreed, without prejudice to any other remedy available to IGIDR, in case of default on the part of the Contractor in the performance of this Agreement or in the discharge of any contractual obligations arising out of this Agreement or if the Contractor commits substantial breach of its obligations and such breach is not corrected within 30 (thirty) days from the date of receipt of the notice specifying the breach, by the Contractor, IGIDR may terminate this Agreement by giving a 15 (fifteen) days written notice of intended termination to the Contractor.

16.2 In the event of this Agreement being terminated, IGIDR shall be liable to make payments of the amount due under this Agreement up to the effective date of termination for which services (including parts thereof) have been rendered by the Contractor.

16.3 Notwithstanding anything contained herein above, IGIDR may terminate this Agreement at any time by giving 15 (fifteen) days' notice to the Contractor without assigning any reason thereof and without prejudice to the rights of IGIDR to recover any money becoming due and payable to IGIDR under this Agreement. The Contractor may terminate this Agreement at any time by giving 15 (fifteen) days' notice to IGIDR without assigning any reason thereof.

16.4 Forthwith, on the expiry or earlier termination of this Agreement, the Contractor shall return to IGIDR all materials and equipment belonging to IGIDR with regard to this Agreement. IGIDR shall also inform the Contractor of the time when it can collect its equipment stored in IGIDR, and the Contractor shall collect the same. In the event that the Contractor does not collect its equipment by the appointed time, IGIDR shall not be liable for the same thereafter.

16.5 Forthwith, on the expiry or earlier termination of this Contract, IGIDR shall determine the costs of execution, the cost of remedying any defects (if any) and the cost of completion of the work (if required). IGIDR shall be entitled to recover from the Contractor the extra costs, if incurred, after adjusting the same against the Performance Security Deposit made by the Contractor.

16.6 On the earlier termination of this Agreement due to failure to discharge its duties, the Performance Security Deposit shall stand forfeited by IGIDR.

17. **WAIVER:**

1. No forbearance, indulgence or relaxations by any Party at any time to require performance of any provision of this Agreement shall in any way affect, diminish or prejudice the right of such party to require performance of that provision, and any waiver by any party or any breach of any provisions

of this Agreement shall not be construed as a waiver or an amendment of the provisions itself, or a waiver of any right under or arising out of this Agreement.

18. **AMENDMENT**

This Agreement may be amended, modified or supplemented only by a written instrument duly executed by a duly authorized representative of each of the parties.

19. **DISPUTE RESOLUTION**

16.1 In the event of any dispute as to the subject matter of the present Agreement arises, the parties hereto shall submit to mediation before the Registrar of IGIDR. IN the event either party is dissatisfied with the decision of the Registrar, the dispute shall be resolved in accordance with clause 16.2 below.

16.2 In the event that the Contractor disagrees with the decision made by The Registrar, Indira Gandhi Institute of Development Research, Goregaon, the dispute shall be settled by Arbitration in accordance with the provisions of Arbitration and Conciliation Act, 1996 or any enactment thereof. The Arbitral Tribunal shall consist of a Sole Arbitrator to be appointed by IGIDR. The place of Arbitration shall be Mumbai and any award whether interim or final, shall be made, and shall be deemed for all purposes between the parties to be made in Mumbai. The Arbitration Proceedings shall be conducted in the English language, and any Award or Awards shall be rendered in the English Language. The procedural law of the Arbitration shall be the Indian Law. The Award of the Arbitrator shall be final, conclusive, and binding upon the Contractor and IGIDR.

20. **GOVERNING LAW AND JURISDICTION**

The law governing this Agreement shall be the laws of India, and shall be limited to the Courts in Mumbai, irrespective of the place of the cause of action and rights and liabilities of the Parties hereto.

21. **STAMP DUTY**

The Parties agree that stamp duty payable on this Agreement shall be borne and paid by the Contractor alone.

IN WITNESS WHEREOF, the parties have hereto set and subscribed their respective hands and seals the day, month, and year first above written.

Signed, sealed and delivered

For and on behalf of the Institute

For and on behalf of contractor
M/s.

_____ _____

Name _____ Name _____

Designation _____ Designation _____

For and on behalf of the Consultant:

1) Signature of the Architect/Consultant _____

2) Name of the Consultant _____

3) Council of Architecture's Registration No. _____

4) Date _____

5) Place _____

Counter-signed by:

In the presence of witnesses:

1. Signature _____ 1. Signature _____

2. Signature _____ 2. Signature _____

Annexure – A*

FORMAT OF UNDERTAKING, TO BE FURNISHED ON COMPANY LETTER HEAD WITH REGARD TO BLACKLISTING/ NON-DEBARMENT, BY ORGANISATION UNDERTAKING REGARDING BLACKLISTING / NON–DEBARMENT.

To,
The Registrar
Indira Gandhi Institute of Development Research
Film City Road, Santosh Nagar,
Goregaon (East),
Mumbai – 400 065.

We hereby confirm and declare that we, M/s _____, is not blacklisted/ De-registered/ debarred by any Government department/ Public Sector Undertaking/ Private Sector/ or any other agency for which we have Executed/ Undertaken the works/ Services during the last 5 years.

For M/s _____

Authorized Signatory

Date:

**To be submitted on the company letterhead, duly signed and stamped.*

FORMAT OF CONFIDENTIAL REPORT

(To be submitted by the Client of applicant on their letter head in sealed envelope to the IGIDR - Mandatory requirement)

To:

The Registrar, IGIDR,
Gen AK Vaidya Marg, Goregaon East.
Tel: _____,
Fax: _____
Email: _____

Sir,

Confidential Report on M/s._____

This is to certify that M/s. _____, having Office at_____ have completed the work of _____. Confidential Report for our project executed is as under:

1.	***DETAILS OF PROJECT EXECUTED BY THE FIRM***	
2.	**AREA OF CONSTRUCTION**	
3.	***DATE OF COMMENCEMENT OF PROJECT***	
4.	***DATE OF COMPLETION OF PROJECT***	
5.	***TOTAL VALUE OF PROJECT EXECUTED***	
6.	***QUALITY OF SERVICE RENDERED***	
7.	***COMPETENCE TO HANDLE WORKS***	
8.	***INTEGRITY AND RELIABILITY OF THE FIRM***	
9.	***DEALING IN EXECUTION OF WORK***	
10.	***WHETHER TIME SCHEDULE IS ADHERED TO***	
11.	***WHETHER ANY PENALTY IMPOSED FOR THE DELAY***	
12.	***GENERAL ATTITUDE OF THE FIRM***	
13.	***ANY OTHER INFORMATION WHICH YOU CONSIDER WILL HELP US IN TAKING OUR DECISION***	

PLACE: **SIGNATURE: _____**
NAME: _____
DATE: **DESIGNATION: _____**
OFFICE SEAL:

DECLARATION

I/We have read the instructions appended to the Proforma. I/We understand that if any false information is detected at a later date, any future contract made between ourselves and IGIDR, on the basis of the information given by me/us, can be treated as invalid by IGIDR. I / We will be solely responsible for the consequences.

I/We agree that the decision of IGIDR in the selection of contractors will be final and binding to me/us.

I/We agree that I/we have no objection if enquiries are made about the work listed by me/us in the accompanying sheets.

I/We agree that I/We have not applied in the name of the sister concern for the subject empanelment/tender process.

All the information furnished by me hereunder is correct to the best of my knowledge and belief.

Place:
Date:

SIGNATURE
NAME & DESIGNATION
SEAL OF ORGANISATION

SUPPLEMENTARY CONDITION

INDEMNITY BOND

On the acceptance of his tender, the contractor will be required to execute an Indemnity Bond with-in 10 days of issue of work order in favour of IGIDR against third party claims, civil or criminal complaints, site mishaps and other accidents or disputes, against any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of the contractor, his subcontractors or his employees and agents etc., as per the appropriate Indemnity Bond attached.

It will also be covered by the labour laws of the Government of India.

Any other conditions suggested by IGIDR may be added subsequently.

INDEMNITY BOND

(On Non-Judicial Stamp Paper of Rs. 200/-)

KNOW all men by these presents that I/We _____ do hereby execute Indemnity Bond in favour of Indira Gandhi Institute of Development Research (IGIDR) on this _____ day of _____2026.

WHEREAS IGIDR, (address of the office) _____, have appointed _____ as the Contractors for their Proposed Project at _____.

THIS DEED WITNESS AS FOLLOWS:

I/We _____hereby do Indemnify and save harmless IGIDR, _____ against

1. Any third party claims, civil or criminal complaints/liabilities, site mishaps and other accidents or disputes and/or damages occurring or arising out of any mishaps at the site due to faulty work, negligence, faulty construction and/or for violating any law, rules and regulations in force, for the time being while executing/executed works by me/us.

2. Any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of me/us or my sub-contractor's, if any, servants or agents.

3. Any claim by an employee of mine/ours or of sub-contractors if any, under the Employee's Compensation Act and Owners Liability Act, 1939 or any other law, rules and regulations in force for the time being and any Acts replacing and/or amending the same or any of the same as may be in force at the time and under any law in respect of injuries to persons or property arising out of and in the course of the execution of the contract work and/or arising out of and in the course of employment of any workman/employee.

Any act or omission of mine/ours of sub-contractors, if any, our/their servants or agents, which may involve any loss, damage, liability, civil or criminal action.

IN WITNESS WHEREOF THE _____ has set his/their hand on this day of _____ 2026.

SIGNED AND DELIVERED BY THE AFORESAID _____

NAME AND ADDRESS

(Contractor)

IN THE PRESENCE OF WITNESSES:

1.

2.